ADTRAN

Express 5110
Frame Relay Service Unit

User Manual

1202130L2   Express 5110 w/built-in DSU

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

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 5110 highlights. The chapter also gives a brief explanation of options that may be purchased for use with the Express 5110.

- Chapter 2, *Installation*, describes the Express 5110 connectors (pin assignments are given in Appendix A) and provides an installation diagram.

- Chapter 3, *Operation*, explains how to operate your Express 5110 using either the front panel or a VT 100 terminal interface.

- Chapter 4, *Applications*, provides examples of some common Express 5110 applications. This chapter includes network diagrams as well as configuration tables for each example.

- Chapter 5, *Configuration Overview*, explains how to access the Express 5110 Configuration menu and provides menu trees for both the front panel and the VT 100 interface.

- Chapters 6 through 9 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 1 and 2, Network Port, IP Routing, and System configuration.

- Chapter 10, *Statistics*, describes how to access statistics information from the Express 5110.

- Chapter 11, *Diagnostics*, explains how to access the Express 5110 diagnostic features, including Ping, and Loopback Tests.

- Appendix A provides pinouts for the Express 5110 connectors.

- Appendix B contains product specifications.

NOTE *Notes provide additional useful information.*

CAUTION *Cautions signify information that could prevent service interruption.*

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

Important Safety Instructions
Save These Instructions

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

1. Do not use this product near water, such as near a bath tub, wash bowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool.

2. Avoid using a telephone (other than a cordless-type) during an electrical storm. There is a remote risk of shock from lightning.

3. Do not use the telephone to report a gas leak in the vicinity of the leak.

4. Use only the power cord, power supply, and/or batteries indicated in the manual. Do not dispose of batteries in a fire. They may explode. Check with local codes for special disposal instructions.

ADTRAN Year 2000 (Y2K) Readiness Disclosure

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

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

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

1. This equipment complies with Part 68 of FCC rules. On the bottom of the equipment housing is a label showing the FCC registration number and ringer equivalence number (REN) for this equipment. If requested, provide this information to the telephone company.

2. If this equipment causes harm to the telephone network, the telephone company may temporarily discontinue service. If possible, advance notification is given; otherwise, notification is given as soon as possible. The telephone company will advise the customer of the right to file a complaint with the FCC.

3. The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the proper operation of this equipment. Advance notification and the opportunity to maintain uninterrupted service are given.

4. If experiencing difficulty with this equipment, please contact ADTRAN for repair and warranty information. The telephone company may require this equipment to be disconnected from the network until the problem is corrected or it is certain the equipment is not malfunctioning.

5. This unit contains no user-serviceable parts.

6. An FCC compliant telephone cord with a modular plug is provided with this equipment. This equipment is designed to be connected to the telephone network or premises wiring using an FCC compatible modular jack, which is Part 68 compliant.

7. The following information may be required when applying to the local telephone company for a dial-up line for the V.34 modem:

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

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

Federal Communications Commission
Radio Frequency Interference Statement

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

> **NOTE**
>
> *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.

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

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

Warranty and Customer Service

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

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

For service, RMA requests, or further information, contact one of the numbers listed on the inside back cover of this manual.

Table of Contents

List of Figures

List of Tables

Express 5110 User Manual 61202130L2-1

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 5110.

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 Express 5110 provides a low cost solution for the CPE equipment in a private or public frame relay network. The Express 5110 connects to the frame relay network via 56/64k DDS (digital data service) or T1/FT1 access links. Connections to 56/64k DDS are made using an integral 56/64k DSU or an external DSU. T1/FT1 connections are made using an external T1 DSU/CSU through a V.35 interface.

The Express 5110 provides connections to the user equipment through two independent ports emulating a DCE device. These ports can be configured for either RS-232 or V.35 signal specifications. Synchronous protocol speeds up to 512 kbps and asynchronous protocol speeds up to 38.4 kbps are supported.

The Express 5110 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 5110 are as follows:

- Two DTE (data terminal equipment) ports for use on a single frame relay network interface.
- Support for IP (internet protocol), SDLC (synchronous data link control), Bisync, SLIP (serial link IP), PPP (point-to-point protocol) both sync and async, frame relay, BOP (bit-oriented protocol), and async protocols.
- SNMP (simple network management protocol) management capability provided inband with support for RFC 1315 (frame relay DTE MIB), RFC 1213 (MIB II), and ADTRAN Enterprise MIB.

- DCE port supporting rates of up to 512 kbps.
- Integrated 56/64 DDS DSU/CSU.
- Telnet-provided remote terminal management control.
- FLASH code space for easy software upgrades.

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 Express 5110's integrated 56/64 DDS DSU connects directly to a frame relay network via a 56 or 64k DDS circuit. The Express 5110 supports the 56/64 kbps DDS service rate yielding DTE rates of 2.4, 4.8, 9.6, 19.2, 38.4, 56, and 64 kbps.

SNMP MANAGEMENT

SNMP management capability is provided inband with support for RFC 1315 (frame relay DTE MIB), RFC 1213 (MIB II), and ADTRAN Enterprise MIB. Telnet capability is also supported. For non-SNMP environments, VT 100 and front panel operation is supported.

Chapter 2   Installation

UNPACK, INSPECT, POWER UP

Receiving Inspection

Carefully inspect the Express 5110 for any damage that may have occurred in shipment. If damage is suspected, file a claim immediately with the carrier and contact ADTRAN Customer Service (see the last page 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 5110:

- Express 5110 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)

Customer Provides

The customer provides an interface cable for each port used. Each cable should be either an RS-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 5110 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.

> **NOTE** *Power to the Express 5110 must be provided from a grounded 115 VAC, 60 Hz receptacle.*

REAR PANEL

The Express 5110 is equipped with three DB-25 connectors labeled **DTE 1**, **DTE 2**, and **DCE**. 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 *Pinouts* on page A-1. The Express 5110 rear panel is shown in Figure 2-1 on page 2-3.

DCE Connector

The connector labeled **DCE** provides connection to an external DSU/CSU. The pinouts for this connector are shown in *Pinouts* on page A-1.

> **NOTE** *The connection between the Express 5110 and an external DSU is a direct connection. When connecting to an external DSU, the Express 5110 emulates an externally timed DTE interface connected directly to the DCE interface of the external device.*

DTE Connectors

DTE devices are connected to the DTE connectors using either an RS-232 DTE cable or a CCITT V.35 DTE adapter cable. The maximum cable lengths recommended are 50 feet for the RS-232 and 100 feet for the CCITT V.35. The pin assignments are listed in *Pinouts* on page A-1.

The V.35 adapter cable is recommended for use with data rates above 19.2 kbps. A low capacitance RS-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.
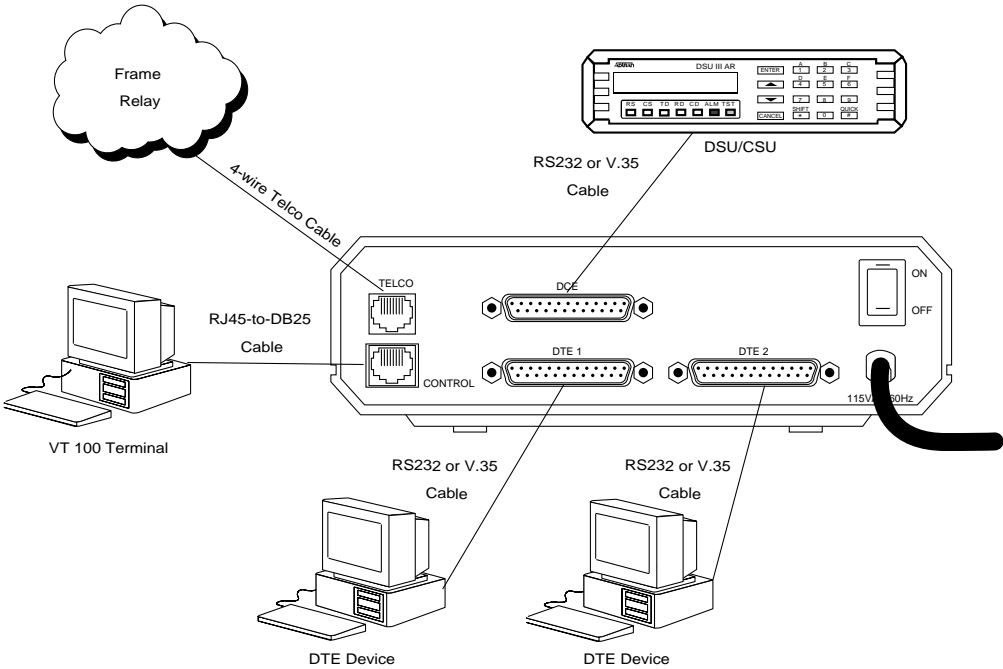
Item	Function
DCE port	Connects to an external DSU/CSU
DTE 1 port	Connects to a DTE device
DTE 2 port	Connects to a DTE device
Telco connector	Connects to the dedicated circuit
Control port	Connects to the VT 100 interface
On/Off switch	Turns power on and off
115 VAC connection	Connects to captive power cord

Figure 2-1. Express 5110 Rear View

Telco Connector

The **TELCO** connector is an eight-position modular jack which provides connection to the dedicated (DDS) network. See *Pinouts* on page A-1 for the **TELCO** connector's pin assignments.

Control Port

The eight-position modular jack labeled **CONTROL** provides connection to a VT 100 RS-232 compatible interface. This enables the Express 5110 to be configured through a terminal instead of the front panel. Use the VT 100 terminal cable (provided) for this connection. See *Pinouts* on page A-1 for the connector pin assignments. A description of the operation of this port is covered in *Operation* on page 3-1.

Chapter 3   Operation

FRONT PANEL

The Express 5110 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.

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).

Shift

Enter alpha characters by pressing **Shift** before each desired character. The **NEXT**, **PREV**, **ADD**, and **DEL** 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 which parameter is activated. Press **Enter** to select the item.

If a key is pressed without using **Shift**, the numbered item becomes active instead of the alpha item. If this happens, repeat the correct procedure.

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.

Up and Down Arrows

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

Next, Prev, Add, Del

To activate these functions, press and release the **Shift** key, then press the **NEXT**, **PREV**, **ADD**, or **DEL** key. Use these keys when editing routing tables. See *DTE Port Configuration* on page 6-1 and *IP Routing* on page 8-1 for more information.

LED Descriptions

The Express 5110 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 5110 DTE 1 port is transmitting data.

RD1: Receive Data (DTE 1)
This LED is active when the Express 5110 DTE 1 port is receiving data.

TD2: Transmit Data (DTE 2)
This LED is active when the Express 5110 DTE 2 port is transmitting data.

RD2: Receive Data (DTE 2)
This LED is active when the Express 5110 DTE 2 port is receiving data.

TDN: Transmit Data (Network)
This LED is active when the Express 5110 Network port is transmitting data.

RDN: Receive Data (Network)
This LED is active when the Express 5110 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

Frame Relay Alarm Condition
- Network frame relay signaling state is down.

External DSU/CSU Alarm Condition
- DSR on an external DSU/CSU is false.

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 pressing either the up or down arrows also activates the menu items. The flashing cursor indicates which selection is activated. Press **Enter** to select the item. The following steps and Figure 3-1 on page 3-4 illustrate how to select Express 5110 options:

1. Activate **CONFIGURATION** (**CONFIG**) using the arrow keys or by 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** using the arrow keys or by pressing **1**. Press **Enter**.

5. Activate **PROTOCOL** options using the arrow keys or by pressing **1**. Press **Enter**.

6. Press the arrow keys until the desired protocol is displayed. Press **Enter**.

			1 PORT DISABLED
			2 FRAME RELAY
			3 SDLC <> LLC2
			4 TRANSPARENT BOP
			5 BISYNC
	1 DTE PORT 1	1 PROTOCOL	6 TRANSPARENT ASYNC
1 CONFIG	2 DTE PORT 2	2 PHYS LYR OPT	7 PPP SYNCHRONOUS
	3 NETWORK PORT	3 PROTOCOL OPT	8 PPP ASYNC
	4 CONTROL PORT	4 ADDRESS TABLE	9 SLIP
	5 IP ROUTING		
	6 UNIT CONFIG		

Figure 3-1. Example of Basic Menu Travel

VT 100 Terminal Connection and Operation

To control the Express 5110 using a VT 100 terminal, perform the following procedure:

1. Set the Express 5110 baud rate to match the terminal through the front panel. Select **1 CONFIG**, then **4 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 5110. This connection is used for both local and remote configuration.

3. Open the connection and press **Enter** repeatedly until the **LOGIN MENU** appears (Figure 3-2 on page 3-5).

4. Select **LOCAL LOGIN** to configure the Express 5110 unit connected to the terminal. Select **REMOTE LOGIN** to configure a remotely located Express 5110 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 (Figure 3-3 on page 3-5).

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 RE-MOTE is displayed, indicating which unit the current screen represents. See Figure 3-3 on page 3-5.*

```
                              LOGIN MENU              ADTRAN EXPRESS 5110
                                                                   LOCAL

 1 - LOCAL LOGIN
 2 - REMOTE LOGIN




 ENTER SELECTION ->
```

Figure 3-2. Terminal Login Menu

```
                              MAIN MENU              ADTRAN EXPRESS 5110
                                                                   LOCAL

 1 - CONFIGURATION
 2 - VIEW STATISTICS
 3 - TEST

 4 - SAVE CONFIGURATION
 5 - ABORT CHANGES
 6 - LOGOUT




 ENTER SELECTION -> █
```

Figure 3-3. Terminal Main Menu

EXPRESS 5110 MENU STRUCTURE

The opening menu is the access point to all other operations. The **MAIN** menu branches are **CONFIGURATION**, **STATISTICS**, **DIAGNOSTICS**, **SAVE**, **ABORT**, and **LOGOUT**. Each **MAIN** menu item has several functions and submenus to identify and access specific parameters.

NOTE   *The Logout selection is available on the VT 100 interface only.*

NOTE   *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 select network and DTE operating parameters. For more information on configuration options, see the following chapters: *Configuration Overview* on page 5-1, *DTE Port Configuration* on page 6-1, *Configuring the Network Port* on page 7-1, *IP Routing* on page 8-1, and *System Configuration* on page 9-1. When DTE Port 1 or 2 is selected, the protocol enabled determines the selections for **PHYSICAL LAYER OPTIONS**, **PROTOCOL OPTIONS**, and **PROTOCOL ADDRESS TABLE**.

View Statistics (STATS)
This selection displays statistical information for DTE ports, the network port, the protocol, and the system. See the chapter *Statistics* for more information.

Diagnostics (DIAG)
Diagnostic options enable and disable loopback and ping functions. See *Diagnostics* on page 11-1 for more information.

Save Configuration (SAVE)
This parameter saves the currently selected configuration.

NOTE	*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 5110 applications. The examples include SNA/SDLC with local spoofing, SNMP/Telnet management, bisync point-to-point and multi-point, and transparent applications. The configuration selections given in these examples may need modification based on your network configuration.

SNA/SDLC WITH LOCAL SPOOFING

When used in an SNA/SDLC network, the Express 5110 provides local spoofing by emulating the primary or secondary SDLC roles (see Figure 4-1 on page 4-2). The Express 5110 performs conversion from SDLC to frame relay and also terminates SDLC links, providing primary and secondary emulation between Express 5110s. 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 5110 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 5110 looks for SNRM on all ports and assumes a secondary role once SNRM is received. The Express 5110 then brings up the LLC2 link across the frame relay network to another FRAD which assumes a primary role. This allows the Express 5110 to operate with PU 2.1 devices.

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

NOTE

In all cases, the Express 5110 is transparent to the XID (exchange identification) negotiation between any two network devices.

The Express 5110 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 on page 4-3 for an example of how to configure the Express 5110 for this application.
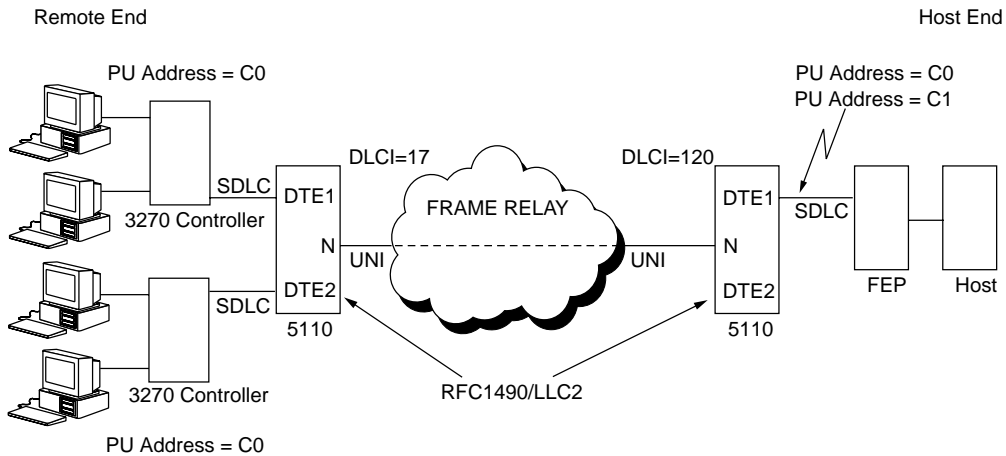
Figure 4-1. SNA /SDLC with Local Spoofing

Table 4-1. Configuration Settings for SNA/SDLC Application

	HOST Express 5110		REMOTE Express 5110
DTE Port 1			
Protocol	SDLC		SDLC
Physical Layer Options	CONN=RS232 RATE=19.2K IDLE=ONES		CONN=RS232 RATE=19.2K IDLE=ONES
Protocol Options	FORMAT=NRZ TIMEOUT=3 MIN POLL TIME=0 THRESHOLD=10 POLL RATIO=1 TX DELAY=0		FORMAT=NRZ TIMEOUT=3 MIN POLL TIME=0 THRESHOLD=10 POLL RATIO=1 TX DELAY=0
Protocol Address Table	ENTRY#1 CTRL ADDR=C0 GROUP ADDR=0 LLC2 SSAP=04 LLC2 DSAP=04 OUT DLCI=120	Entry #2 CTRL ADDR=C1 GROUP ADDR=0 LLC2 SSAP=08 LLC2 DSAP=04 OUT DLCI=120	ENTRY #1 CNTRL ADDR=C0 GROUP ADDR=0 LLC2 SSAP=04 LLC2 DSAP=04 OUT DLCI=17
DTE Port 2			
Protocol	DISABLED		SDLC
Physical Layer Options	N/A		CONN=RS232 RATE=19.2 IDLE=ONES
Protocol Options	N/A		FORMAT=NRZ TIMEOUT=3 MIN POLL TIME=0 THRESHOLD=10 POLL RATIO=1 TX DELAY=0
Protocol Address Table	N/A		ENTRY #1 CTRL ADDR= C1 GROUP ADDR=0 LLC2 SSAP=04 LLC2 DSAP=08 OUT DLCI=17
Network Port			
Interface Type	V.35		NET
Physical Layer Options	BIT RATE=64K		LOOP RATE=64K CLOCK SOURCE= SLAVE
Frame Relay Options	SIGNAL TYPE=ANNEX D T391=10 N391=6 N392=3 N393=4		SIGNAL TYPE=ANNEX D T391=10 N391=6 N392=3 N393=4

SNA and LAN Application with SNMP/Telnet Management

When used in a mixed environment consisting of both SNA and LAN networks, the Express 5110 serves as a concentrator, allowing both networks access to one frame relay link. The example shown in Figure 4-2 on page 4-5 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 5110 routes data at the DLCI level using the DTE 2 frame relay address table. The Express 5110 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 5110. This Management DLCI carries the SNMP and telnet traffic destined for the Express 5110. This DLCI is included in the UNI full status responses to the router. The Express 5110 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 5110's SNMP and telnet information. See Table 4-2 on page 4-6 for an example configuration.

NOTE

RIP and inverse ARP are not used for the Express 5110 DTE frame relay port.
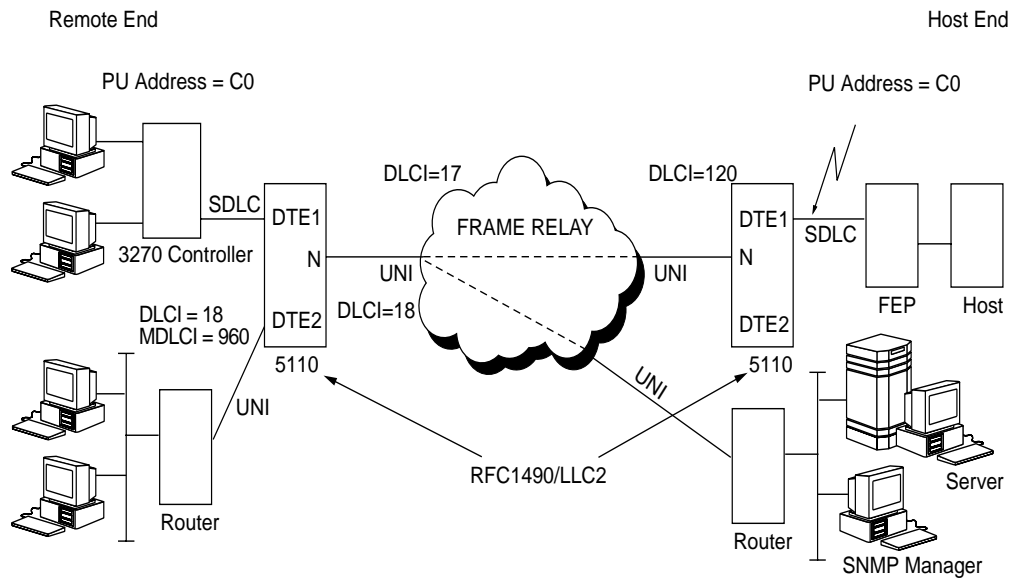
Figure 4-2. SNA and LAN Application with SNMP/Telnet Management

Table 4-2. Configuration Settings for SNA and LAN Application

	HOST Express 5110	**REMOTE Express 5110**
DTE Port 1		
Protocol	SDLC	SDLC
Physical Options	CONN=RS232 RATE=19.2 IDLE=ONES	CONN=RS232 RATE=RS232 IDLE=ONES
Protocol Options	FORMAT=NRZ TIMEOUT=3 MIN POLL TIME=0 THRESHOLD=10 POLL RATIO=1 TX DELAY=0	FORMAT=NRZ TIMEOUT=3 MIN POLL TIME=0 THRESHOLD=10 POLL RATIO=1 TX DELAY=0
Protocol Address Table	ENTRY#1 CTRL ADDR=CO GROUP ADDR=0 LLC2 SSAP=04 LLC2 DSAP=04 OUT DLCI=120	ENTRY #1 CTRL ADDR=0 GROUP ADDR=0 LLC2 SSAP=04 LLC2 DSAP=04 OUT DLCI=17
DTE Port 2		
Protocol	DISABLED	FRAME RELAY
Physical Options	N/A	CONN=V.35 RATE=64K IDLE=FLAGS HDW FLOW CTRL=ON
Protocol Options	N/A	SIGNAL=ANSI T392=15 N392=3 N393=4 IP ADDR=200.200.200.2 SUBNETMASK=255.255.255.0 MNG DLCI=960
Protocol Address Table	N/A	PORT DLCI=18 NET DLCI=18
Network Port		
Interface Type	NET	NET
Physical Options	LOOP RATE=64K CLOCK SOURCE=SLAVE	LOOP RATE=64K CLOCK SOURCE=SLAVE
FRAME RELAY OPTIONS	SIGNAL TYPE= ANNEX D T391=10 N391=6 N392=3 N393=4	SIGNAL TYPE=ANNEX D T391=10 N391=6 N392=3 N393-4

Bisync Application

The Express 5110 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 19200 bps. 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 5110 performs local spoofing, minimizing traffic across the frame relay network. Sample network illustrations for both point-to-point and multi-point are shown in Figures 4-3 and 4-4.

See Table 4-3 on page 4-9 for an example configuration for the point-to-point application.
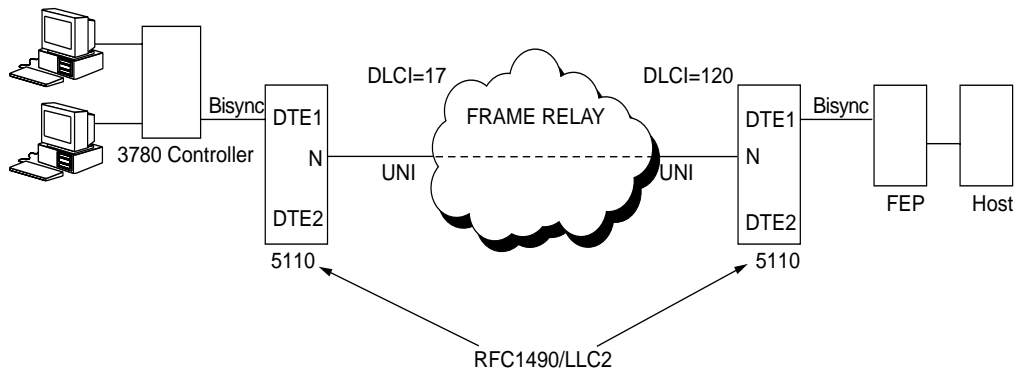
Figure 4-3. Bisync Point-to-Point
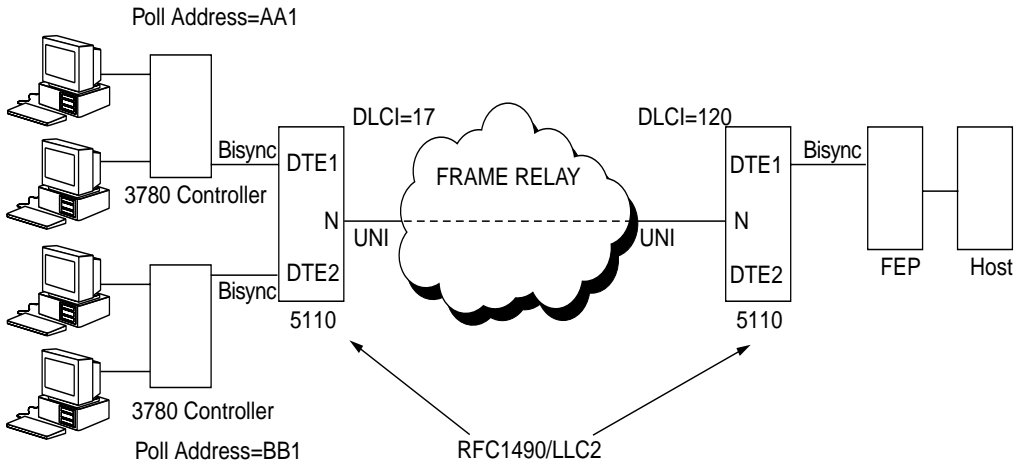
Figure 4-4. Bisync Multi-Point

Table 4-3. Configuration Settings for Multi-Point Bisync Application

	HOST Express 5110		REMOTE Express 5110
DTE Port 1			
Protocol	BISYNC		BISYNC
Physical Options	CONN=RS232 RATE=9600		CONN=RS232 RATE=9600
Protocol Options	LINE=MULTIPOINT TRANS CODE=EBCDIC CRC 16 FORMAT=NRZ TIMEOUT=3 THRESHOLD=10 POLL RATIO=1		LINE=MULTIPOINT TRANS CODE=EBCDIC CRC 16 FORMAT=NRZ TIMEOUT=3 THRESHOLD=10 POLL RATIO=1
Protocol Address Table	ENTRY #1 UNIT ADDR=AA1 LLC2 SSAP=04 LLC2 DSAP=04 OUT DLCI=120	ENTRY #2 UNIT ADDR=BB1 LLC2 SSAP=04 LLC2 DSAP=08 OUT DLCI=12	ENTRY #1 UNIT ADDR=AA1 LLC2 SSAP=04 LLC2 DSAP=04 OUT DLCI=17
DTE Port 2			
Protocol	BISYNC		BISYNC
Physical Options	LINE=MULTIPOINT TRANS CODE=EBDIC CRC 16 FORMAT=NRZ TIMEOUT=3 THRESHOLD=10 POLL RATIO=1		LINE=MULTIPOINT TRANS CODE=EBCDIC CRC 16 FORMAT=NRZ TIMEOUT=3 THRESHOLD=10 POLL RATIO=1
Protocol Address Table	ENTRY #1 UNIT ADDR=AA1 LLC2 SSAP=04 LLC2 DSAP=04 OUT DLCI=120	ENTRY #2 UNIT ADDR=BB1 LLC2 SSAP=04 LLC2 DSAP=08 OUT DLCI=12	ENTRY#1 UNIT ADDR=BB1 LLC2 SSAP=08 LLC2 DSAP=04 OUT DLCI=17
Frame Relay Options	SIGNAL TYPE=ANNEX D T391=10 N391=6 N392=3 N393=4		SIGNAL TYPE=ANNEX D T391=10 N391=6 N392=3 N393=4

Transparent Application

In cases when the user protocol is not supported by the Express 5110, 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 5110 is transparent to the protocol address formats.

In the transparent BOP protocol, the Express 5110 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 5110 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 5110 buffers async characters and encapsulates the data portion of each character for transport across frame relay using a programmable DLCI and remote Express 5110 port number.

See Figure 4-5 below and Table 4-4 on page 4-11 for an example of a transparent BOP configuration. See Figure 4-6 on page 4-11 and Table 4-5 on page 4-12 for an example of a transparent asynchronous application.
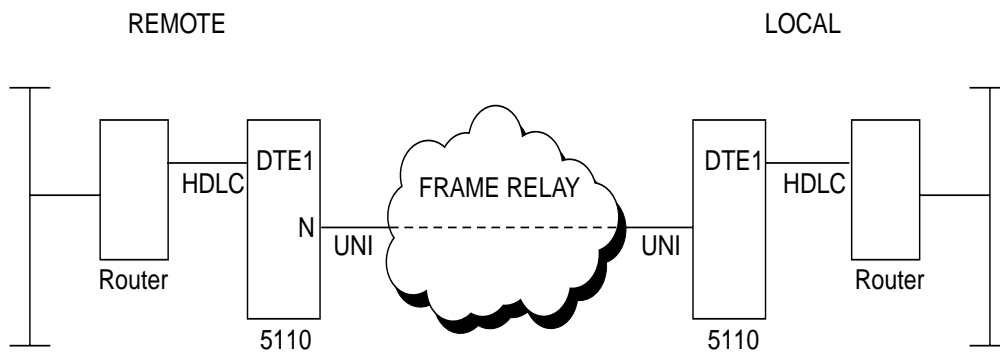
Figure 4-5. Transparent BOP Application

Table 4-4. Configuration Settings for Transparent BOP Application

	HOST Express 5110	REMOTE Express 5110
DTE Port 1		
Protocol	TRANS BOP	TRANS BOP
Physical Layer Options	CONN=V.35 RATE=64K IDLE=FLAGS HDW FLOW CTRL=ON	CONN=V.35 RATE=64K IDLE=FLAGS HDW FLOW CTRL=ON
Protocol Options	N/A	N/A
Protocol Address Table	FAR END PORT=1 DLCI=100	FAR END PORT=2 DLCI=17
Network Port		
Interface Type	NET	NET
Physical Layer Options	LOOP RATE=64K CLOCK SOURCE=SLAVE	LOOP RATE CLOCK SOURCE=SLAVES
Frame Relay Options	SIGNAL TYPE=ANNEX D T391=10 N391=6 N392=3 N393=4	SIGNAL TYPE=ANNEX D T391=10 N391=6 N392=3 N393=4
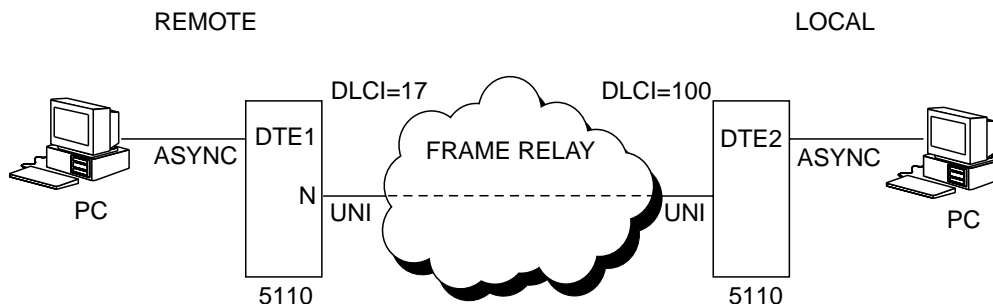
Figure 4-6. Transparent Async Application

Table 4-5. Configuration Settings for Transparent Async Application

	HOST Express 5110	**REMOTE Express 5110**
DTE Port 1	TRANS ASYNC	TRANS ASYNC
Physical Layer Options	CONN=RS232 BAUD=38.4 DATA BITS=8 PARITY=NONE STOP BITS=1 HDW FLOW CTRL=ON	CONN=RS232 BAUD=38.4K DATA BITS=8 PARITY=NONE STOP BITS=1 HDW FLOW CTRL=ON
Protocol Options	N/A	N/A
Protocol Address Table	FAR END PORT=1 DLCI=100	FAR END PORT=2 DLCI=12
Network Port		
Interface Type	NET	NET
Physical Layer Options	LOOP RATE=64K CLOCK SOURCE=SLAVE	LOOP RATE CLOCK SOURCE=SLAVE
Frame Relay Options	SIGNAL TYPE=ANNEX D T391=10 N391=6 N392=3 N393=4	SIGNAL TYPE=ANNEX D T391=10 N391=6 N392=3 N393=4

Chapter 5 Configuration Overview

LOCAL AND REMOTE CONFIGURATION

The Express 5110 can be configured locally or, when using the VT 100 interface, communications can be established so a local Express 5110 can configure a remote Express 5110. See *Operation* on page 3-1 for information on selecting **LOCAL** or **REMOTE** operation.

The **CONFIGURATION** menu (Figure 5-1 on page 5-2) consists of submenus relating to specific interfaces or functions of the Express 5110 requiring setup:

DTE Port 1
DTE Port 2
Network Port
Control (front panel only)
IP Routing
System Configuration

> **NOTE**
> *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 Protocol Address Table.*

The Express 5110 contains a default set of configuration options stored in read-only memory (see the appendix *Default Configuration Profile).* 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. When the profile is modified, it is stored in the current (nonvolatile configuration) memory. The Express 5110 is then configured with that profile every time power is turned on.

For detailed information on configuration see *DTE Port Configuration* on page 6-1, *Configuring the Network Port* on page 7-1, *IP Routing* on page 8-1, and *System Configuration* on page 9-1.

Configuration menus are shown in Figure 5-2 on page 5-3 (for the Front Panel) and Figure 5-3 on page 5-5 (for the VT 100 terminal).

```
                    CONFIGURATION MENU          ADTRAN EXPRESS 5110
                                                            LOCAL

  1 - DTE PORT 1
  2 - DTE PORT 2
  3 - NETWORK PORT
  4 - IP ROUTING
  5 - SYSTEM




  ENTER SELECTION ->
```
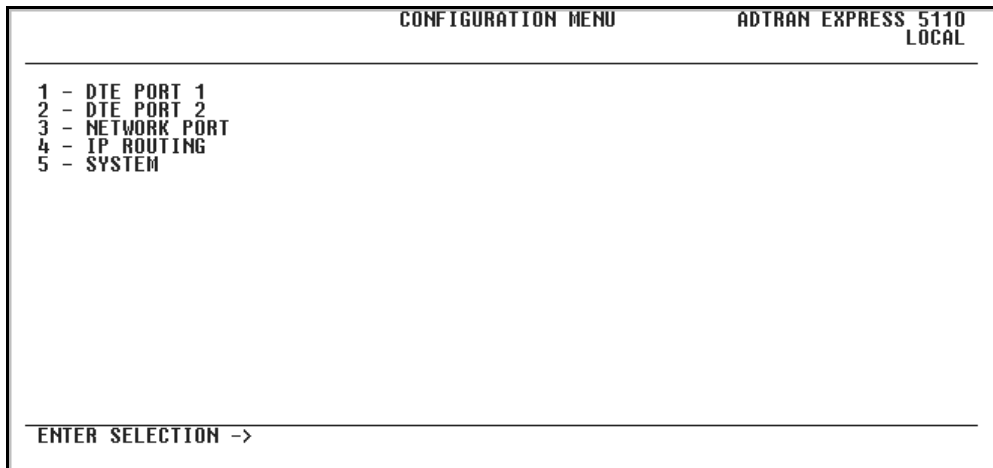
Figure 5-1. VT 100 Configuration Menu

Chapter 6   DTE Port Configuration

Configure the protocol, physical layer options, protocol options, and protocol address table for the two DTE ports located on the rear of the Express 5110 by selecting **DTE PORT 1** or **DTE PORT 2** from the **CONFIGURATION** menu. Figures 6-1 illustrates the VT 100 configuration menu for DTE Port 1.

> **NOTE**
>
> *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 5110
                                                                      LOCAL
_____

1 - PROTOCOL   FRAME RELAY
2 - PHYSICAL LAYER OPTIONS
3 - PROTOCOL OPTIONS
4 - ADDRESS TABLE






                                                  _____

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

> **NOTE** *In this chapter, the VT 100 selections are listed first followed by the Front Panel selections (if the names differ).*
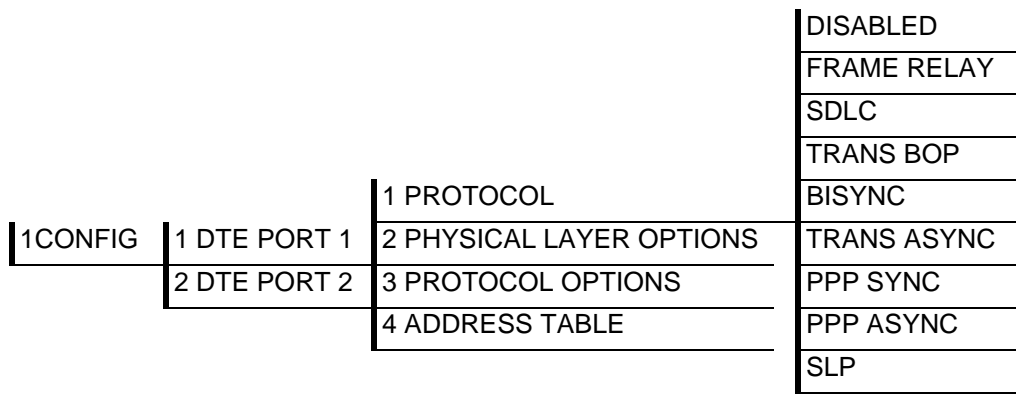
Figure 6-2. Front Panel Protocol Menu Tree

Port Disabled Protocol (DISABLED)

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.

		1 PROTOCOL	1 PORT DISABLED
	1 DTE PORT 1	2 PHYSICAL LAYER OPTIONS	N/A
1 CONFIG			
	2 DTE PORT 2	3 PROTOCOL OPTIONS	N/A
		PROTOCOL ADDRESS TABLE	N/A
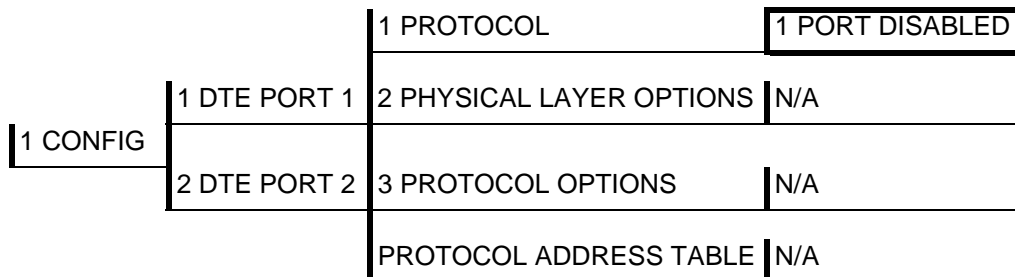
Figure 6-3. Port Disabled Menu Tree

Physical Layer Options

Physical layer options are not available when the port is disabled.

Protocol Options

Protocol options are not available when the port is disabled.

Protocol Address Table (ADDRESS TABLE)

Address table options are not available when the port is disabled.

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 5110 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

Interface Type (CONN)
Select the connector type for the DTE interface. The choices are **V.35** and **RS-232**. See the appendix *Pinouts* for the connector pin assignments.

Synchronous Bit Rate (RATE)
Select the operating speed of the DTE interface. The selections are **2400**, **4800**, and **9600** bps and **19.2**, **38.4**, **56**, **64**, **112**, **128**, **168**, **192**, **224**, **256**, **280**, **320**, **384**, **448**, and **512** kbps.

> **NOTE**
>
> *Speed selections made for the Network Port affect the choices available for the DTE ports.*

Synchronous Idle Method (IDLE)
Enable the Express 5110 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 enabled, the Express 5110 varies the transmit clock rate to temporarily limit the transmit data rate to the Express 5110.

1 CONFIG	1 DTE PORT 1	1 PROTOCOL	2 FRAME RELAY	
	2 DTE PORT 2	2 PHYSICAL LAYER OPTIONS	1 INTERFACE TYPE	1 RS232
				2 V.35
			2 SYNCHRONOUS BIT RATE	1 2400 bps
				2 4800 bps
				3 9600 bps
				4 19.2 Kbps
				5 38.4 Kbps
				6 56 Kbps
				7 64 Kbps
				8 112 Kbps
				9 128 Kbps
				10 168 Kbps
				11 192 Kbps
				12 224 Kbps
				13 256 Kbps
				14 280 Kbps
				15 320 Kbps
				16 384 Kbps
				17 448 Kbps
				18 512 Kbps
			3 SYNCHRONOUS IDLE METHOD	1 TRANSMIT FLAGS
				2 TRANSMIT ALL ONES
			4 HARDWARE FLOW CONTROL	1 OFF
				2 ON
		3 PROTOCOL OPTIONS	1 SIGNALING TYPE	1 NONE
				2 FRF LMI
			2 T392	3 ANSI T1.617-D
			3 N392	4 ITU-T Q.933-A
			4 N393	
			5 IP ADDRESS	
			6 SUBNET MASK	
			7 MANAGEMENT DLCI	
		4 PROTOCOL ADDRESS TABLE		1 DTE PORT DLCO
				2 NETWORK DLCI

Figure 6-4. Frame Relay Protocol Menu Tree

Protocol Options

Signaling Type (SIGNAL)

Set the signaling type for the DTE port to match the signaling type of the connected DTE device. Choices are **NONE**, **FRF 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 5110 DTE port and the attached frame relay device. 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 **STATUS** menu under **DTE PORT SIGNALING STATE**. The status will return to active once the threshold is no longer exceeded.

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

If the attached router or FRAD is used to route SNMP/telnet frames to the Express 5110, set the **MANAGEMENT DLCI** to a unique value that identifies the virtual circuit between the router/FRAD and the Express 5110. The router/FRAD must also be configured to route the Express 5110 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 Mng DLCI to a value not used by the attached frame relay device disables this feature.

IP Address (IP ADDR)
Enter the Express 5110 IP address. Each port capable of carrying IP traffic has its own unique IP address. See the previous section, *Guidelines for Configuring IP Addr, Subnet Mask, and Mng DLCI* on page 6-6, for more information.

IP Subnet Mask
Enter the subnet number assigned to the network formed by the Express 5110 and the other FRAD/routers across the frame relay network. See *Guidelines for Configuring IP Addr, Subnet Mask, and Mng DLCI* on page 6-6 for more information.

Management DLCI (MNG DLCI)
Enter the management data link connection identifier. The Management DLCI is a special DLCI used between the attached DTE device and the Express 5110 to carry SNMP and telnet packets to/from the Express 5110 on the DTE port. See *Guidelines for Configuring IP Addr, Subnet Mask, and Mng DLCI* on page 6-6 for more information.

Protocol Address Table

DTE Port DLCI (PRT 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.

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

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

Delete This Entry (DEL key on front panel)
Delete the current entry in the address table.

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

NOTE
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 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 5110s for each SDLC session.

NOTE
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

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

Synchronous Bit Rate (RATE)
Select the operating speed of the DTE interface. The selections are
2400, **4800**, and **9600** bps and **19.2**, **38.4**, **56**, **64**, **112**, **128**, **168**,
192, **224**, **256**, **280**, **320**, **384**, **448**, and **512** kbps.

> **NOTE**
>
> *Speed selections made for the Network Port affect the choices available for the DTE ports.*

Synchronous Idle Method (IDLE)
Enable the Express 5110 to transmit flags or all ones. When
configured for the SDLC protocol, all ones is the recommended
setting.

Hardware Flow Control (HDW FLOW CTRL)
When configured for the SDLC protocol, this parameter is always
enabled. The Express 5110 issues RNR (receive not ready)
commands to the attached PU, temporarily disabling transmit data
to the Express 5110.

		1 PROTOCOL	3 SDLC

1 CONFIG	1 DTE PORT 1	2 PHYSICAL LAYER OPTIONS	1 INTERFACE TYPE	1 RS232
	2 DTE PORT 2			2 V.35

2 SYNCHRONOUS BIT RATE	1 2400 bps
	2 4800 bps
	3 9600 bps
	4 19.2 Kbps
	5 38.4 Kbps
	6 56 Kbps
	7 64 Kbps
	8 112 Kbps
	9 128 Kbps
	10 168 Kbps
	11 192 Kbps
	12 224 Kbps
	13 256 Kbps
	14 280 Kbps
	15 320 Kbps
	16 384 Kbps
	17 448 Kbps
	18 512 Kbps

3 SYNCHRONOUS IDLE METHOD	1 TRANSMIT FLAGS
	2 TRANSMIT ALL ONES

4 HARDWARE FLOW CONTROL	1 OFF
	2 ON

3 PROTOCOL OPTIONS	1 DATA FORMAT	1 NRZ
	2 POLL RESPONSE TIMEOUT	2 NRZI
	3 MINIMUM POLL TIMER	
	4 SLOW POLL RATIO	
	5 RESPONSE TIMER THRESHOLD	
	6 TRANSMIT DELAY	

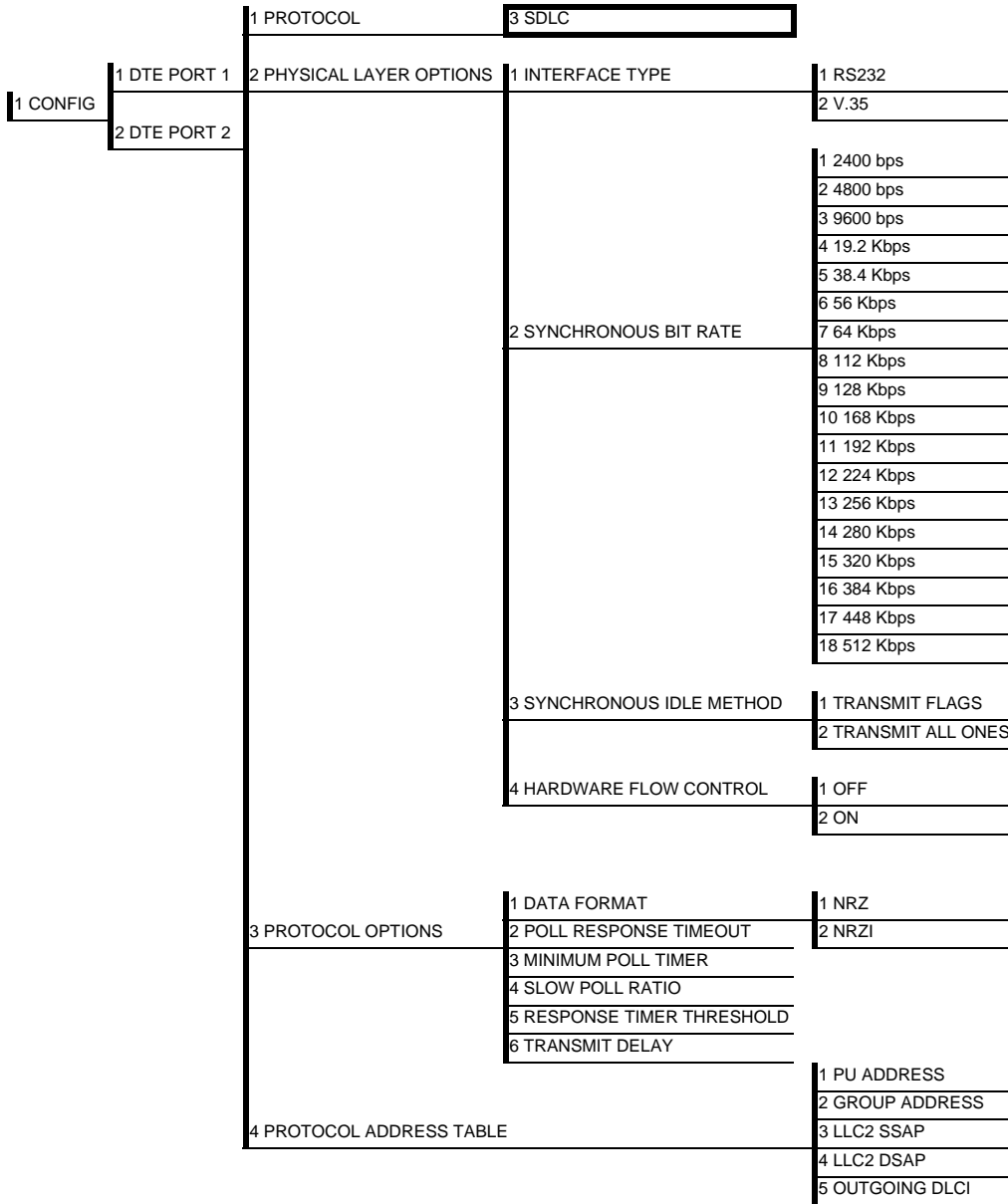| 4 PROTOCOL ADDRESS TABLE	1 PU ADDRESS
	2 GROUP ADDRESS
	3 LLC2 SSAP
	4 LLC2 DSAP
	5 OUTGOING DLCI

Figure 6-5. SDLC Protocol Menu Tree

Protocol Options

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**).

> **NOTE** *When using NRZI format, the Express 5110 does not derive timing from the receive data input.*

Poll/Response Timeout (TIMEOUT)
Set the amount of time the Express 5110 waits for a poll response before issuing another poll.

Minimum Poll Timer
This parameter defines the minimum time (ms) between consecutive polls to a given PU assigned to the DTE port.

Slow Poll Ratio (POLL RAT)
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.

Response Timer Threshold (THRESHOLD)
Set the maximum number of response timeouts allowed before a session is terminated.

Transmit Delay (DELAY)
Set the minimum time between transmission frames.

Protocol Address Table

PU Address (PU ADDR)
Enter the physical unit address of each SDLC device you wish to connect to the Express 5110.

Group Address (GROUP ADDR)
Enter the address used for group polling. With this address the host can poll the Express 5110 for information on all units connected to the Express 5110. This address should match the host's group address. Set this entry to **0** to disable group polling for the DTE port.

LLC2 SSAP (LLC SSAP)
Defines a point-to-point connection on the network. For an SDLC connection, the SSAP of one Express 5110 should match the DSAP on the other Express 5110. The value of this parameter must be in increments of four beginning with **04**.

LLC2 DSAP (LLC DSAP)
Defines a point-to-point connection on the network. For an SDLC connection, the DSAP of one Express 5110 should match the SSAP on the other Express 5110. The value of this parameter must be in increments of four beginning with **04**. See *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.

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

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

Delete This Entry (DEL on front panel)
Delete the current entry in the address table.

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

Transparent BOP (TRANS BOP)

Transparent BOP is a synchronous mode which can accept any HDLC-like protocol as input. This setting allows the Express 5110 to connect to devices even if the Express 5110 does not understand their protocol's addressing and controlling techniques. The Express 5110 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.
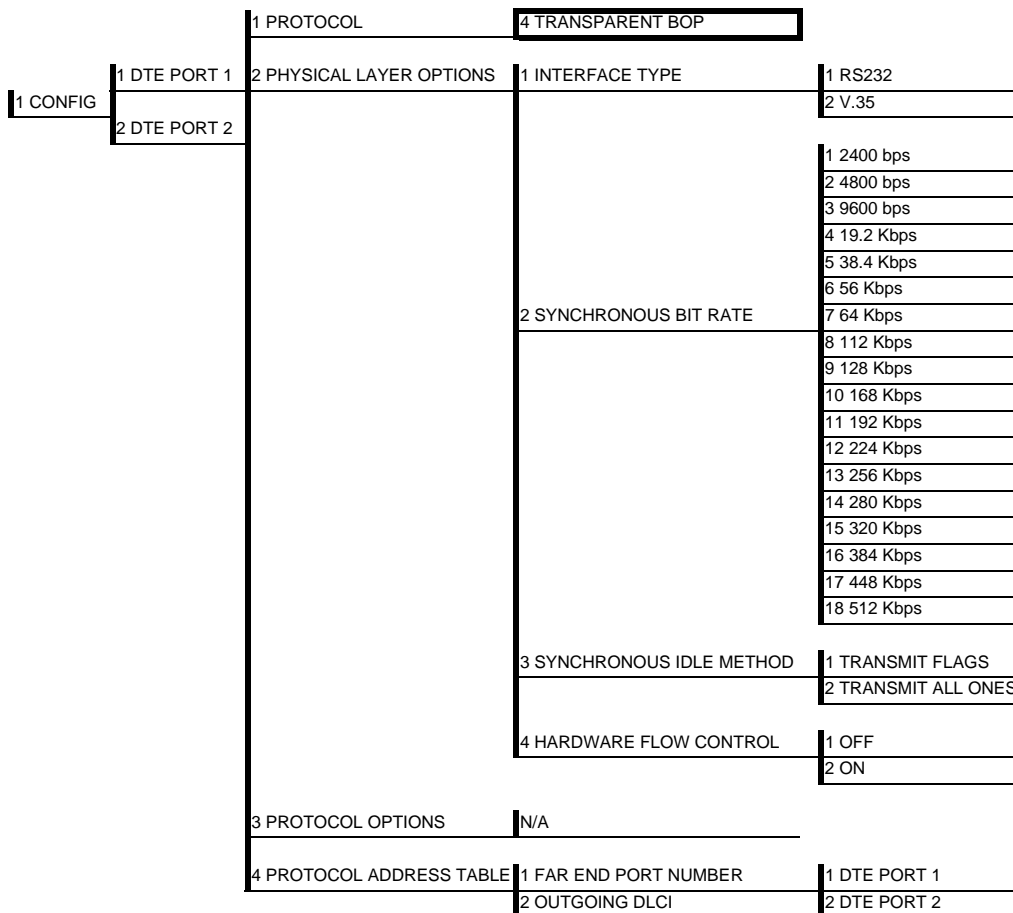

Figure 6-6. Transparent BOP Menu Tree

Physical Layer Options

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

Synchronous Bit Rate (RATE)
Select the operating speed of the DTE interface. The selections are
2400, **4800**, and **9600** bps and **19.2**, **38.4**, **56**, **64**, **112**, **128**, **168**,
192, **224**, **256**, **280**, **320**, **384**, **448**, and **512** kbps.

> **NOTE**
>
> *Speed selections made for the Network Port affect the choices available for the DTE ports.*

Synchronous Idle Method (IDLE)
Enable the Express 5110 to transmit flags or all ones (flags are
recommended).

Hardware Flow Control (HDW FLOW CTRL)
When enabled, the Express 5110 varies the transmit clock rate to
temporarily limit the transmit data rate to the Express 5110.

Protocol Options

Protocol options are not available when the Transparent BOP
protocol is enabled.

Protocol Address Table

Far End Port Number (FE PORT)
Enter the remote Express 5110 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 5110.

Bisync Protocol

The Bisync protocol option enables the Express 5110 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 5110 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.
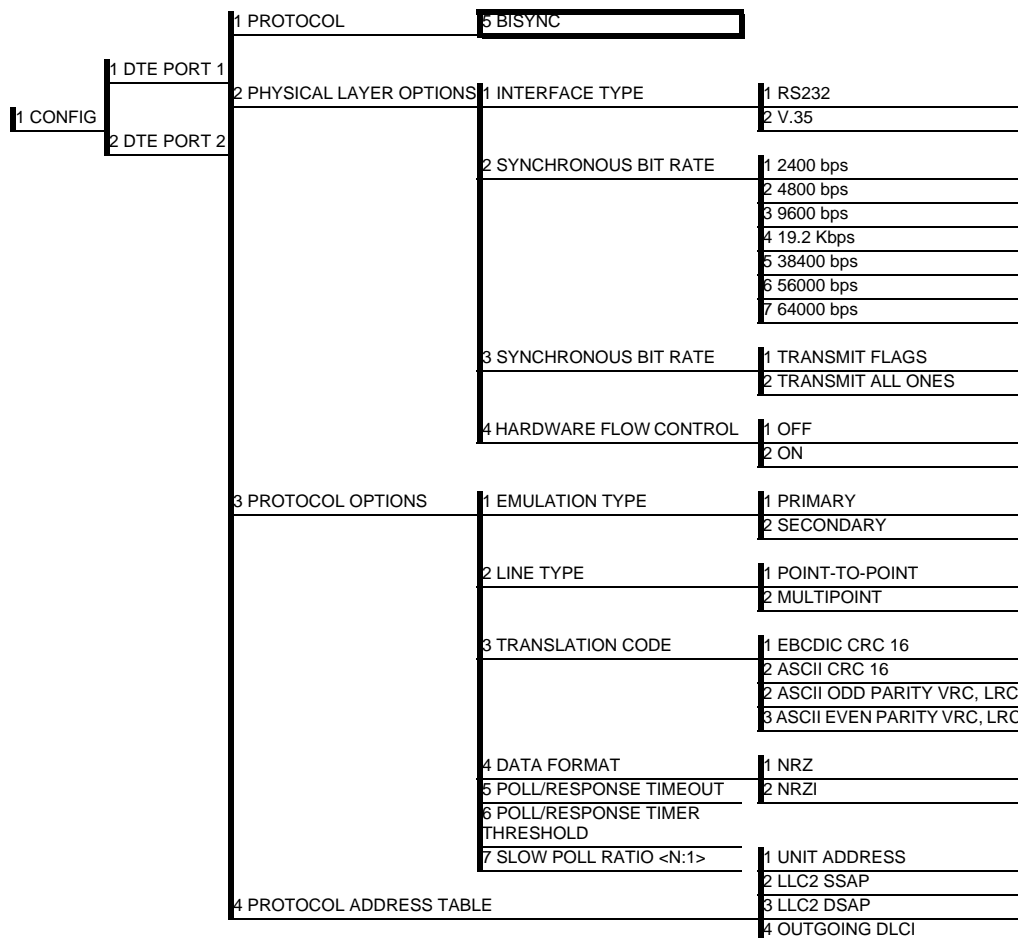
1 CONFIG	1 DTE PORT 1	1 PROTOCOL	5 BISYNC	
	2 DTE PORT 2	2 PHYSICAL LAYER OPTIONS	1 INTERFACE TYPE	1 RS232
				2 V.35
			2 SYNCHRONOUS BIT RATE	1 2400 bps
				2 4800 bps
				3 9600 bps
				4 19.2 Kbps
				5 38400 bps
				6 56000 bps
				7 64000 bps
			3 SYNCHRONOUS BIT RATE	1 TRANSMIT FLAGS
				2 TRANSMIT ALL ONES
			4 HARDWARE FLOW CONTROL	1 OFF
				2 ON
		3 PROTOCOL OPTIONS	1 EMULATION TYPE	1 PRIMARY
				2 SECONDARY
			2 LINE TYPE	1 POINT-TO-POINT
				2 MULTIPOINT
			3 TRANSLATION CODE	1 EBCDIC CRC 16
				2 ASCII CRC 16
				2 ASCII ODD PARITY VRC, LRC
				3 ASCII EVEN PARITY VRC, LRC
			4 DATA FORMAT	1 NRZ
			5 POLL/RESPONSE TIMEOUT	2 NRZI
			6 POLL/RESPONSE TIMER THRESHOLD	
			7 SLOW POLL RATIO <N:1>	1 UNIT ADDRESS
		4 PROTOCOL ADDRESS TABLE		2 LLC2 SSAP
				3 LLC2 DSAP
				4 OUTGOING DLCI

Figure 6-7. Bisync Protocol Menu Tree

Physical Layer Options

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

Synchronous Bit Rate (RATE)
Select the operating speed of the DTE interface. These selections
are dependent upon the **NETWORK PORT** speed.

> **NOTE**
> *Speed selections made for the Network Port affect the choices available for the DTE ports.*

Synchronous Idle Method (IDLE)
Enable the Express 5110 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 5110 uses commands within the bisync
protocol to temporarily disable transmit data to the Express 5110.

Protocol Options

Emulation Type (EMUL TYPE)
For multi-point configurations, this entry defines primary or
secondary emulation. Set the Express 5110 connected to the host to
secondary and the Express 5110 connected to the 2780/3780
controller to primary.

Line Type (LINE)
Select a point-to-point or multi-point line type.

Translation 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.

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**).

Poll/Response Timeout (TIMEOUT)
For multi-point configurations, set the amount of time the Express 5110 waits for a poll response before issuing another poll.

Poll/Response Timer 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 RAT)
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.

Protocol Address Table

Unit Address (UNIT ADDR)
For a multi-point connection, enter the unit address used for specific unit identification. The address may consist of a maximum of seven alphanumeric characters. There must be one alphabetic character for this parameter so the Express 5110 can use the upper case version for the port address and the lower case version for the select address.

LLC2 SSAP (LLC SSAP)
Defines a point-to-point connection on the network. For each bisync SDLC connection, the SSAP of one Express 5110 should match the DSAP on the other Express 5110.

LLC2 DSAP (LLC DSAP)
Define a point-to-point connection on the network. For each bisync SDLC connection, the DSAP of one Express 5110 should match the SSAP on the other Express 5110. See *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.

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

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

Delete This Entry (DEL key on front panel)
Delete the current entry in the address table.

Add New Entry (ADD key on front panel)
Add a new entry to 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 5110 is an async device such as a terminal or PC. See Figure 6-8 for the Transparent Async menu tree.
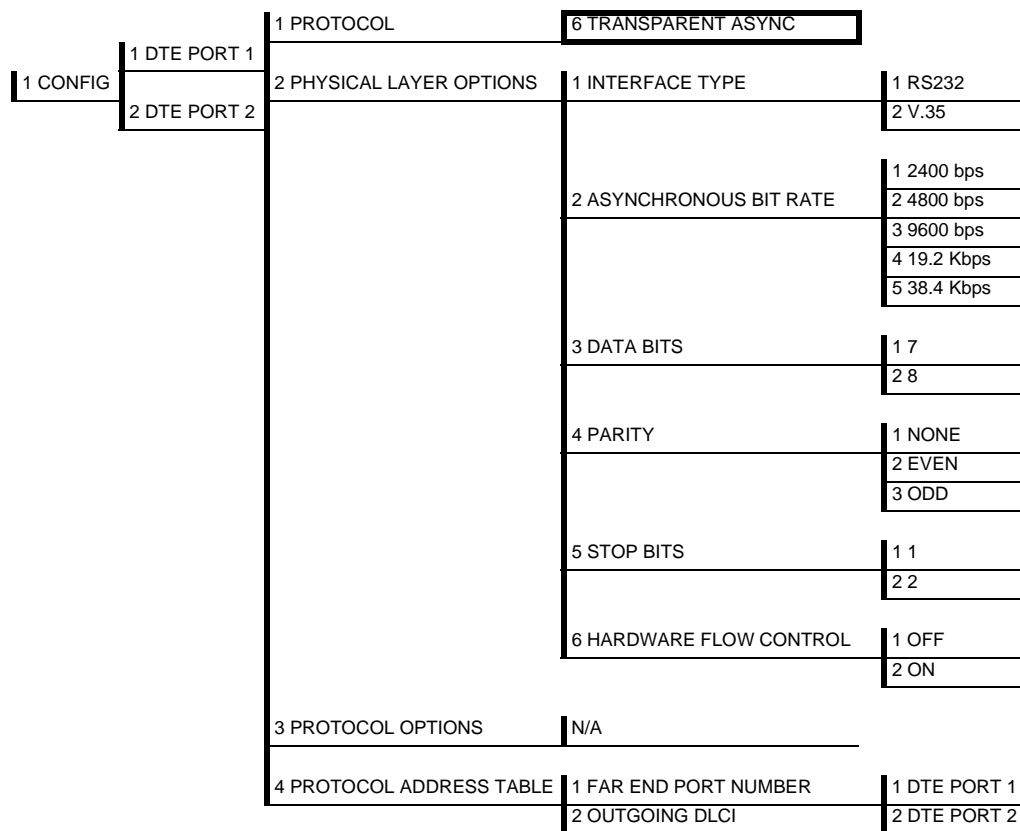
Figure 6-8. Transparent Async Protocol Menu Tree

The Express 5110 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.

> ✎ **NOTE** *No control lead status or break characters are transmitted across the frame relay network.*

Physical Layer Options

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

Asynchronous Bit Rate (BIT RATE)
Select the operating speed to match the DTE device connected to the Express 5110. The selections are **2400** bps, **4800** bps, **9600** bps, **19.2** kbps, and **38.4** kbps.

Data Bits
Select the byte length to match the DTE device connected to the Express 5110. The choices are **7** and **8**.

Parity
Select **EVEN**, **ODD**, or **NO PARITY** information. Set to match the DTE device connected to the Express 5110.

Stop Bits
Select one or two stop bits. Set to match the DTE device connected to the Express 5110.

Hardware Flow Control (HDW FLOW CTRL)
When enabled, the Express 5110 uses CTS to temporarily disable transmit data to the Express 5110.

Protocol Options

Protocol options are not available when the **TRANSPARENT ASYNC** protocol is selected.

Protocol Address Table

Far End Port Number (FE PORT)
Enter the remote Express 5110 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 5110.

PPP Synchronous Protocol (PPP SYNC)

PPP Synchronous protocol provides a PPP device access to the frame relay network and also routes IP traffic from the network to the PPP device. See Figure 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.

> **NOTE** *Static routing requires additional configuration (see the chapter **IP Routing** for more information).*

> **NOTE** *The port set for PPP Synchronous protocol routes and supports IP traffic only.*

	1 PROTOCOL	7 PPP SYNCHRONOUS
1 DTE PORT 1		
	2 PHYSICAL LAYER OPTIONS	1 INTERFACE TYPE
2 DTE PORT 2		

1 INTERFACE TYPE	1 RS232
	2 V.35

2 SYNCHRONOUS BIT RATE	1 2400 bps
	2 4800 bps
	3 9600 bps
	4 19.2 Kbps
	5 38.4 Kbps
	6 56 Kbps
	7 64 Kbps
	8 112 Kbps
	9 128 Kbps
	10 168 Kbps
	11 192 Kbps
	12 224 Kbps
	13 256 Kbps
	14 280 Kbps
	15 320 Kbps
	16 384 Kbps
	17 448 Kbps
	18 512 Kbps

3 SYNCHRONOUS IDLE METHOD	1 TRANSMIT FLAGS
	2 TRANSMIT ALL ONES

4 HARDWARE FLOW CONTROL	1 OFF
	2 ON

3 PROTOCOL OPTIONS	N/A

4 PROTOCOL ADDRESS TABLE	1 IP ADDRESS
	2 SUBNET MASK
	3 PEER IP ADDRESS

4 TRANSMIT RIP REQUESTS	1 NO
5 REPLY TO RIP REQUESTS	2 YES

Figure 6-9. PPP Synchronous Protocol Menu Tree

Physical Layer Options

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

Synchronous Bit Rate (RATE)
Select the operating speed of the DTE interface. The selections are
2400, **4800**, and **9600** bps and **19.2**, **38.4**, **56**, **64**, **112**, **128**, **168**,
192, **224**, **256**, **280**, **320**, **384**, **448**, and **512** kbps.

> **NOTE** *Speed selections made for the Network Port affect the choices available for the DTE ports.*

Synchronous Idle Method (IDLE)
Enable the Express 5110 to transmit flags or all ones.

Hardware Flow Control (HDW FLOW CTRL)
When enabled, the Express 5110 varies the transmit clock rate to
temporarily limit the transmit data rate to the Express 5110.

Protocol Options

Protocol options are not available when the PPP Synchronous
protocol is enabled.

Protocol Address Table

IP Address (IP ADDR)
Enter the internet protocol (IP) address assigned to the Express 5110
for the DTE port.

Subnet Mask
Enter the subnet number assigned to the network formed by the
Express 5110 and the Peer PPP station.

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

Transmit RIP Requests (TX RIP)
ENABLE or **DISABLE** the Express 5110'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.

Reply to RIP Requests (RIP REPLY)
ENABLE or **DISABLE** the Express 5110'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 for the port is in async format, connected to an async device. Special control characters are used to determine frame boundaries for the async channel. See Figure 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 **CONFIG** menu.

Static routing requires additional configuration (see the chapter **IP Routing** for more information).

Physical Layer Options

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

Asynchronous Bit Rate (BIT RATE)
Select the operating speed of the DTE interface to match the connected device. The selections are **2400** bps, **4800** bps, **9600** bps, **19.2** kbps, and **38.3** kbps.

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)
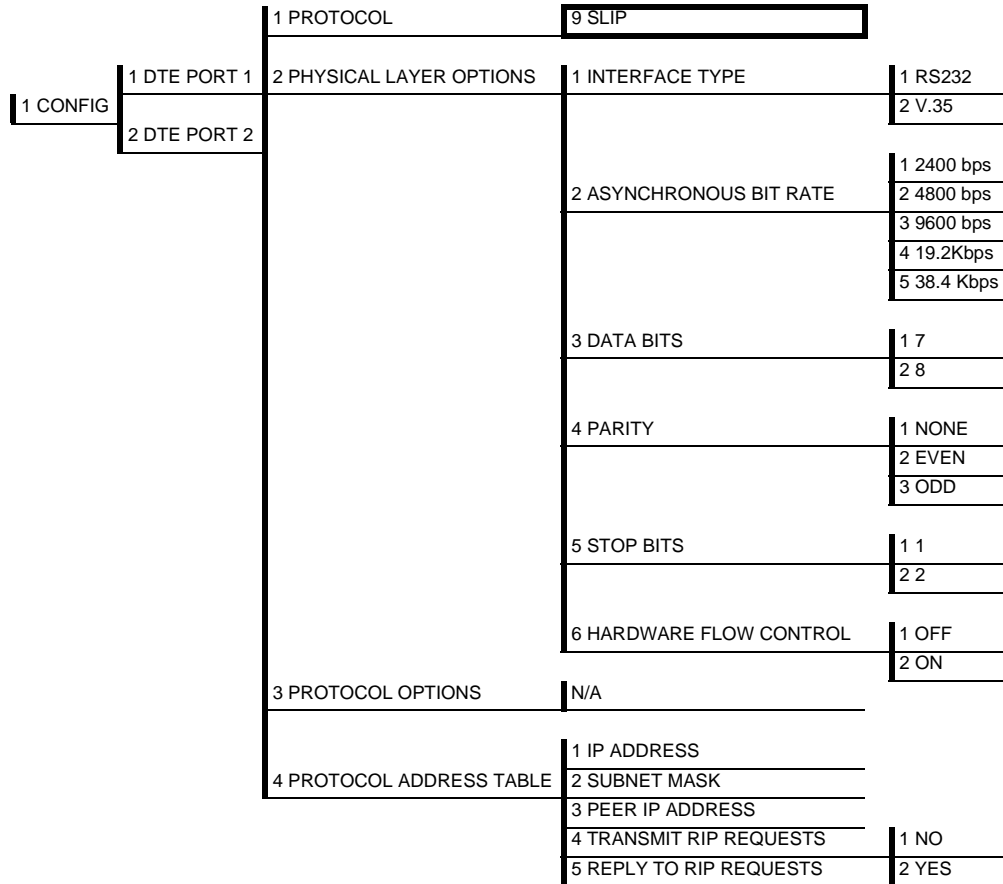When enabled, the Express 5110 uses CTS to temporarily disable transmit data to the Express 5110.

		1 PROTOCOL	8 PPP ASYNC	
	1 DTE PORT 1	2 PHYSICAL LAYER OPTIONS	1 INTERFACE TYPE	1 RS232
1 CONFIG				2 V.35
	2 DTE PORT 2			
				1 2400 bps
			2 ASYNCHRONOUS BIT RATE	2 4800 bps
				3 9600 bps
				4 19.2Kbps
				5 38.4 Kbps
			3 DATA BITS	1 7
				2 8
			4 PARITY	1 NONE
				2 EVEN
				3 ODD
			5 STOP BITS	1 1
				2 2
			6 HARDWARE FLOW CONTROL	1 OFF
				2 ON
		3 PROTOCOL OPTIONS	N/A	
			1 IP ADDRESS	
		4 PROTOCOL ADDRESS TABLE	2 SUBNET MASK	
			3 PEER IP ADDRESS	
			4 TRANSMIT RIP REQUESTS	1 NO
			5 REPLY TO RIP REQUESTS	2 YES
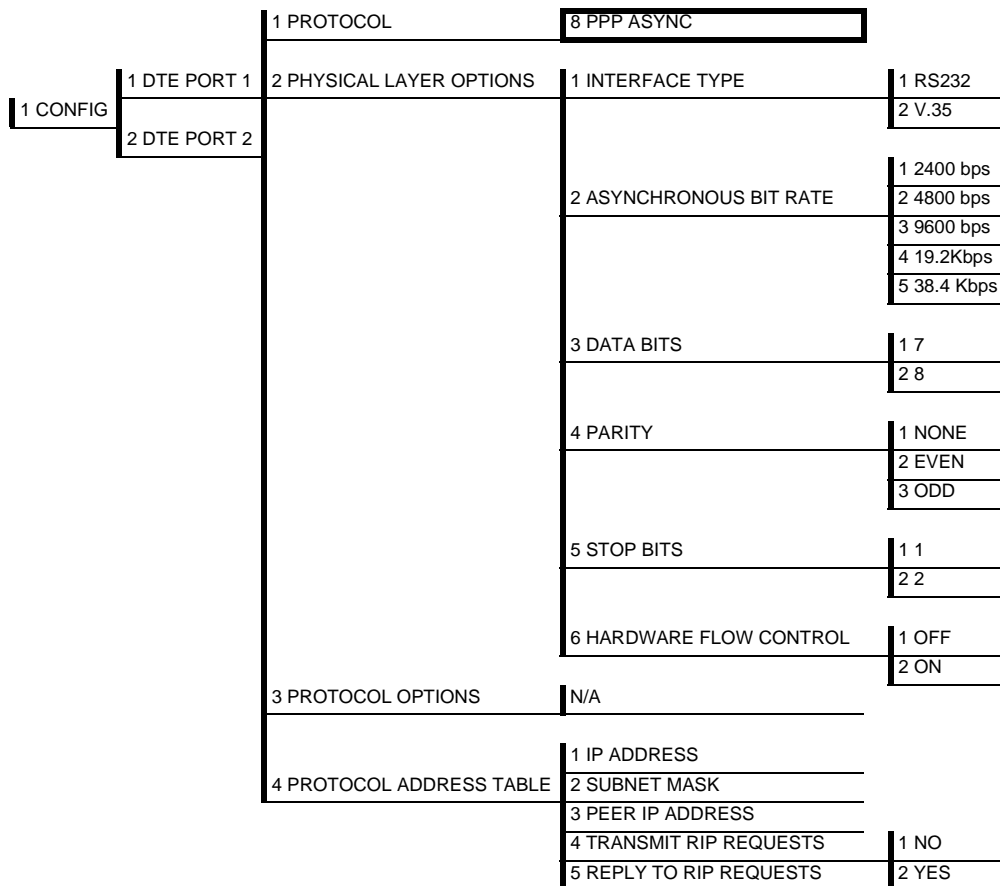
Figure 6-10. PPP Asynchronous Protocol Menu Tree

Protocol Options

Protocol options are not available when the **PPP ASYNCHRONOUS** protocol is enabled.

Protocol Address Table

IP Address (IP ADDR)
Enter the internet protocol (IP) address of the Express 5110 DTE port.

Subnet Mask
Enter the subnet number of the network formed by the Express 5110 and the Peer PPP station.

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

Transmit RIP Requests (TX RIP)
Enable or disable the Express 5110'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.

Reply to RIP Requests (RIP REPLY)
Enable or disable the Express 5110'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. See Figure 6-11 on page 6-28 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 **CONFIG** menu.

> ✎ **NOTE**
>
> *Static routing requires additional configuration (see the chapter **IP Routing** for more information).*

Physical Layer Options

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

Asynchronous Bit Rate (BIT RATE)
Set the operating speed of the DTE interface to match the connected device. The selections are **2400** bps, **4800** bps, **9600** bps, **19.2** kbps, and **38.4** kbps.

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 5110 uses CTS to temporarily disable transmit data to the Express 5110.

```
                              1 PROTOCOL              9 SLIP

             1 DTE PORT 1     2 PHYSICAL LAYER OPTIONS  1 INTERFACE TYPE         1 RS232
 1 CONFIG                                                                        2 V.35
             2 DTE PORT 2
                                                                                 1 2400 bps
                                                         2 ASYNCHRONOUS BIT RATE  2 4800 bps
                                                                                 3 9600 bps
                                                                                 4 19.2Kbps
                                                                                 5 38.4 Kbps

                                                         3 DATA BITS             1 7
                                                                                 2 8

                                                         4 PARITY                1 NONE
                                                                                 2 EVEN
                                                                                 3 ODD

                                                         5 STOP BITS             1 1
                                                                                 2 2

                                                         6 HARDWARE FLOW CONTROL 1 OFF
                                                                                 2 ON

             3 PROTOCOL OPTIONS       N/A

                                      1 IP ADDRESS
             4 PROTOCOL ADDRESS TABLE 2 SUBNET MASK
                                      3 PEER IP ADDRESS
                                      4 TRANSMIT RIP REQUESTS   1 NO
                                      5 REPLY TO RIP REQUESTS   2 YES
```

Figure 6-11. Slip Protocol Menu Tree

Protocol Options

Protocol options are not available when the **SLIP** protocol is enabled.

Protocol Address Table

IP Address (IP ADDR)
Enter the internet protocol (IP) address of the Express 5110 DTE port.

Subnet Mask
Enter the subnet number of the network formed by the Express
5110 and the Peer SLIP station.

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

Transmit RIP Requests (TX RIP)
Enable or disable the Express 5110'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.

Reply to RIP Requests (RIP REPLY)
Enable or disable the Express 5110's reply to the request from the
Peer SLIP device to issue RIP messages.

Chapter 7 Configuring the Network Port

NETWORK PORT

Access the **NETWORK PORT** menus by selecting **NETWORK PORT** from the **CONFIGURATION** menu. See the menu tree in Figure 7-1. 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 5110 supports three standard PVC signaling formats: LMI, ANSI T1.617-D, and ITU Q.933-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.

> **NOTE**
> *Configure the Network Port before the DTE Ports. Selections made will affect the choices available for the DTE ports.*

Connection

Connection is made through the internal DDS 56/64 DSU.

> **NOTE**
>
> *When connecting to an external DSU, the Express 5110 emulates an externally timed DTE interface connected directly to the DCE interface of the external device. Therefore, the connection between the Express 5110 and the DSU is a direct connection.*
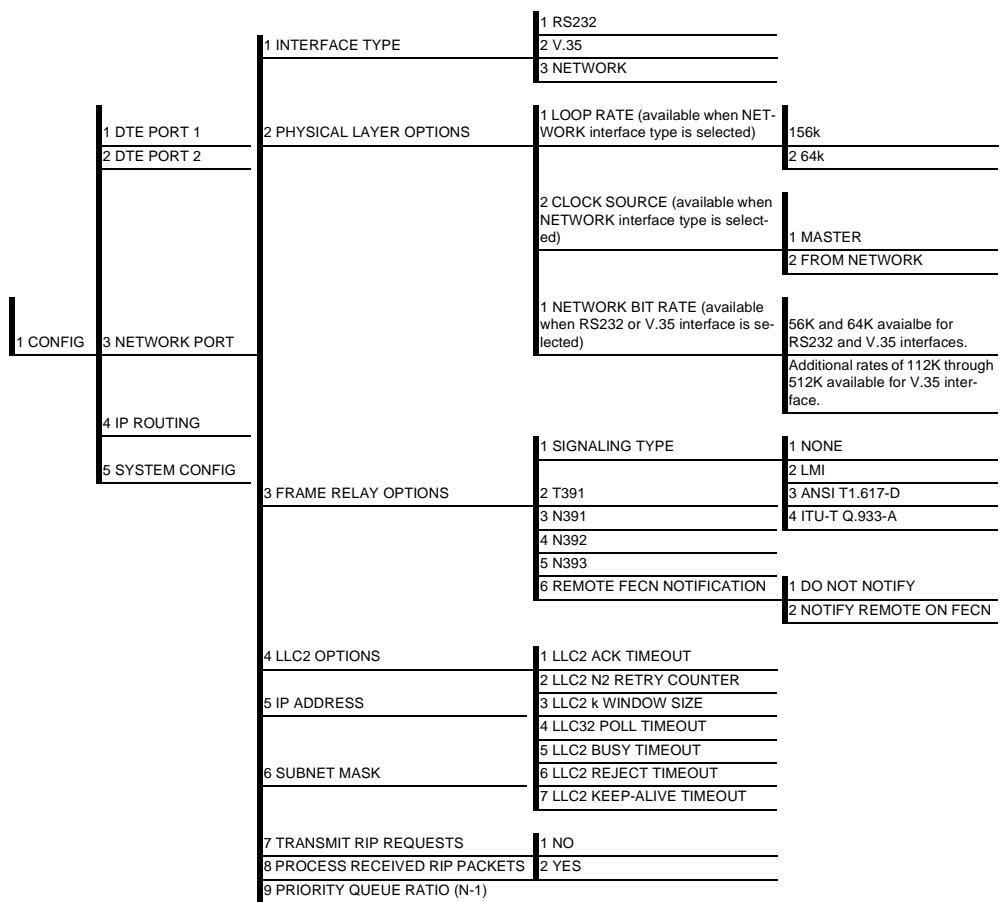
Figure 7-1. Network Port Configuration Menu Tree

When configuring from a VT 100 terminal, the screen in Figure 7-2 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 5110
                                                                     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




 ENTER SELECTION ->
```

Figure 7-2. VT 100 Network Port Configuration Menu

Interface Type (INT TYPE)

Select the connector type for the network interface. The choices are **V.35** and **RS232**. If the internal DSU is installed, the **NET** selection will appear. Select **NET** to operate the internal DSU.

Physical Layer Options (PHYS LYR OPT)

The following physical layer options are available when the internal DSU is selected as the interface type:

Loop Rate
Select a loop rate of either **56K** or **64K**.

Clock Source
Configure the Express 5110 clocking source as either the master or slave (usually slave).

The following physical layer option is available when the selected interface type is **V.35** or **RS232**:

Bit Rate
Select the bit rate that closely matches the clock rate supplied by the external DSU. The choices are **56K** and **64K** when **RS232** interface type is selected. Additional choices of **112K**, **128K**, **168K**, **192K**, **224K**, **256K**, **280K**, **320K**, **384K**, **448K**, and **512K** are available when the **V.35** interface is selected.

Frame Relay Options (FR OPT)

The VT 100 screen in Figure 7-3 appears when **FRAME RELAY OPTIONS** is selected from the **NETWORK PORT CONFIGURATION MENU**.

```
NETWORK PORT          CONFIGURE FRAME RELAY PARAMETERS   ADTRAN EXPRESS 5110
                                                                      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 7-3. VT 100 Network Port Frame Relay Options Menu

Signaling Type (SIGNAL)
Set the signaling type option to match the network signaling type.

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 5110 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 **STATUS** menu under **NETWORK PORT SIGNALING STATE**. The status will return to active again once the threshold is no longer exceeded.

Remote FECN Notification (RFECN)
Enable/disable the Express 5110 to issue remote FECN (forward explicit congestion notification). This feature ensures that a frame will be generated in the reverse direction upon receiving a frame with the FECN bit enabled. This is a proprietary feature with ADTRAN Express 5110s and can only be used with an ADTRAN Express 5110 on both ends of the virtual circuit.

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

LLC2 Options (LLC2 OPT)

The VT 100 screen in Figure 7-4 appears when LLC2 (Logical Link Control Type 2) Options is selected from the Network Port Configuration menu.

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 N2 Retry Counter (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 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.

```
NETWORK PORT                CONFIGURE LLC2 PARAMETERS        ADTRAN EXPRESS 5110
                                                                          LOCAL
_____

1 - LLC2 N2 RETRY COUNTER   2
2 - LLC2 k WINDOW SIZE   7

3 - LLC2 ACK TIMEOUT <S>   5
4 - LLC2 POLL TIMEOUT <S>   5
5 - LLC2 BUSY TIMEOUT <S>   5
6 - LLC2 REJECT TIMEOUT <S>   5
7 - LLC2 KEEP-ALIVE TIMEOUT <S>   3






_____

  ENTER SELECTION ->
```

Figure 7-4. VT 100 Network Port LLC2 Options Menu

Local IP Address (LOCAL IP ADDR)

Enter the internet protocol (IP) address of the Express 5110
Network port.

Subnet Mask

Enter the subnet number of the network formed by the Express
5110 and the other FRADs/routers across the frame relay network.

Transmit RIP Requests (XMIT RIP)

ENABLE or **DISABLE** the Express 5110'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

ENABLE or **DISABLE** the Express 5110's reply to the request from the
peer routers or FRADs to issue RIP messages.

Priority Queue Ration (N:1)

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.

Chapter 8   IP Routing

IP ROUTING WITH THE EXPRESS 5110

The Express 5110 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 Tx RIP parameter enables the Express 5110 to share the internal routing table with other routers and FRADs attached to the port. The Rx RIP parameter enables the Express 5110 to process routing table information from other routers and FRADs attached to the port.

In addition to RIP, the network port uses inverse ARP (RFC 1490) to associate peer router/FRAD IP addresses to PVC addresses. The Express 5110 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 8-1 will appear. Full menu trees for these selections are shown in Figure 5-2 on page 5-3 and Figure 5-3 on page 5-5.

```
                    IP ROUTE MENU              ADTRAN EXPRESS 5110
                                                              LOCAL

   1 - IP ROUTE TABLE
   2 - GATEWAY IP ADDRESS  0.0.0.0
   3 - GATEWAY DESTINATION PORT  NONE
   4 - GATEWAY DLCI  0
   5 - TRANSMIT ARP PACKETS  NO
   6 - PROCESS RECEIVED ARP PACKETS  NO
   7 - ARP REFRESH TIME (S)  0




   ENTER SELECTION ->
```

Figure 8-1. VT 100 IP Route Menu

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 8-2.

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.

```
                                  IP ROUTING TABLE        ADTRAN EXPRESS 5110
  CURRENT ENTRY    1                                                   LOCAL

  1 - IP ADDRESS   0.0.0.0
  2 - DESTINATION PORT   DTE PORT 1
  3 - DESTINATION DLCI   0

  4 - NEXT
  5 - PREVIOUS
  6 - ADD
  7 - DELETE




  ENTER SELECTION -> █
```

Figure 8-2. 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 (IP ADDR)
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 (DST PORT)
Select the port on the Express 5110 used to transmit the packets with the specified IP address.

Destination DLCI (DST 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 element is set for **NETWORK** port.

Edit Next Entry (NEXT Key on Front Panel)
Edit the next entry in the address table.

Edit Previous Entry (PREV Key on Front Panel)
Edit the previous entry in the address table.

Delete This Entry (DEL Key on Front Panel)
Delete the current entry in the address table.

Add New Entry (ADD Key on Front Panel)
Add a new entry to the address table.

Gateway IP Address (GW IP ADD)

Enter the Gateway IP address. If an IP packet with an unknown IP address is received, the Express 5110 sends it to the Gateway (which is a router or another FRAD).

Gateway Port (GW PORT)

Enter the port from which the gateway can be reached.

Gateway DLCI (GW DLCI)

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

Transmit ARP Requests (TX ARP)

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

> **NOTE** *ARP is used in conjunction with RIP to dynamically resolve IP routes and should be enabled if RIP is enabled.*

Chapter 9 System Configuration

SYSTEM CONFIG

Access **SYSTEM CONFIGURATION** selections by first choosing **1 CONFIGURATION** from the **MAIN** menu. Then choose **SYSTEM CONFIGURATION** from the **CONFIGURATION** menu. Full menu trees for the **SYSTEM CONFIGURATION** selections are shown in Figure 5-2 on page 3-3 and Figure 5-3 on page 3-5.

. The VT 100 **SYSTEM CONFIGURATION** menu is shown in Figure 9-1.

```
                              CONFIGURE UNIT              ADTRAN EXPRESS 5110
                                                                       LOCAL
_____
  1 - CHANGE PASSWORD
  2 - READ COMMUNITY   public
  3 - WRITE COMMUNITY  private
  4 - TRAP MGR OPTIONS
  5 - SUPPORT FRAGMENTATION  NO




_____
  ENTER SELECTION -> █
```

Figure 9-1. System Configuration Menu

Change Password

Enter a new password of nine digits or less. The default password is **adtran**.

Read Community (RD COM)

Enter the authentication strings used for SNMP management. Match the Express 5110 to the SNMP manager for read privileges.

Write Community (WR COM)

Enter the authentication strings used for SNMP management. Match the Express 5110 to the SNMP manager for write privileges.

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 5110. (This option is found under **TRAP MANAGER OPTIONS**.)

Trap Manager IP Address (TRAP IP ADDR)

Enter the IP address of the SNMP manager to which the Express 5110 sends traps. (This option is found under **TRAP MANAGER OPTIONS**.)

Trap Manager Port (TRAP PORT)

Enter the Express 5110 port number used to transmit traps to the SNMP manager. (This option is found under **TRAP MANAGER OPTIONS**.)

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.

Chapter 10 Statistics

For descriptions of the VT 100 statistics menus see the following
section, *Viewing Statistical Information with the VT 100 Interface.* For
front panel menu descriptions, see *Viewing Statistical Information
with the Front Panel Interface* on page 10-8

Viewing Statistical Information with the VT 100 Interface

Select **VIEW STATISTICS** from the **MAIN** menu to access the **VIEW
STATISTICS** menu shown in Figure 10-1. From this menu, select to
view port (**DTE** or **NETWORK**), **PROTOCOL**, or **SYSTEM** statistics.
Select **RESET STATISTICS** to clear all current information.

```
                          STATISTICS MENU              ADTRAN EXPRESS 5110
                                                                     LOCAL
_____

1 - DTE PORT 1
2 - DTE PORT 2
3 - NETWORK PORT

4 - PROTOCOL
5 - SYSTEM

6 - RESET STATISTICS




_____
 ENTER SELECTION ->
```

Figure 10-1. View Statistics Menu

DTE and Network Port Statistics

The following sections describe the information given on the **DTE PORT** and **NETWORK PORT** statistics menus. See Figures 10-2 through 10-5.

Current Statistics

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 10-3.

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 Trans Async protocol is selected.)

Parity Errors	Frames received with parity errors (only available when Trans Async protocol is selected.)
Rcv Overrun	Receive FIFO (first in first out) overrun. External clock for network is too fast.
Inv Formats	Frames received with invalid encapsulation code points.
Buffer Unavailable	Number of packets received without any buffers available indicating a congested situation. Verify flow control is enabled.
Unknown DLCI	All frames received with a DLCI address not already defined by the Express 5110.
Aborts Rcv	Frames received with abort sequence of seven ones (not available when Trans Async protocol is selected.)
Breaks Rcv	Async break characters received (only available when Trans 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.
Port Unavailable	Frames received destined for an inactive port.
Inactive DLCI	Frames received on inactive DLCI.

Signal Statistics

These statistics apply when the DTE port is configured for frame relay protocol or when viewing network statistics.

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.

```
 CURRENT               ADTRAN EXPRESS 5110 VIEW STATISTICS          LOCAL

DTE PORT 1    Leads On  -->  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




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

```

Figure 10-2. DTE Port Statistics Menu-Frame Relay Protocol

```
 CURRENT                ADTRAN EXPRESS 5110 VIEW STATISTICS            LOCAL
DTE PORT 1    Leads On  -->  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



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

Figure 10-3. DTE Port Statistics Menu-Transparent Async Protocol

```
 CURRENT                ADTRAN EXPRESS 5110 VIEW STATISTICS            LOCAL
DTE PORT 1    Leads On  -->  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



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

Figure 10-4. DTE Port Statistics Menu-All Other Protocols

```
CURRENT                 ADTRAN EXPRESS 5110 VIEW STATISTICS            LOCAL

NETWORK PORT  Leads On  -->  RTS  DTR
                  DSU state -->  OPEN
  TOTAL:
    Rx Frames --->        0              Rx Bytes ---->        0
    Tx Frames --->        83             Tx Bytes ---->     1328

  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

  SIGNAL STATS:
    Tx Signal Frm>        83             Rx Signal Frm>        0
    Sig Frm Err ->        0              Sig Timeouts >       83
    Sig State --->DOWN


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

Figure 10-5. 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 10-6. 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               ADTRAN EXPRESS 5110 VIEW DLCI STATISTICS        LOCAL

  NETWORK PORT
              ------------------- Frames ------------------   ------- Bytes -------
DLCI            In        Out       FECN     BECN      DE         In          Out

   0  U          0        108        0        0        0          0         1728

UNKNOWN          0          0                                     0            0
INACTIVE         0          0                                     0            0
SIGNAL           0        108                                     0         1728

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

Figure 10-6. View DLCI Statistics Menu-Network Port and Frame Relay Protocol Only

Protocol Statistics

This menu provides information on frames and bytes received/
transmitted by the Express 5110. 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 10-7.

```
CURRENT               ADTRAN EXPRESS 5110 VIEW PROTOCOL STATISTICS      LOCAL
  DTE PROTOCOLS:

              --------- Frames ---------     --------- Bytes ---------
  Protocol        In            Out             In            Out
  Frame Relay      0             0               0             0
  SDLC             0             0               0             0
  Trans BOP        0             0               0             0
  Bisync           0             0               0             0
  Trans Async      0             0               0             0
  PPP Sync         0             0               0             0
  PPP Async        0             0               0             0
  SLIP             0             0               0             0

  OTHER PROTOCOLS:

  Signal           0            120              0            1920
  Network          0            120              0            1920

      ESC - Stats Menu    C - Current Stats    F - Freeze Stats
```

Figure 10-7. Protocol Statistics Menu

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 **VIEW STATISTICS** menu (shown in Figure 10-1).

DLCI Stats (D)
When viewing **NETWORK PORT** statistics or when configured for frame relay on the DTE Port, press **D** to view the **DLCI STATISTICS** menu shown in Figure 10-6 on page 10-7.

Protocol Stats (P) - DTE and Network Port Menus only
When in any **PORT STATISTICS** menu, press **P** to view the **PROTOCOL STATISTICS** menu shown in Figure 10-7 on page 10-7.

Current Stats (C)
Press **C** to resume viewing current status information after a freeze.

Freeze Stats (F)
Press the **F** key to freeze the current statistics.

Viewing Statistical Information with the Front Panel Interface

Select **STATS** from the **MAIN** menu. From this menu, choose to view **DTE 1**, **DTE 2**, **NETWORK**, or **SYSTEM** statistics. The first **STATISTICS** screen displays. Scroll through the remaining 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).

Statistics Available for DTE and Network Ports

The following information is displayed when the DTE 1, DTE 2, or NET port is selected.

Control Signal Status Screen
An asterisk (*) indicates that the signal is active for the currently
selected port. See Figure 10-8.

RS	request to send
TR	data terminal ready
CS	clear to send
CD	carrier detect
SR	data set ready
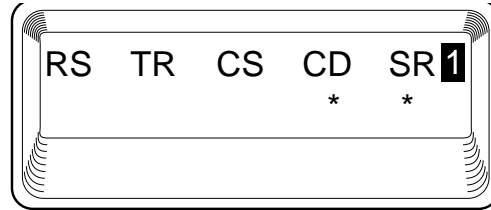
Figure 10-8.   Control Signal Status Screen

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
Total occurrences of a cyclic redundancy check error since last reset.

Abort Frames
Total frames aborted since last reset.

Sync Frame Errors
Total synchronous frame errors received since last reset.

Statistics Available Only for the Network Port

The following information is available only when the **NETWORK PORT** is selected from the **STATS** menu.

Signal State
Current state of frame relay port (up or down). See Figure 10-9.

```
 SIGNAL STATE          1
 DOWN
```
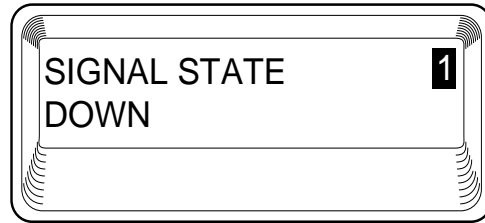
Figure 10-9. Signal State Screen

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

Signal Errors
Total signal errors received since last reset.

System Statistics

Select **SYS** from the **STATS** menu to display the software version and checksum. This screen is shown in Figure 10-10. Press **Cancel** to return to the **STATS** menu.

```
 VERSION CHKSUM
 VER 2.200    17AB
```
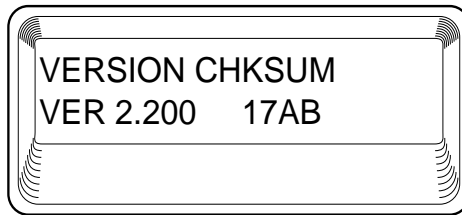
Figure 10-10. System Statistics Screen

Chapter 11   Diagnostics

DIAGNOSTICS

This menu allows you to perform diagnostics by sending ping requests and performing loopback tests. See Figure 11-1 for the VT 100 Test menu. See Figure 11-2 on page 11-2 for the Front Panel menu tree.
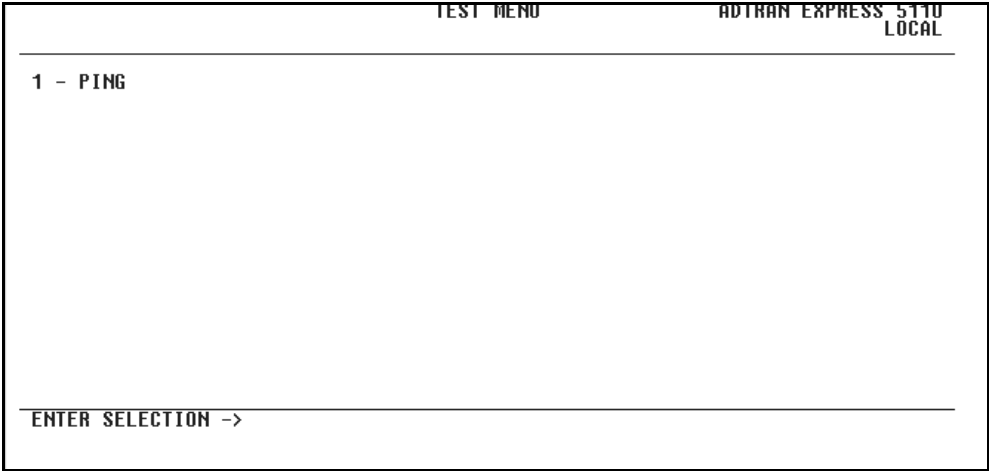
Figure 11-1. VT 100 Test Menu

```
                                                              ┌─ 1 PINGS SENT
                                      ┌─ 1 PING ADDRESS ──────┤
                   ┌─ 1 PING ────────┤                        ├─ 2 RESPONSES
                   │                  └─ 2 START PING ─────────┤
     3 DIAG ──────┤                                           ├─ 3 MIN TIME
                   │                                           ├─ 4 MAX TIME
                   └─ 2 LOOPBACK ── DIS                        └─ 5 AVG TIME
                                    ENA
```
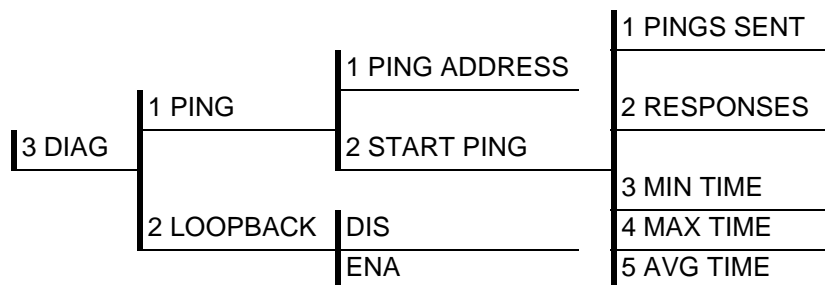
Figure 11-2. Front Panel Test Menu

Ping

Select **1 PING** to send a ping request to a specific address. See Figure 11-3 on page 11-3 for the **VT 100 PING** menu.

Address to Ping (PING ADDRESS)

Enter the IP address of the unit the Express 5110 is sending an echo request (ping) to.

NOTE

*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 **Configuring IP Routing**).*

Start Ping

Results are shown once you start the ping. The **START PING** command causes the Express 5110 to send ten ping requests to the target station. At the end of the ten-ping test, the following results are shown:

Pings Sent
This field shows the number of pings sent (always 10).

Responses
This field shows the number of responses received from the pinged device.

Min 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 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 Time
This field shows the average response time based on all received responses.

```
                              PING MENU                ADTRAN EXPRESS 5110
                                                                     LOCAL

  1 - ADDRESS TO PING  0.0.0.0
  2 - START PING




  ENTER SELECTION ->
```

Figure 11-3. VT 100 Ping Menu

Appendix A   Pinouts

The following tables give the pin assignments for the connectors located on the back of the Express 5110. For more information on the connectors, see the chapter *Installation*.

Table A-1. DTE/DCE Connector Pin Assignments

DB25 Pin#	V.35 Pin#	Function	DTEx Port Direction	DCE Port Direction
1	A	FGND		
2		TD(RS232)	I	O
3		RD(RS232)	O	I
4	C	RTS	I	O
5	D	CTS	O	I
6	E	DSR	O	I
7	B	GND		
8	F	DCD	O	I
9		NEG		
10		POS		
11	AA	TC-B(V.35)	O	I
12	Y	TC-A(V.35)	O	I
13	V	RC-A(V.35)	O	I
14	T	RD-B(V.35)	O	I
15		TC(RS232)	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(RS232)	I	O
25	X	RC-B(V.35)	O	I

| = Input

O = Output

Table A-2. 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-3. Control Connector Pin Assignments

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

| = Input

O = Output

V.35 ADAPTER CABLE

The V.35 adapter cable allows the Express 5110 to interface with DTE equipment using the 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

Appendix B   Specifications Summary

SPECIFICATIONS AND FEATURES

This section describes the standard specifications and features
incorporated in the Express 5110.

Operating Modes

Frame relay utilizing DDS or FT1 circuits

Network Interfaces

DDS: 56/64 kbps

Physical: RJ-48S

Control Port Interface

Electrical: RS-232

Physical: RJ-48S (DB-25 with provided adapter)

Async Data Rates: 2.4 to 38.4 kbps

Rates

Data Rates

DDS: 56 and 64 kbps

DCE: up to 512 kbps

DTE Rates Provided

Synchronous rates: 2.4 to 512 kbps

Asynchronous rates: 2.4 to 38.4 kbps

DCE & DTE Interfaces

RS-232

V.35 via adapter cable

SNMP

Internal SNMP agent

MIB II RFC 1213

Frame relay DTE MIB RFC 1315

ADTRAN enterprise MIB

Telnet Access

Clocking

Normal DDS or private network tributary (slaved to network receive clock)

Private network master (internal)

Protocol Support

Each DTE interface may be assigned one of the following

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

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

Diagnostics

Network
CSU and DSU loopbacks

User
All Port Loopback Mode
Ping Test Mode

Line

Line Requirements
Loop transmission parameters as defined in:
AT&T PUB 62310: Dedicated DDS

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

Receiver Sensitivity
-45 dB at all rates

FCC Approval
FCC Part 15, Class A and Part 68

Relevant Protocol Standards

Frame Relay
Protocol

ANSI T1.606

ANSI T1.607

ANSI T1.617

ANSI T1.618

ITU Q.922

ITU Q.933

Frame Relay Forum FRF 1.1

Encapsulation

RFC 1490

Frame Relay Forum FRF 3.1

SDLC
IBM #GA27-3093-4

2780/3780 BISYNC

IBM #GA27-3004-2

LLC
ANSI/IEEE 802.2

PPP
RFC 1661

RFC 1662

SLIP
RFC 1055

SNMP MIB
RFC 1315

RFC 1213

Environment

Operating temperature: 0 to 50 $^{\circ}$C (32 to 122 $^{\circ}$F)

Storage: -20 to 70 $^{\circ}$C (-4 to 158 $^{\circ}$F)

Relative humidity: Up to 95%, non-condensing

Dimensions: 2.5"H, 7.75"W, 10.375"L

Weight: 3 lbs

Power

115 VAC, 60 Hz, 8 W

Index

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 # _____