FSU 5622 ESP

Frame Relay Service Unit

USER MANUAL

1200175L1	**FSU 5622 ESP base unit**
1200187L1	**ESP Dual FXO Card**
1200188L1	**ESP Dual FXS Card**
1200189L1	**ESP Dual E&M Card**
1204001L1	**ESP 4-wire SW56 DBU Card**
1204002L1	**ESP V.34 DBU Card**
1204004L1	**ESP ISDN DBU Card**
1204006L1	**ESP External DCE Card**

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

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ABOUT THIS MANUAL

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

- Chapter 1, Introduction, familiarizes you with frame relay networks and FSU 5622 ESP highlights and gives a brief explanation of options that may be purchased for use with the FSU 5622 ESP.
- Chapter 2, Installation, describes the FSU 5622 ESP connectors (pin assignments are given in Appendix A) and provides an installation diagram.
- Chapter 3, Operation, explains how to operate your FSU 5622 ESP using either the front panel or a VT 100 terminal interface.
- Chapter 4, Applications, provides examples of some common FSU 5622 ESP applications. This chapter includes network diagrams as well as configuration tables for each example.
- Chapter 5, Configuration Overview, explains how to access the FSU 5622 ESP configuration menu and provides menu trees for both the front panel and the VT 100 interface.
- Chapters 6 through 11 provide brief explanations for selections made in the Configuration menus. These chapters are based on the first level menu branches of the Configuration menu: DTE Ports 1 and 2, Voice Ports 1 and 2, Network Port, Dial Backup, IP Routing, and System configuration.
- Chapter 12, Status, describes how to access status information from the FSU 5622 ESP.
- Chapter 13, Testing, explains how to access the FSU 5622 ESP diagnostic features, including Ping and Loopback Tests.
- Chapter 14, Activating Dialing Functions, provides information on the dialing options accessed through the Main menu.
- Appendix A provides pinouts for the FSU 5622 ESP connectors.
- Appendix B contains product specifications.

Notes provide additional useful information.

Cautions signify information that could prevent service interruption.

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

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

1. This equipment complies with Part 68 of the FCC rules. On the bottom of the equipment housing is a label that shows the FCC registration number and Ringer Equivalence Number (REN) for this equipment. If requested, provide this information to the telephone company (REN is not required for some types of analog or digital facilities).

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. In addition, an FCC compliant cable appropriate for the dial backup option ordered 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 leased line facilities:

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

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

FEDERAL COMMUNICATIONS COMMISSION
RADIO FREQUENCY INTERFERENCE STATEMENT:

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

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

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

CANADIAN EMISSIONS REQUIREMENTS

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

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

CANADIAN EQUIPMENT LIMITATIONS

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

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method 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 conditions may not prevent degradation of service in some situations.

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

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

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

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

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Chapter 1
Introduction

UNDERSTANDING FRAME RELAY

Frame relay is a wide area network (WAN) service designed to minimize physical connections. This is accomplished by using virtual connections within the frame relay cloud and accessing these virtual circuits with normally one physical connection at each location to the frame relay service. Virtual circuits are addressed using header information at the beginning of each frame. These frames are formatted by the user's CPE equipment such as the ADTRAN FSU 5622 ESP.

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

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

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

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

PRODUCT OVERVIEW

The ADTRAN FSU 5622 ESP is a standalone frame relay access device (FRAD) that provides a cost-effective means of transporting voice and multi-protocol data over frame relay or DDS networks. The FSU 5622 ESP provides an easy-to-use interface for customers migrating existing services or developing new applications for operation over frame relay networks.

The FSU 5622 ESP provides high-quality voice and fax capabilities to remote locations without expensive toll charges. In frame relay networks the FSU 5622 ESP allows voice and data to share the same PVC eliminating unnecessary PVC charges associated with other vendor's voice and data frame relay products. Two voice ports are provided when configured with an ESP option card. Options include: ESP Dual FXS, ESP Dual FXO, and ESP Dual E&M.

The FSU 5622 ESP provides two independent DTE interfaces for connecting non-frame relay devices to the frame relay network. These ports can be configured for either EIA-232 or V.35 signal specifications. Synchronous protocol speeds up to 512 kbps and asynchronous protocol speeds up to 38.4 kbps are supported.

The FSU 5622 ESP 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 FSU 5622 ESP are as follows:

- Dual voice port support; options include Dual FXS, Dual FXO, and Dual E&M
- Two independent DTE data ports
- Integral 56/64 DDS DSU/CSU
- SNMP/TELNET management
- RFC 1490 encapsulation for IP & LLC2
- SDLC local port spoofing
- Automatic or manual dial backup for DDS operation
- Dial backup available with ESP DBU cards; options include 4-wire Switched 56, V.34, and ISDN
- Time of day and weekend dial backup lockout options
- Frame relay management using ANSI, ITU, or LMI formats
- Easy to use VT 100 interface for configuration
- Standard 5 year warranty

The ESP 4-wire SW56 DBU card is compatible with AT&T Accunet and Sprint SW56 type services. The V.34 DBU card allows switched backup over the public switched telephone network (PSTN). The ESP ISDN 1B+D card supports a U-interface to the Basic Rate ISDN and is compatible with National ISDN and AT&T DMS.

DDS OPERATION

DDS is a nationwide service that allows interconnection and transportation of data at speeds up to 64 kbps. The local exchange carriers provide the local loop service to DDS customers and may provide data for routing Inter-LATA to an interexchange carrier. The integrated 56/64 DDS DSU supports the 56/64 kbps DDS service rate.

SNMP

The term SNMP broadly refers to the message protocols used to exchange information between the network and the managed devices, as well as to the structure of network management data bases. SNMP has three basic components:

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

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

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

The FSU 5622 ESP supports the MIB-II standard, RFC 1213, and ADTRAN Enterprise Specific MIB.

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

The FSU 5622 ESP's embedded SNMP feature allows the unit to be accessed and controlled by a network manager through the network interface or through a DTE port running frame relay, SLIP, or async PPP protocol.

TELNET

TELNET provides a password-protected, remote login facility to the FSU 5622 ESP. TELNET allows a user on a network manager to control the FSU 5622 ESP through the terminal menus. See the chapter *Applications* and the appendix *Terminal Menu Structure* for more information.

VOICE COMPRESSION

The FSU 5622 ESP voice option cards employ MP-MLQ voice compression technology to provide toll-quality voice using significantly less bandwidth than traditional voice channels. In addition to supporting voice calls, the cards support group 3 facsimile up to 9.6 kbps. Each voice channel requires an aggregate bandwidth of 9.6 kbps for voice or 12 kbps for facsimile. The FSU 5622 ESP dynamically allocates bandwidth to voice and data applications. This results in all bandwidth being available for data applications in the absence of voice or fax.

FXS Module

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

FXO Module

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

E&M Module

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

DIAL BACKUP OPERATION

The FSU 5622 ESP's unique DBU cards are field-installable by the customer. See the chapter *Installation* for information on installing DBU cards. The DBU cards are compatible with other ADTRAN ESP products supporting DBU (see the following note). The four backup options are described in the following sections. Contact the local telco provider to determine which services are available in your area. See the chapter *Applications* for more information, including an example of a dial backup application.

The ESP V.34 DBU is not compatible with the TSU ESP.

ESP Dial Backup Options

4-Wire Switched 56 Card

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

V.34 Card

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

ISDN Card

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

ESP DCE Card

This module connects an external DCE device to the FSU 5622 ESP for the purpose of using an external DSU/CSU to support access rates up to 512 kbps.

WARRANTY AND CUSTOMER SERVICE

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

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

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

Chapter 2
Installation

UNPACK, INSPECT, POWER UP

Receiving Inspection

Carefully inspect the FSU 5622 ESP 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 back cover of this manual). Keep the original shipping container to use for future shipment or verification of damage during shipment.

ADTRAN Shipments Include

The following items are included in ADTRAN shipments of the FSU 5622 ESP:

- FSU 5622 ESP unit
- User manual
- An 8-position modular to 8-position modular cable
- VT 100 terminal adapter cable (consists of a DB-25 modular adapter and an 8-position to 8-position modular cable)

The ADTRAN FSU 5622 ESP MIB is available in the support section of the ADTRAN Web page at www.adtran.com.

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

- ESP DBU card
- An 8-position modular to 8-position modular cable for the 4-wire SW56 and ISDN dial backup options. An 8-position modular to 4-position modular cable for the V.34 backup option.

Customer Provides

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

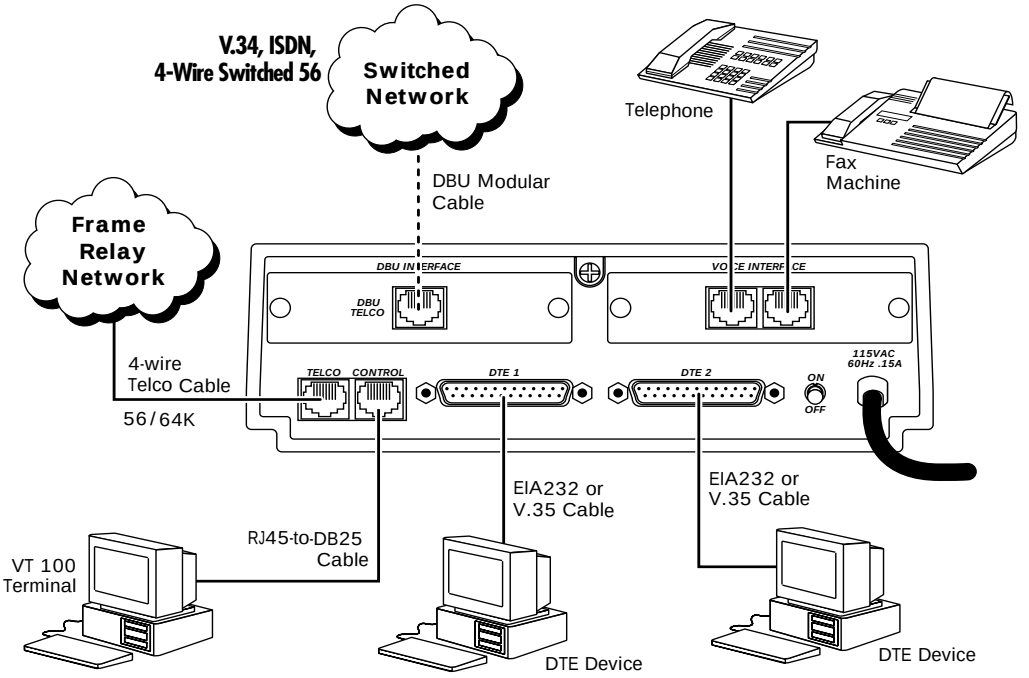
Power Up

Each FSU 5622 ESP unit is provided with a captive eight-foot power cord, terminated by a three-prong plug which connects to a grounded 115 VAC power receptacle.

Power to the FSU 5622 ESP must be provided from a grounded 115 VAC, 60 Hz receptacle.

REAR PANEL

The FSU 5622 ESP is equipped with two DB-25 connectors labeled **DTE 1** and **DTE 2**. Connections to the dedicated circuit and VT 100 interface are provided through the 8-pin telco jacks labeled **TELCO** and **CONTROL**. Pin assignments for these connectors are given in the appendix *Pinouts*. The FSU 5622 ESP rear panel is shown in Figure 2-1.



Item	Function
DBU Interface	ESP DBU card slot
Voice Interface	FXS, FXO, E&M card slot
Telco port	Connects to the dedicated circuit
Control port	Connects to the VT 100 interface
DTE 1 port	Connects to a DTE device
DTE 2 port	Connects to a DTE device
On / Off Switch	Turns power on and off
115 VAC connection	Connects to captive power cord

Figure 2-1
FSU 5622 ESP Rear View

DBU and Voice Interface Card Slots

The FSU 5622 ESP rear panel has two card slots for the installation of dial backup and voice interface cards. To insert cards, perform the following procedure:

1. Remove power from the FSU 5622 ESP.
2. Slide the card into the corresponding rear slot until the card panel is flush with the FSU 5622 ESP chassis.
3. Push card locks in (until they click) to secure the card and ensure proper installation.

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

Telco Connector

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

Control Port

The eight-position modular jack labeled **CONTROL** provides connection to a VT 100 EIA-232 compatible interface. This enables the FSU 5622 ESP to be configured through a terminal instead of the front panel. Use the VT 100 terminal cable (provided) for this connection. See the appendix *Pinouts* for the connector pin assignments. A description of the operation of this port is covered in the chapter *Operation*.

DTE Connectors

DTE devices are connected to the DTE connectors using either an EIA-232 DTE cable or an ADTRAN V.35 DTE adapter cable. The maximum cable lengths recommended are 50 feet for the EIA-232 and 100 feet for the V.35. The pin assignments are listed in the appendix *Pinouts*.

The V.35 adapter cable is recommended for use with data rates above 19.2 kbps. A low capacitance EIA-232 cable works up to 56 kbps. The DTE ports are configured through the front panel or the VT 100 control port. The DTE ports can operate in asynchronous or synchronous modes.

Chapter 3
Operation

FRONT PANEL

The FSU 5622 ESP faceplate is shown in Figure 3-1. Descriptions of each part of the front panel follow.

LCD Window

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

Enter

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

Up and Down Arrows

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

Cancel

Pressing the **Cancel** key stops the current activity and returns to the previous menu. Repeat until the desired menu level is reached. When a submenu item is displayed, press **Cancel** to exit the current display and return to the previous menu.

Numeric Keypad

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

Next, Prev, Add, 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 the chapters *DTE Port Configuration* and *Configuring IP Routing* for more information.

Shift

Enter alpha characters by pressing and releasing the **Shift** key 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.

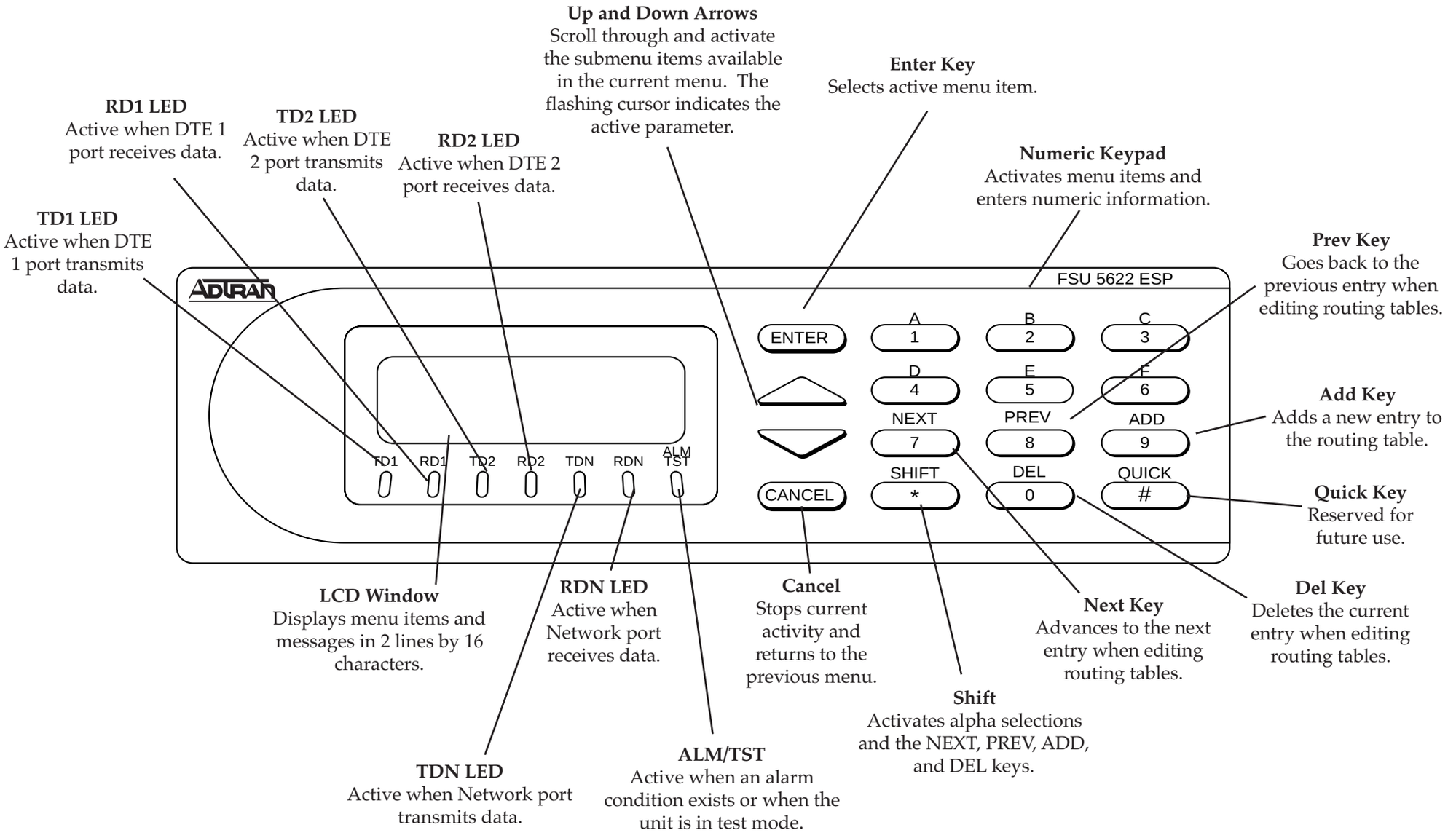


Figure 3-1
FSU 5622 ESP Front Panel

LED Descriptions

The FSU 5622 ESP 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 FSU 5622 ESP DTE 1 port is transmitting data.

RD1: Receive Data (DTE 1)
This LED is active when the FSU 5622 ESP DTE 1 port is receiving data.

TD2: Transmit Data (DTE 2)
This LED is active when the FSU 5622 ESP DTE 2 port is transmitting data.

RD2: Receive Data (DTE 2)
This LED is active when the FSU 5622 ESP DTE 2 port is receiving data.

TDN: Transmit Data (Network)
This LED is active when the FSU 5622 ESP Network port is transmitting data.

RDN: Receive Data (Network)
This LED is active when the FSU 5622 ESP Network port is receiving data.

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

DDS Alarm Conditions
- Open loop on network
- No frame synchronization
- OOS/OOF

Frame Relay Alarm Condition
- Network frame relay signaling state down

Front Panel Operation

To choose a menu item, press the corresponding number or alpha character on the keypad. Press **Shift** to activate menu items with alpha selections. Scrolling to the selection by pressing either the up or down arrow also activates the menu items. The flashing cursor indicates which selection is activated. Press **Enter** to select the item. The following steps and Figure 3-2 illustrate how to select FSU 5622 ESP 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**.

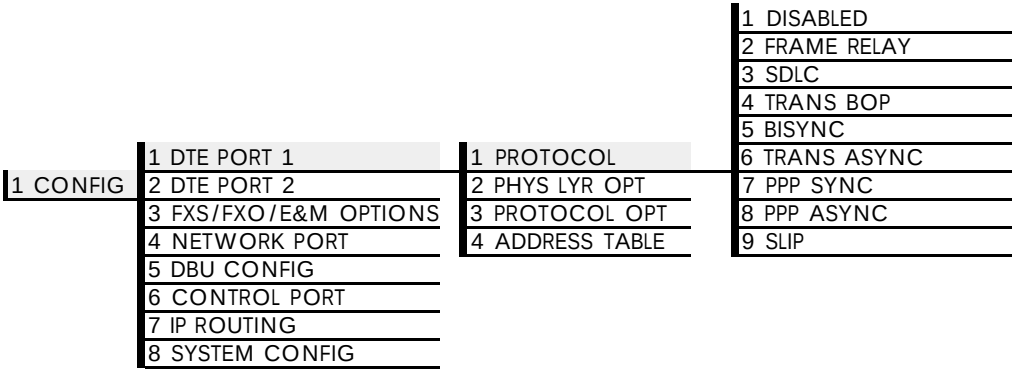


Figure 3-2
Example of Basic Menu Navigation

VT 100 Terminal Connection and Operation

To control the FSU 5622 ESP using a VT 100 terminal, perform the following procedure:

1. Set the FSU 5622 ESP baud rate to match the terminal through the front panel. Select **1 CONFIG**, then **6 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 FSU 5622 ESP. This connection is used for both local and remote configuration.

3. Open the connection and press **Enter** repeatedly until the Login Menu appears (Figure 3-3).

4. Select LOCAL LOGIN to configure the FSU 5622 ESP unit connected to the terminal. Select REMOTE LOGIN to configure a remotely located FSU 5622 ESP 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 3-4).

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

In the upper right-hand corner of the VT 100 screen, LOCAL or REMOTE is displayed, indicating which unit the current screen represents. See Figure 3-3.

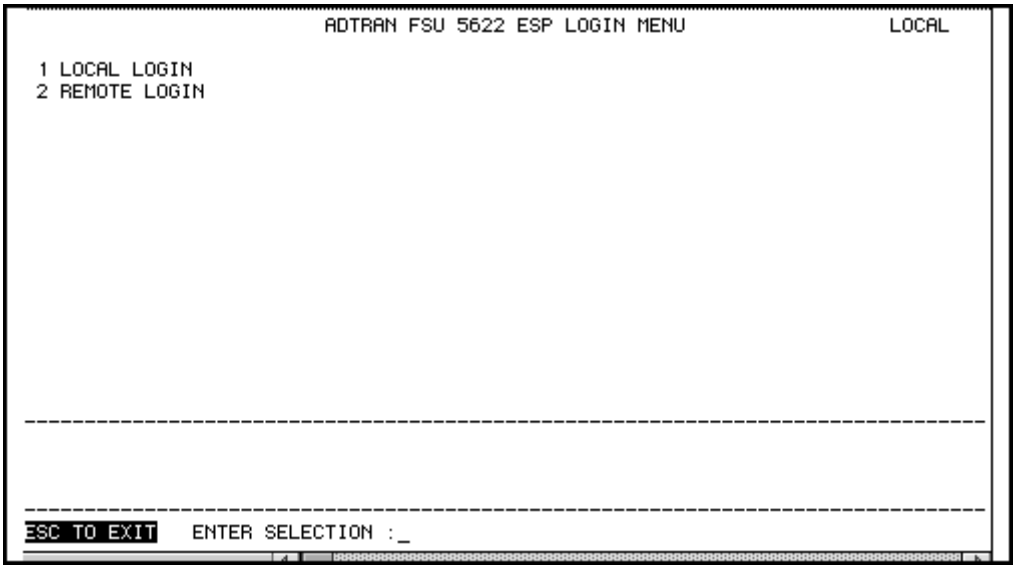


Figure 3-3
Terminal Login Menu

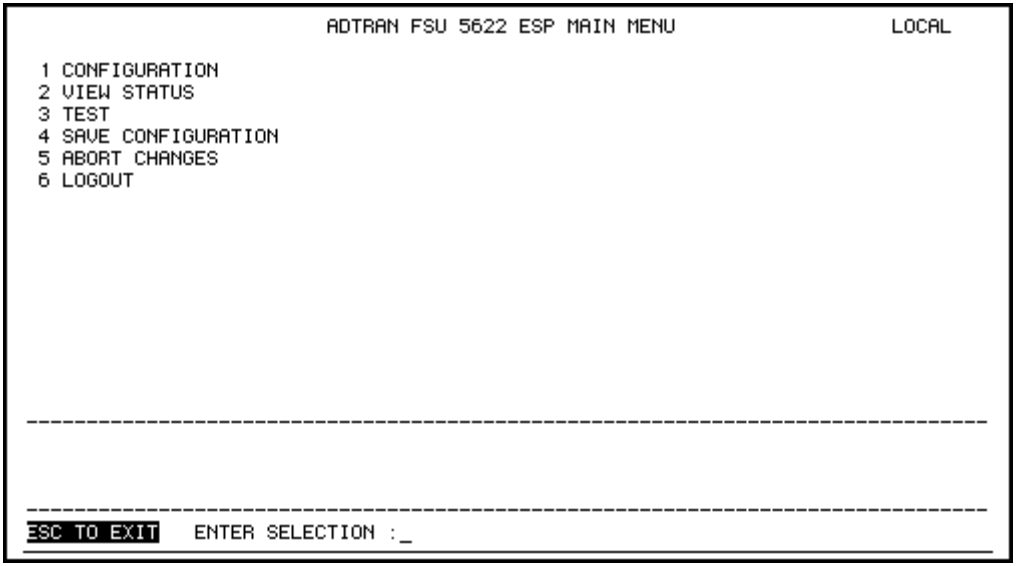


Figure 3-4
Terminal Main Menu

FSU 5622 ESP MENU STRUCTURE

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

The Logout selection is available on the VT 100 interface only. The DBU selection is available only when a DBU card is installed.

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

Main Menu

Definitions for the branches of the Main menu follow:

Configuration (CONFIG)
Configuration is used to select network and DTE operating parameters. For more information on configuration options, see the following chapters: *Configuration Overview, DTE Port Configuration*, *Configuring the Voice Interfaces, Configuring the Network Port*, *Configuring Dial Backup Options, IP Routing, and System Configuration*. 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 Status (STATUS)
This selection displays status information for DTE ports, the network port, the protocol, and the system. See the chapter *Status* for more information.

Test
Diagnostic options enable and disable voice and ping functions. See the chapter *Testing* for more information.

DBU
This selection allows you to access DBU functions. See the chapter *Activating DBU Functions* for more information.

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

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

Abort Changes (ABORT)
This parameter cancels the current selections and reverts to the last saved configuration.

Logout (VT 100 menu only)
This parameter logs out of the system.

Chapter 4
Applications

This chapter provides examples of some common FSU 5622 ESP data and voice applications. The data examples include SNA/SDLC with local spoofing, SNMP/TELNET management, bisync point-to-point and multi-point, and transparent applications. The voice applications include direct FXS/FXO, switched, and PLAR circuits. 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 FSU 5622 ESP provides local spoofing by emulating the primary or secondary SDLC roles (see Figure 4-1). The FSU 5622 ESP performs conversion from SDLC to frame relay and also terminates SDLC links, providing primary and secondary emulation between FSU 5622 ESPs. 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 FSU 5622 ESP 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 FSU 5622 ESP looks for SNRM on all ports and assumes a secondary role once SNRM is received. The FSU 5622 ESP then brings up the LLC2 link across the frame relay network to another FRAD which assumes a primary role. This allows the FSU 5622 ESP to operate with PU 2.1 devices.

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

In all cases, the FSU 5622 ESP is transparent to the XID (exchange identification) negotiation between any two network devices.

The FSU 5622 ESP 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-A for an example of how to configure the FSU 5622 ESP for this application.

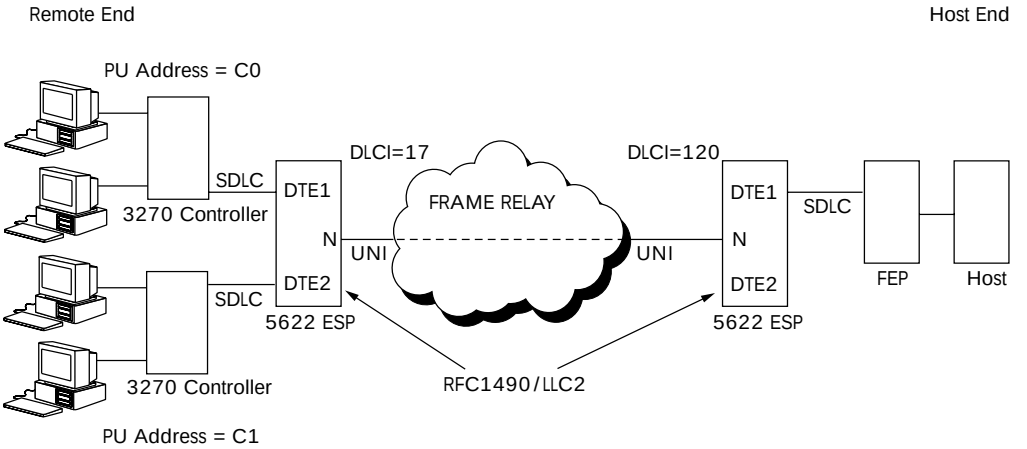


Figure 4-1
SNA /SDLC with Local Spoofing

Table 4-A
Configuration Settings for SNA/SDLC Application

	HOST FSU		REMOTE FSU
DTE Port 1			
Protocol	SDLC		SDLC
Physical Layer Options	CONN=EIA 232 RATE=19.2K IDLE=ONES		CONN=EIA 232 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 CTRL 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=19.2K 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			
Physical Layer Options	LOOP RATE=64K CLOCK SOURCE=SLAVE		LOOP RATE=64K CLOCK SOURCE=SLAVE
Frame Relay Options	SIGNAL TYPE=ANSI T391=10 N391=6 N392=3 N393=4		SIGNAL TYPE=ANSI 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 FSU 5622 ESP serves as a concentrator, allowing both networks access to one frame relay link. The example shown in Figure 4-2 shows DTE 1 configured for SDLC protocol (as in the previous example). DTE 2 is configured for frame relay protocol, providing the LAN gateway/router with frame relay access.

The FSU 5622 ESP routes data at the DLCI level using the DTE 2 frame relay address table. The FSU 5622 ESP 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 FSU 5622 ESP. This Management DLCI carries the SNMP and TELNET traffic destined for the FSU 5622 ESP. This DLCI is included in the UNI full status responses to the router. The FSU 5622 ESP 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 FSU 5622 ESP's SNMP and TELNET information. See Table 4-B for an example configuration.

RIP and inverse ARP are not used for the FSU 5622 ESP DTE frame relay port.

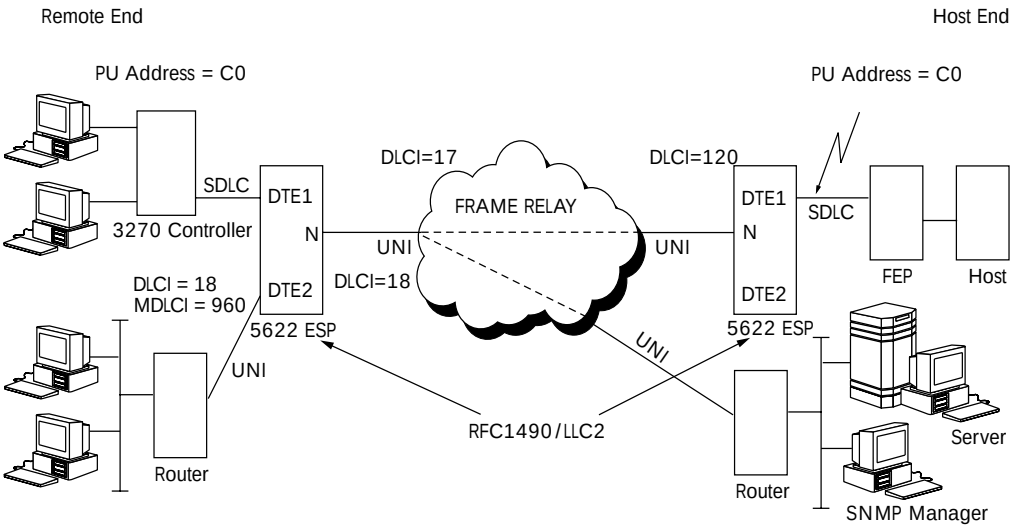


Figure 4-2
SNA and LAN Application with SNMP/TELNET Management

Table 4-B
Configuration Settings for SNA and LAN Application

	HOST FSU	REMOTE FSU
DTE Port 1		
Protocol	SDLC	SDLC
Physical Layer Options	CONN=EIA 232 RATE=19.2K IDLE=ONES	CONN=EIA 232 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 #1 CTRL ADDR=C0 GROUP ADDR=0 LLC2 SSAP=04 LLC2 DSAP=04 OUT DLCI=17
DTE Port 2		
Protocol	DISABLED	FRAME RELAY
Physical Layer Options	N/A	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 SUBNET MASK=255.255.255.0 MNG DLCI=960
Protocol Address Table	N/A	PORT DLCI=18 NET DLCI=18
Network Port		
Physical Layer Options	LOOP RATE=64K CLOCK SOURCE=SLAVE	LOOP RATE=64K CLOCK SOURCE=SLAVE
Frame Relay Options	SIGNAL TYPE=ANSI T391=10 N391=6 N392=3 N393=4	SIGNAL TYPE=ANSI T391=10 N391=6 N392=3 N393=4

Bisync Application

The FSU 5622 ESP 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 FSU 5622 ESP 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-C for an example configuration for the multi-point application.

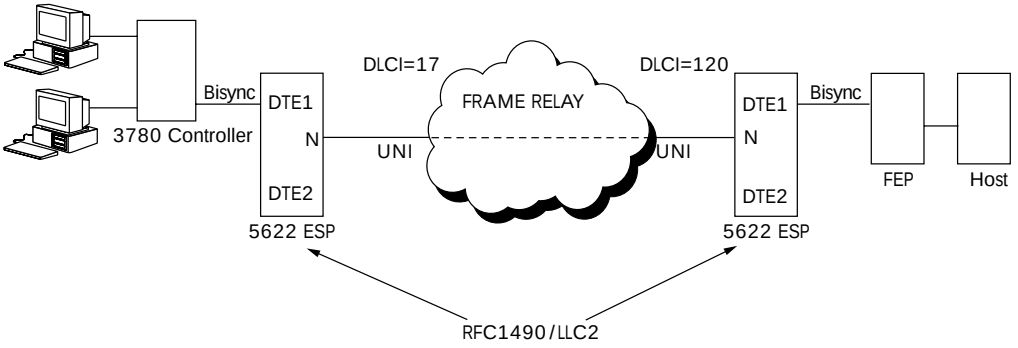


Figure 4-3
Bisync Point-to-Point

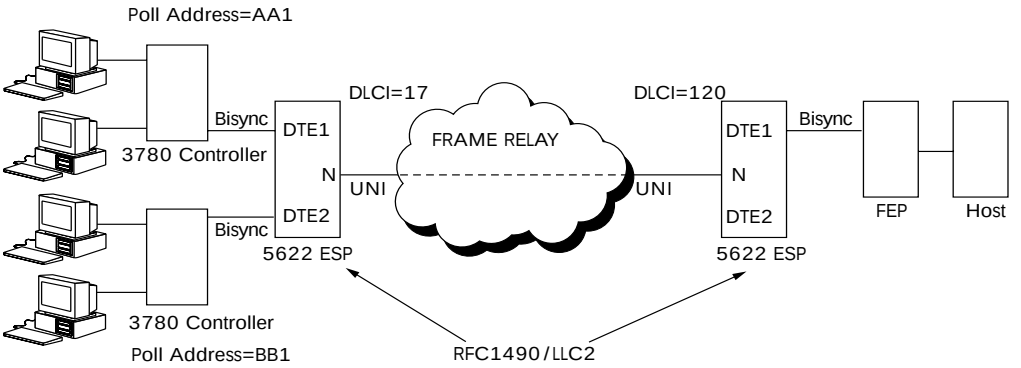


Figure 4-4
Bisync Multi-Point

Table 4-C
Configuration Settings for Multi-Point Bisync Application

	HOST FSU		REMOTE FSU
DTE Port 1			
Protocol	BISYNC		BISYNC
Physical Layer Options	CONN=EIA 232 RATE=9600		CONN=EIA 232 RATE=9600
Protocol Options	LINE=MULTIPOINT TRANS CODE= EBCDIC CRC16 FORMAT=NRZ TIMEOUT=3 THRESHOLD=10 POLL RATIO=1		LINE=MULTIPOINT TRANS CODE= EBCDIC CRC16 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=120	ENTRY #1 UNIT ADDR=AA1 LLC2 SSAP=04 LLC2 DSAP=04 OUT DLCI=17
DTE Port 2			
Protocol	DISABLED		BISYNC
Physical Layer Options	N/A		CONN=RS232 RATE=9600
Protocol Options	N/A		LINE=MULTIPOINT TRANS CODE= EBCDIC CRC16 FORMAT=NRZ TIMEOUT=3 THRESHOLD=10 POLL RATIO=1
Protocol Address Table	N/A		ENTRY #1 UNIT ADDR=BB1 LLC2 SSAP=08 LLC2 DSAP=04 OUT DLCI=17
Frame Relay Options	SIGNAL TYPE=ANSI T391=10 N391=6 N392=3 N393=4		SIGNAL TYPE=ANSI T391=10 N391=6 N392=3 N393=4

Transparent Application

In cases when the user protocol is not supported by the FSU 5622 ESP, 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 FSU 5622 ESP is transparent to the protocol address formats.

In the transparent BOP protocol, the FSU 5622 ESP 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 FSU 5622 ESP 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 FSU 5622 ESP buffers async characters and encapsulates the data portion of each character for transport across frame relay using a programmable DLCI and remote FSU 5622 ESP port number.

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

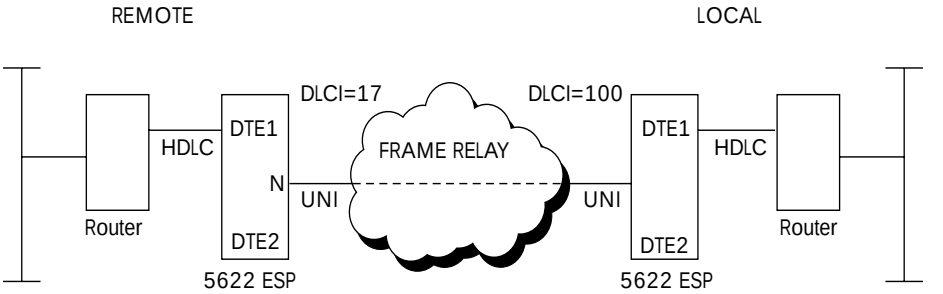


Figure 4-5
Transparent BOP Application

Table 4-D
Configuration Settings for Transparent BOP Application

	LOCAL FSU	REMOTE FSU
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=1 DLCI=17
DTE Port 2		
Protocol	DISABLED	DISABLED
Network Port		
Physical Layer Options	LOOP RATE=64K CLOCK SOURCE=SLAVE	LOOP RATE=64K CLOCK SOURCE=SLAVE
Frame Relay Options	SIGNAL TYPE=ANSI T391=10 N391=6 N392=3 N393=4	SIGNAL TYPE=ANSI T391=10 N391=6 N392=3 N393=4

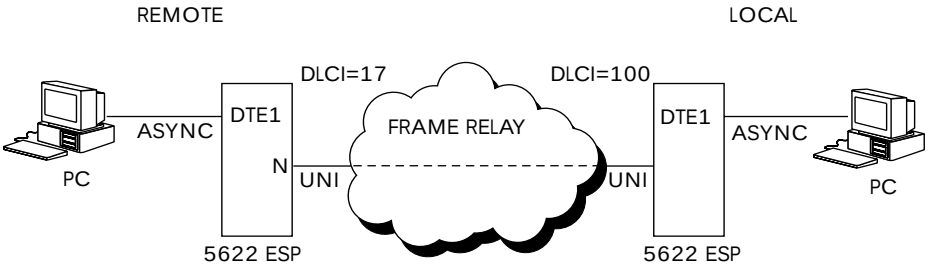


Figure 4-6
Transparent Async Application

Table 4-E
Configuration Settings for Transparent Async Application

	HOST FSU	REMOTE FSU
DTE Port 1		
Protocol	TRANS ASYNC	TRANS ASYNC
Physical Layer Options	CONN=EIA 232 BAUD=38.4K DATA BITS=8 PARITY=NONE STOP BITS=1 HDW FLOW CTRL=ON	CONN=EIA 232 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=1 DLCI=17
DTE Port 2		
Protocol	DISABLED	DISABLED
Network Port		
Physical Layer Options	LOOP RATE=64K CLOCK SOURCE=SLAVE	LOOP RATE=64K CLOCK SOURCE=SLAVE
Frame Relay Options	SIGNAL TYPE=ANSI T391=10 N391=6 N392=3 N393=4	SIGNAL TYPE=ANSI T391=10 N391=6 N392=3 N393=4

Switched Mode Application

Switched mode is used to multiplex several remote extensions (up to 40) to two host ports (see Figure 4-7). This enables many remote users to have access to a limited number of access lines on a call-by-call basis. The host unit typically connects two extensions to a PBX via an FXO module. The remote units connect to telephone sets via FXS modules.

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

External Call Origination

When the telephone set on a remote FSU 5622 ESP is taken off-hook, the local FSU 5622 ESP generates dial tone and waits for a four-digit extension to be entered by the user. Once the extension is entered, the remote FSU 5622 ESP transmits this information to the host FSU 5622 ESP where it is compared to extension information in the extension / DLCI table. If the extension is not located, the host assumes the number is external and attempts to seize an available port and dial the extension on the PBX. If no port is available, a trunk busy (fast busy) is returned to the remote port. After the extension is dialed, the data link is established and the call remains up until the remote FSU 5622 ESP terminates the call.

External Call Reception

When an incoming call is received from the PBX, the host FSU 5622 ESP auto-answers the call and generates dial tone. At this point the calling party can dial the four-digit extension of the party they are trying to reach. The host looks up the extension in the extension / DLCI table and routes the call appropriately. If the extension does not exist, the FSU 5622 ESP generates a trunk busy signal back into the PBX. Otherwise, the host routes the call to the appropriate port. When the remote party answers the call, the data link is established and the call remains up until the remote FSU 5622 ESP hangs up or until a loss of line current is detected on the FXO port.

Internal Calls

When the telephone set on a remote FSU 5622 ESP is taken off-hook, the local FSU 5622 ESP generates dial tone and waits for the four-digit extension to be entered. Once the extension is entered, the remote FSU 5622 ESP transmits this information to the host FSU 5622 ESP where it is compared to extension information in the extension / DLCI table. If the extension if found in the extension / DLCI table, then the call is routed to the appropriate extension via the host unit. When the called unit goes off-hook, the data link is established and remains up until one of the two extensions terminates the call.

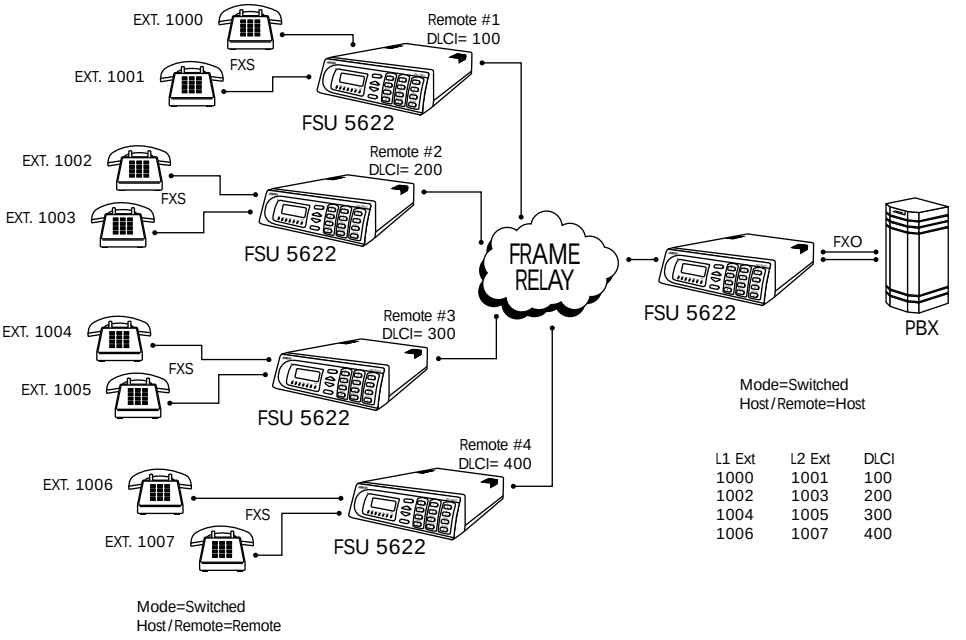


Figure 4-7
Switched Mode Application

PLAR Mode Application

PLAR (private line automatic ringdown) mode connects up to two remote telephone sets to one or two local telephone sets without a PBX. PLAR mode runs over a point-to-point DDS network or over a frame relay network. This mode requires the use of FXS modules on both ends for connection to the telephone sets. In PLAR mode, taking a phone off-hook rings the opposite end of the circuit. See Figure 4-8.

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

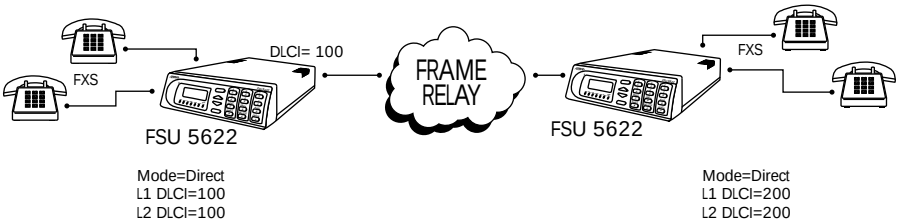


Figure 4-8
PLAR Mode Application

Direct Mode Application

Direct mode is used to set up a typical FXS / FXO extension arrangement. In this mode, the local unit is connected to a PBX via an FXO module. The remote unit uses an FXS module to connect the telephone sets. In this arrangement, the local PBX extensions are extended across the frame relay or point-to-point DDS circuit. In direct mode, the FSU FSU 5622 ESP is transparent to the telephone circuit. All signalling information is generated / detected by the attached PBX / telephone.

For direct mode, the DLCI for each voice port must be programmed. In the case of a frame relay circuit, this is the local DLCI that the voice data is to be carried on. For a point-to-point circuit, the DLCI value must be non-zero and it must be the same on both ends of the circuit. See Figure 4-9.

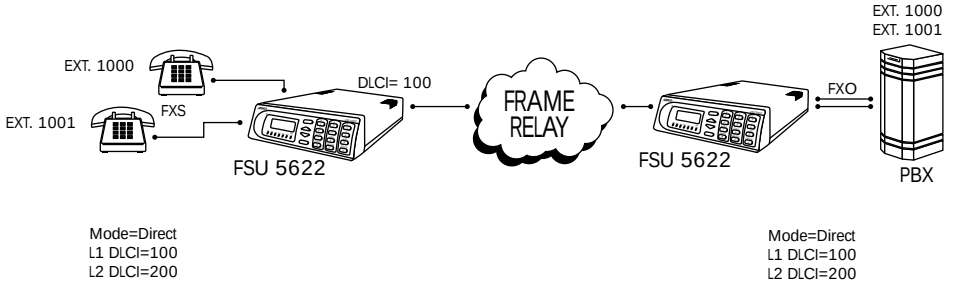


Figure 4-9
Direct Mode Application

Chapter 5
Configuration Overview

LOCAL AND REMOTE CONFIGURATION

The FSU 5622 ESP can be configured locally or, when using the VT 100 interface, communications can be established so a local FSU 5622 ESP can configure a remote FSU 5622 ESP. See the chapter *Operation* for information on selecting Local or Remote operation.

The Configuration menu (Figure 5-1) consists of submenus relating to specific interfaces or functions of the FSU 5622 ESP requiring setup:

DTE Port 1
DTE Port 2
FXS/FXO/E&M Options
Network Port
DBU Configuration
Control Port (front panel only)
IP Routing
System Configuration

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

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 FSU 5622 ESP contains a default set of configuration options stored in read-only memory. The unit is shipped from the factory with this profile loaded into the current (nonvolatile configuration) memory. If this profile matches requirements for the system, then no additional configuration is required to put the unit into service. If the profile does not match system requirements, it can be modified.

For detailed information on configuration see the chapters *DTE Port Configuration, Configuring the Voice Interfaces, Network Port Configuration, Configuring Dial Backup Options*, *IP Routing,* and *System Configuration.*

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

```
                    ADTRAN FSU 5622 ESP CONFIG MENU                LOCAL

 1 DTE PORT 1
 2 DTE PORT 2
 3 FXS OPTIONS
 4 NETWORK PORT
 5 DIAL BACKUP
 6 IP ROUTING
 7 SYSTEM CONFIG

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


--------------------------------------------------------------------------------
ESC TO EXIT   ENTER SELECTION :_
```

Figure 5-1
VT 100 Configuration Menu

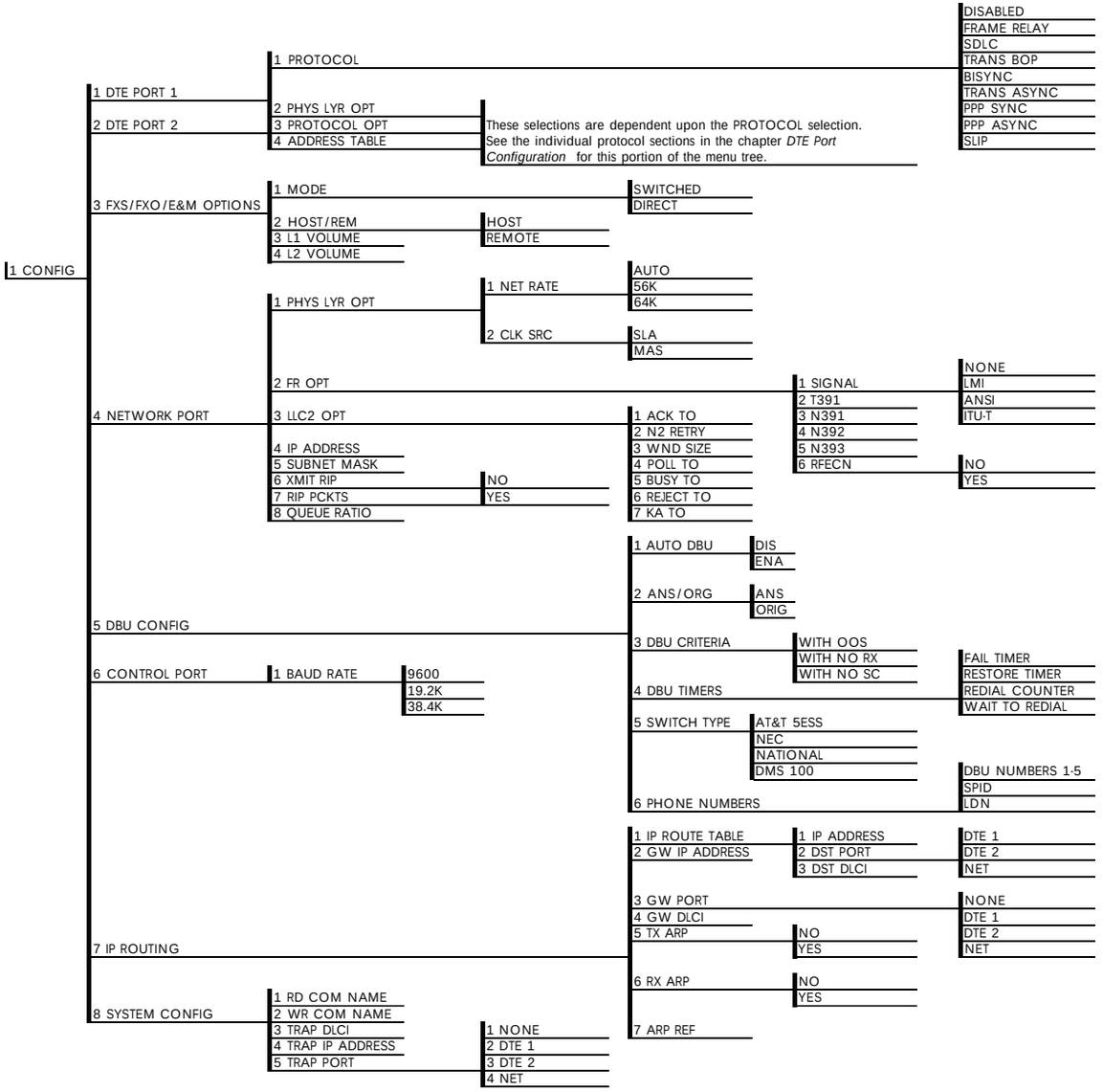


Figure 5-2
Front Panel Configuration Menu Tree

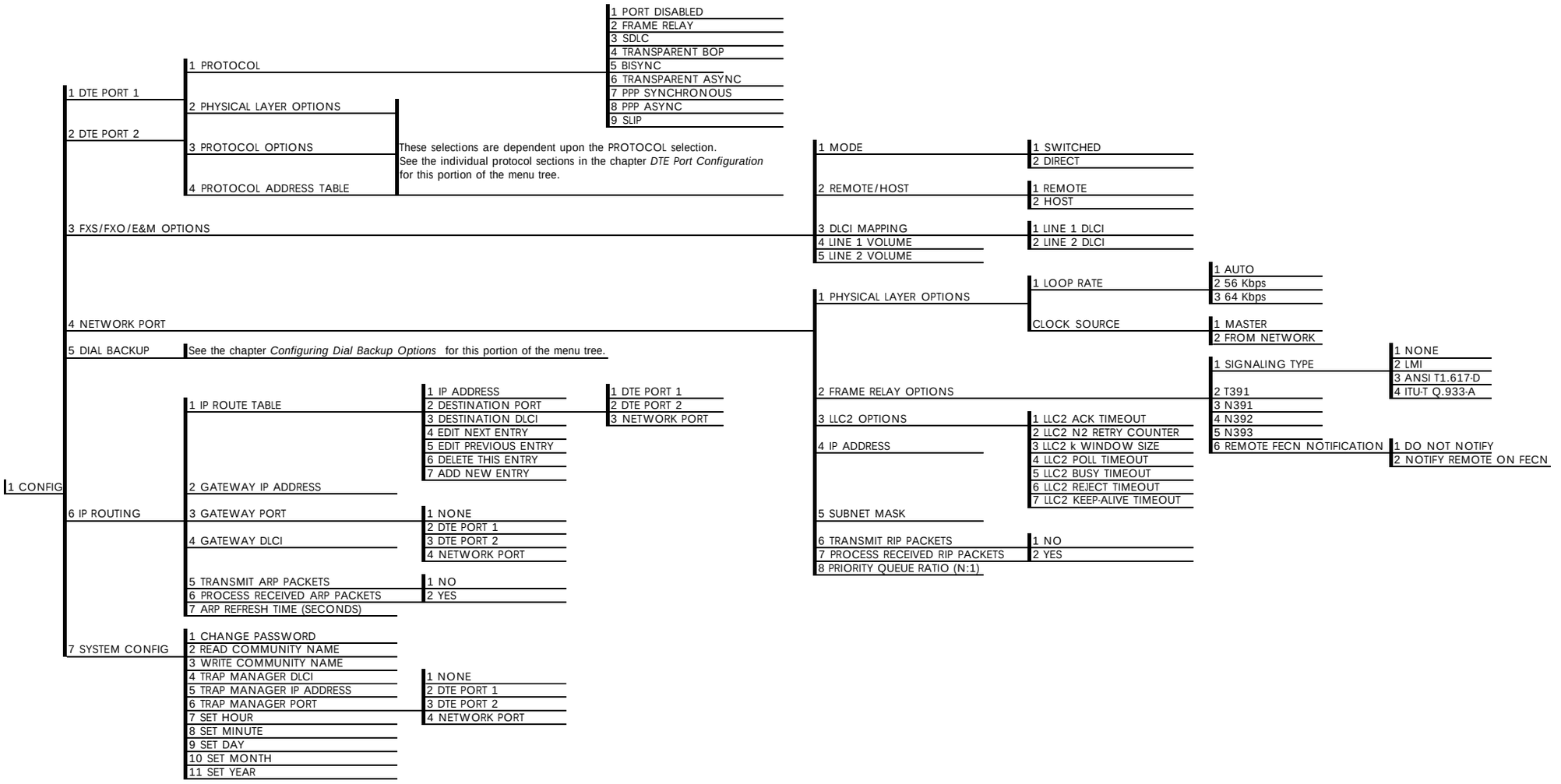


Figure 5-3
VT 100 Configuration Menu Tree

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 FSU 5622 ESP 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            ADTRAN FSU 5622 ESP PORT CONFIG MENU            LOCAL

 1 PROTOCOL=PORT DISABLED
 2 PHYSICAL LAYER OPTIONS
 3 PROTOCOL OPTIONS
 4 PROTOCOL ADDRESS TABLE

ESC TO EXIT   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.

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

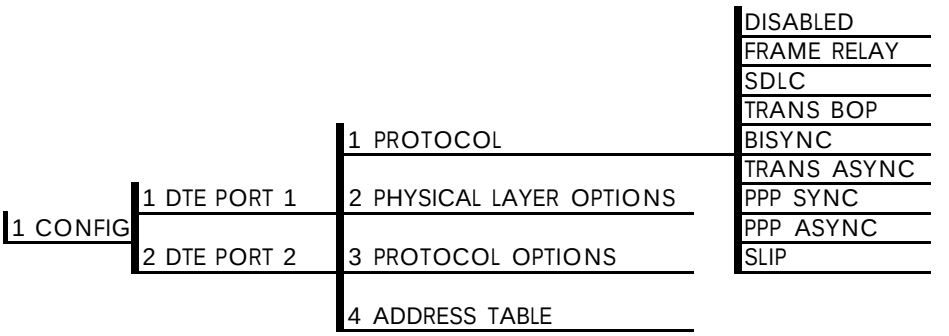


Figure 6-2
Front Panel Protocol Menu Tree

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.

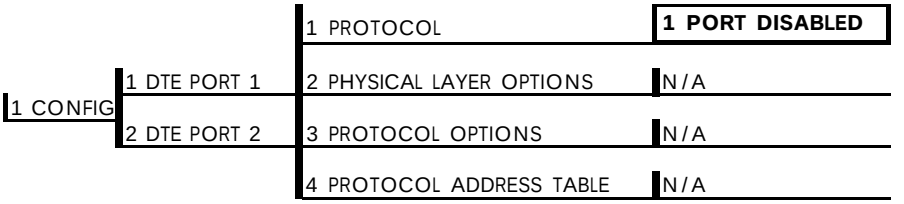


Figure 6-3
Port Disabled Menu Tree

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 FSU 5622 ESP 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 EIA-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.

For rates higher than 56/64 kbps, the ESP external DCE card is required.

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

Transmit Idle Code (IDLE)

Enable the FSU 5622 ESP 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 FSU 5622 ESP varies the transmit clock rate to temporarily limit the transmit data rate from the DTE device to the FSU 5622 ESP.

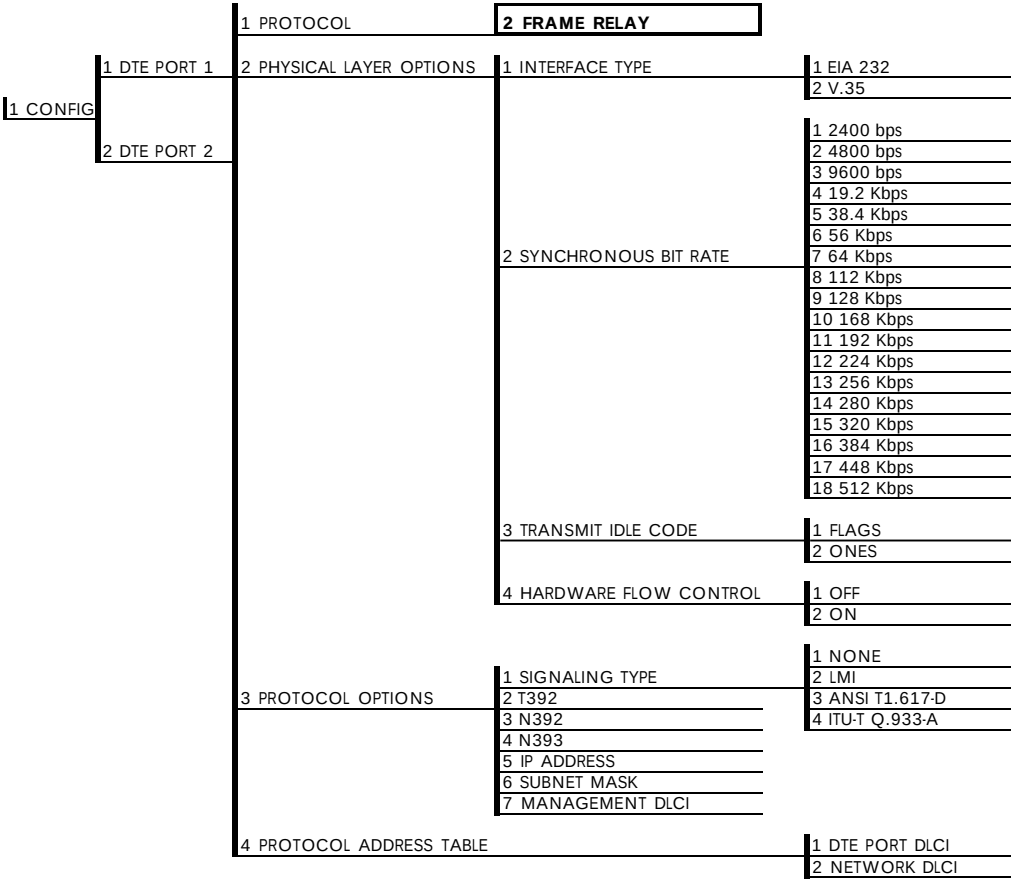


Figure 6-4
Frame Relay Protocol Menu Tree

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, 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 FSU 5622 ESP 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 FSU 5622 ESP, set the Management DLCI to a unique value that identifies the virtual circuit between the router/FRAD and the FSU 5622 ESP. The router/FRAD must also be configured to route the FSU 5622 ESP 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 ADDRESS)
Enter the FSU 5622 ESP 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,* for more information.

Subnet Mask
Enter the subnet number assigned to the network formed by the FSU 5622 ESP and the other FRAD / routers across the frame relay network. See the section, *Guidelines for Configuring IP Addr, Subnet Mask, and Mng DLCI,* 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 FSU 5622 ESP to carry SNMP and TELNET packets to / from the FSU 5622 ESP on the DTE port. See the section, *Guidelines for Configuring IP Addr, Subnet Mask, and Mng DLCI,* 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.

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 FSU 5622 ESPs for each SDLC session.

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

Physical Layer Options

Interface Type (CONN)

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

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

Transmit Idle Code (IDLE)

Enable the FSU 5622 ESP 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 FSU 5622 ESP issues RNR (receive not ready) commands to the attached PU, temporarily disabling transmit data to the FSU 5622 ESP.

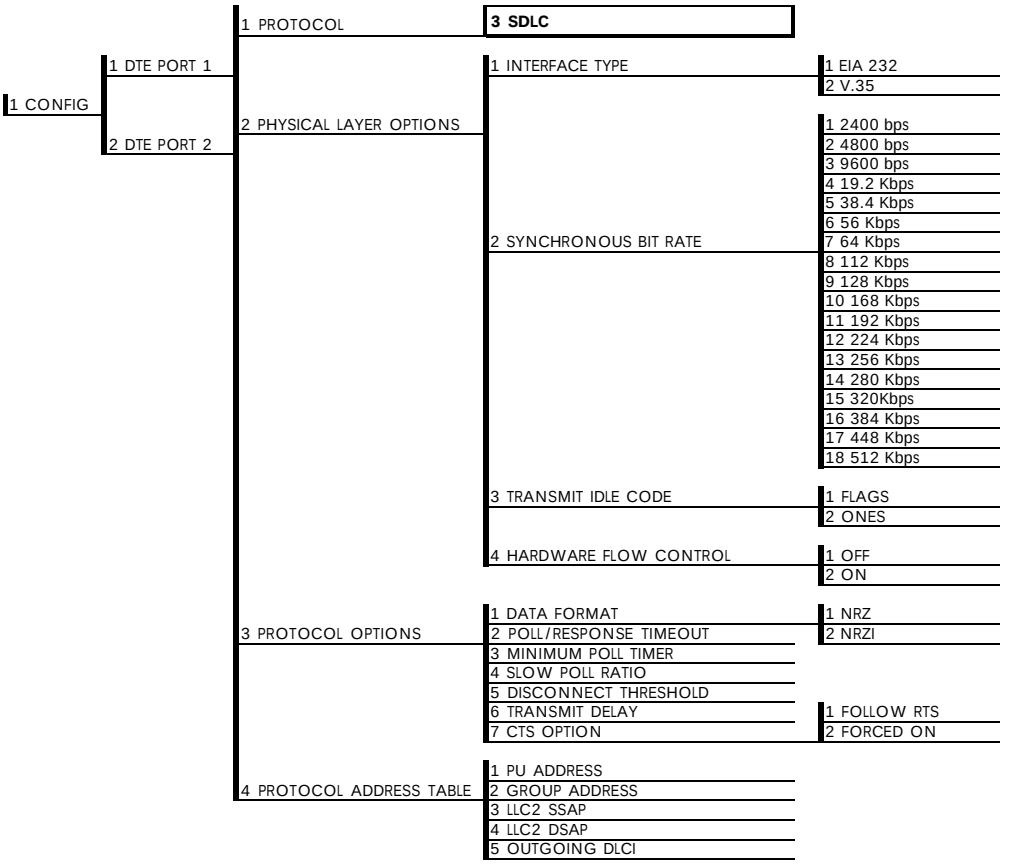


Figure 6-5
SDLC Protocol Menu Tree

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).

When using NRZI format, the FSU 5622 ESP does not derive timing from the receive data input.

Poll/Response Timeout (TIMEOUT)
Set the amount of time the FSU 5622 ESP waits for a poll response before issuing another poll.

Minimum Poll Timer (MIN POLL TIME)
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.

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

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

CTS Option
Set the FSU 5622 ESP CTS option to follow RTS or to be forced on.

Protocol Address Table

PU Address (PU ADDRESS)
Enter the physical unit address of each SDLC device you wish to connect to the FSU 5622 ESP.

Group Address
Enter the address used for group polling. With this address the

host can poll the FSU 5622 ESP for information on all units connected to the FSU 5622 ESP. 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 FSU 5622 ESP should match the DSAP on the other FSU 5622 ESP. 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 FSU 5622 ESP should match the SSAP on the other FSU 5622 ESP. The value of this parameter must be in increments of four beginning with 04. See the section *SNA/SDLC with Local Spoofing* in the chapter *Applications* 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 FSU 5622 ESP to connect to devices even if the FSU 5622 ESP does not understand their protocol's addressing and controlling techniques. The FSU 5622 ESP 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.

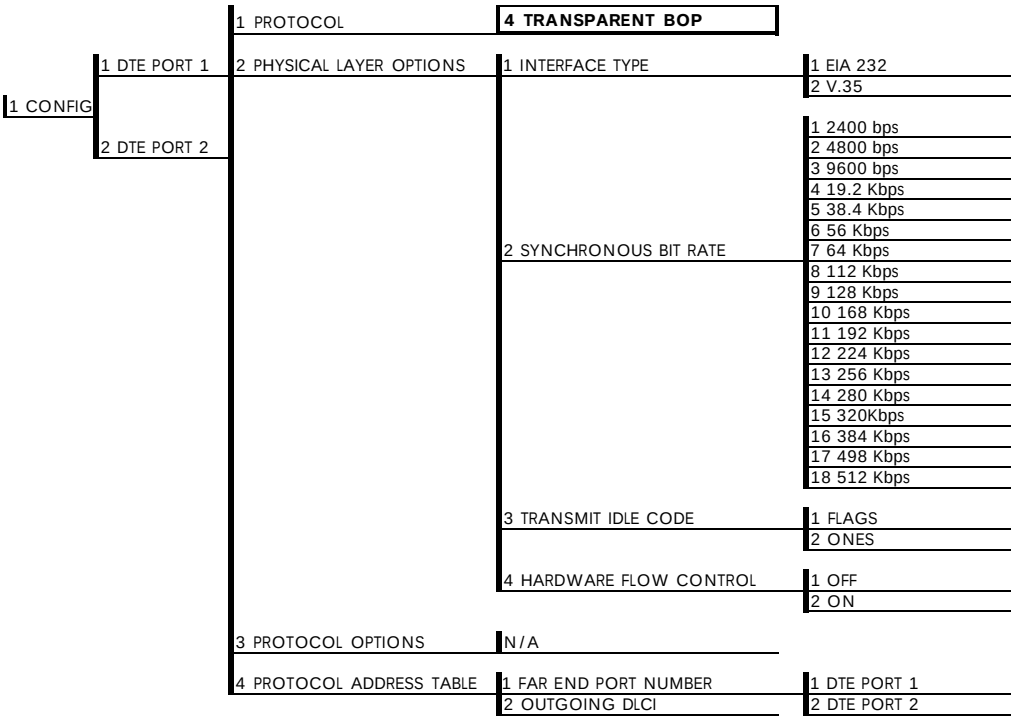


Figure 6-6
Transparent BOP Menu Tree

Physical Layer Options

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

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

Transmit Idle Code (IDLE)
Enable the FSU 5622 ESP to transmit flags or all ones (flags are recommended).

Hardware Flow Control (HDW FLOW CTRL)
When enabled, the FSU 5622 ESP varies the transmit clock rate to temporarily limit the transmit data rate to the FSU 5622 ESP.

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 FSU 5622 ESP 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 FSU 5622 ESP.

Bisync Protocol

The Bisync protocol option enables the FSU 5622 ESP to connect IBM 2780/3780 bisync controllers to the host across frame relay. Both point-to-point and multi-point configurations are supported.

The FSU 5622 ESP can decode both ASCII and EBCDIC character sets and support CRC16, parity, VRC, and LRC error checking methods. See Figure 6-7 for the Bisync protocol menu tree.

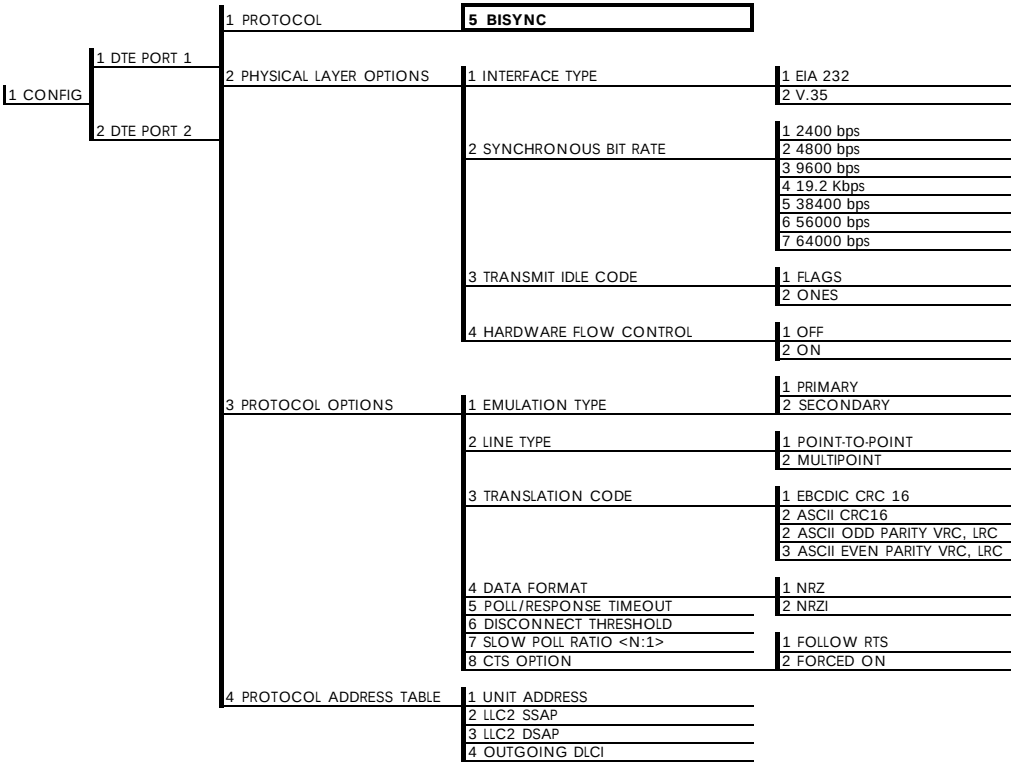


Figure 6-7
Bisync Protocol Menu Tree

Physical Layer Options

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

Synchronous Bit Rate (RATE)
Select the operating speed of the DTE interface.

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

Transmit Idle Code (IDLE)
Enable the FSU 5622 ESP to transmit flags or all ones.

Hardware Flow Control (HDW FLOW CTRL)
When configured for the Bisync protocol, this parameter is always enabled. The FSU 5622 ESP uses commands within the bisync protocol to temporarily disable transmit data to the FSU 5622 ESP.

Protocol Options

Emulation Type (EMUL TYPE)
For multi-point configurations, this entry defines primary or secondary emulation. Set the FSU 5622 ESP connected to the host to secondary and the FSU 5622 ESP connected to the 2780/3780 controller to primary.

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

Translation Code (TRANSLAT CODE)
Define the character set and error checking algorithm to use. The choices are EBCDIC CRC16, ASCII CRC16, ASCII odd parity VRC/LRC, and ASCII even parity VRC/LRC.

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 FSU 5622 ESP waits for a poll response before issuing another poll.

Disconnect Threshold (THRESHOLD)

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

Slow Poll Ratio <N:1> (POLL 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.

CTS Option

Set the FSU 5622 ESP CTS option to follow RTS or to be forced on.

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 FSU 5622 ESP 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 FSU 5622 ESP should match the DSAP on the other FSU 5622 ESP.

LLC2 DSAP (LLC DSAP)

Define a point-to-point connection on the network. For each

bisync SDLC connection, the DSAP of one FSU 5622 ESP should match the SSAP on the other FSU 5622 ESP. See the section *SNA/SDLC with Local Spoofing* in the chapter *Applications* 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 FSU 5622 ESP is an async device such as a terminal or PC. See Figure 6-8 for the Transparent Async menu tree.

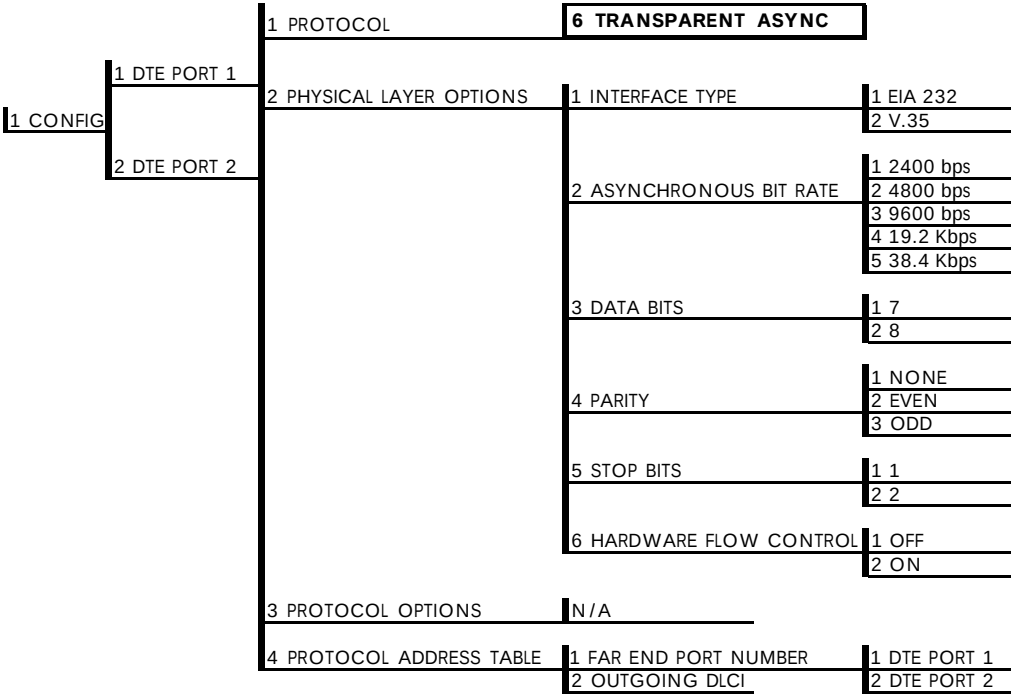


Figure 6-8
Transparent Async Protocol Menu Tree

The FSU 5622 ESP buffers async characters from the DTE device until two idle characters or 100 characters are received. A frame relay synchronous frame is constructed containing the data content of each character. Frame relay frames received on the

network containing transparent async data are transmitted to the attached device with the character format set under the DTE port physical layer options.

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

Physical Layer Options

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

Asynchronous Bit Rate (BAUD)
Select the operating speed to match the DTE device connected to the FSU 5622 ESP. 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 FSU 5622 ESP. The choices are 7 and 8.

Parity
Select even, odd, or no parity information. Set to match the DTE device connected to the FSU 5622 ESP.

Stop Bits
Select one or two stop bits. Set to match the DTE device connected to the FSU 5622 ESP.

Hardware Flow Control (HDW FLOW CTRL)
When enabled, the FSU 5622 ESP uses CTS to temporarily disable transmit data to the FSU 5622 ESP.

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 FSU 5622 ESP 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 FSU 5622 ESP.

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.

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

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

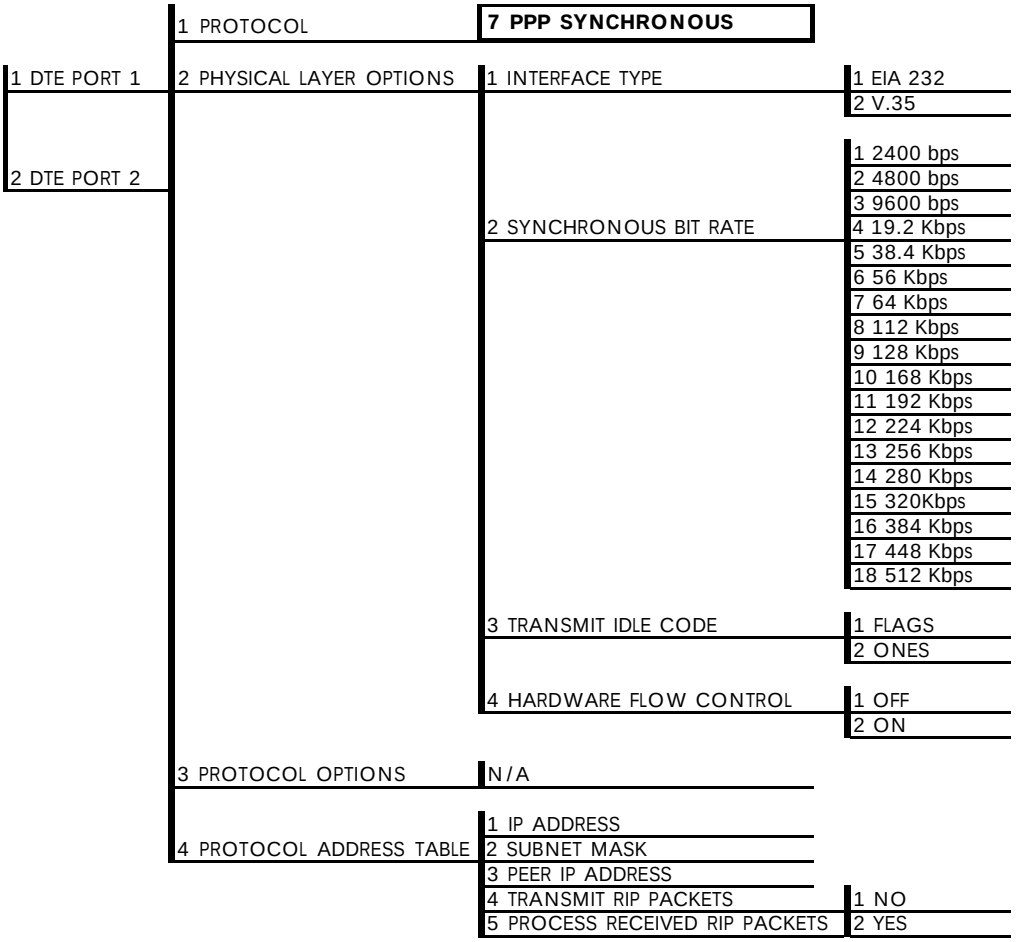


Figure 6-9
PPP Synchronous Protocol Menu Tree

Physical Layer Options

Interface Type (CONN)

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

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

Transmit Idle Code (IDLE)
Enable the FSU 5622 ESP to transmit flags or all ones.

Hardware Flow Control (HDW FLOW CTRL)
When enabled, the FSU 5622 ESP varies the transmit clock rate to temporarily limit the transmit data rate to the FSU 5622 ESP.

Protocol Options

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

Protocol Address Table

IP Address (IP ADDRESS)
Enter the internet protocol (IP) address assigned to the FSU 5622 ESP for the DTE port.

Subnet Mask
Enter the subnet number assigned to the network formed by the FSU 5622 ESP and the Peer PPP station.

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

Transmit RIP Packets (TX RIP)
Enable or disable the FSU 5622 ESP's transmission of routing information protocol (RIP) messages. RIP broadcasts occur in 60 second intervals, advertising network addresses to the Peer PPP device. Routing tables are generated from these broadcasts.

Process Received Packets (RIP REPLY)
Enable or disable the FSU 5622 ESP'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 EIA-232.

Asynchronous Bit Rate (BAUD)

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 38.4 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 FSU 5622 ESP uses CTS to temporarily disable transmit data to the FSU 5622 ESP.

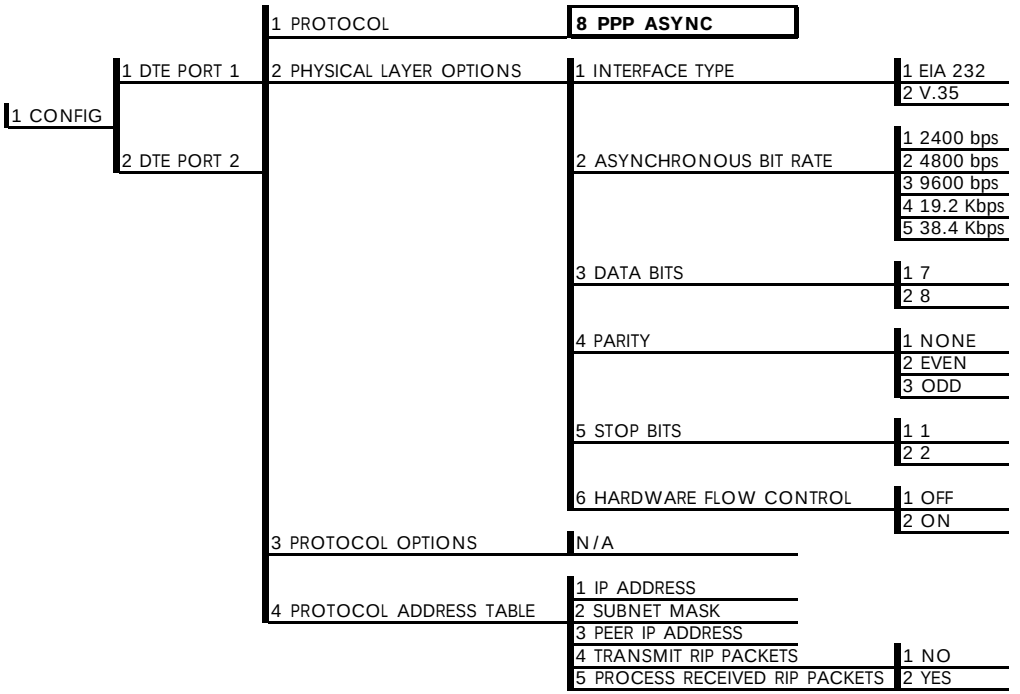


Figure 6-10
PPP Asynchronous Protocol Menu Tree

Protocol Options

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

Protocol Address Table

IP Address (IP ADDRESS)
Enter the internet protocol (IP) address of the FSU 5622 ESP DTE port.

Subnet Mask
Enter the subnet number of the network formed by the FSU 5622 ESP and the Peer PPP station.

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

Transmit RIP Packets (TX RIP)
Enable or disable the FSU 5622 ESP's transmission of routing information protocol (RIP) messages. RIP broadcasts occur in 60 second intervals, advertising network addresses to the Peer PPP device. Routing tables are generated from these broadcasts.

Process Received Packets (RIP REPLY)
Enable or disable the FSU 5622 ESP'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 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.

*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 EIA-232.

Asynchronous Bit Rate (BAUD)
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 FSU 5622 ESP uses CTS to temporarily disable transmit data to the FSU 5622 ESP.

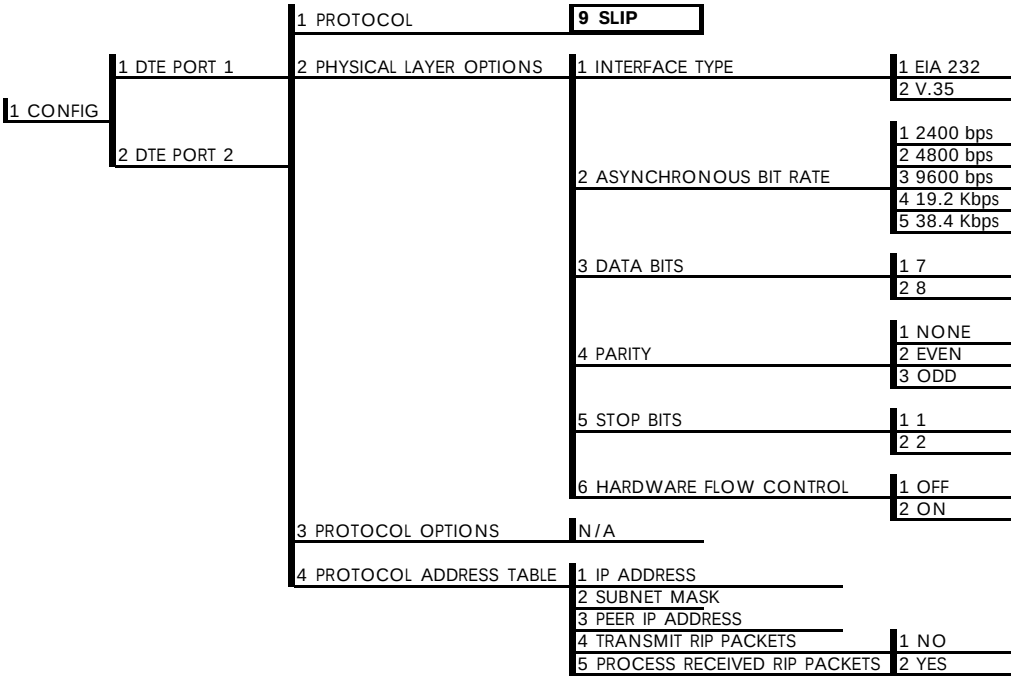


Figure 6-11
Slip Protocol Menu Tree

Protocol Options

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

Protocol Address Table

IP Address (IP ADDRESS)
Enter the internet protocol (IP) address of the FSU 5622 ESP DTE port.

Subnet Mask
Enter the subnet number of the network formed by the FSU 5622 ESP and the Peer SLIP station.

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

Transmit RIP Packets (TX RIP)
Enable or disable the FSU 5622 ESP's transmission of routing information protocol (RIP) messages. RIP broadcasts occur in 60 second intervals, advertising network addresses to the Peer SLIP device. Routing tables are generated from these broadcasts.

Process Received Packets (RIP REPLY)
Enable or disable the FSU 5622 ESP's reply to the request from the Peer SLIP device to issue RIP messages.

Chapter 7
Configuring the Voice Interfaces

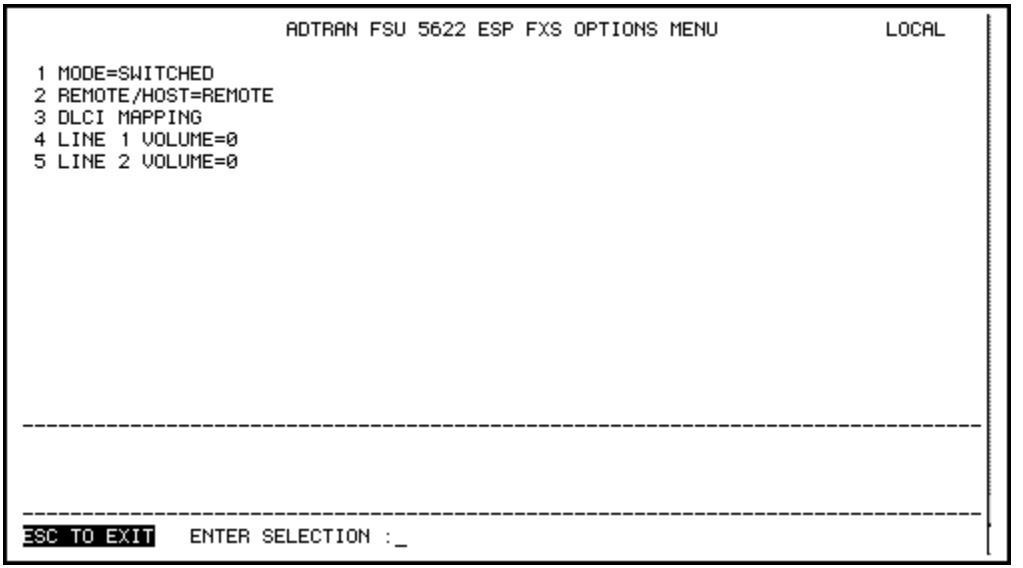


Figure 7-1
Voice Options Menu

Mode

Select either DIRECT or SWITCHED mode for the voice interface.

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

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

Host/Rem

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

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

DLCI Map

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

Selections Available for a Unit in Direct Mode

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

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

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

Selections Available for a Host Unit in Switched Mode

This selection gives access to the remote extension table that is maintained by the host unit. The table consists of a local DLCI associated with the voice data on a remote FSU 5622 ESP and the extension for the two voice ports connected to that DLCI. The FSU 5622 ESP supports up to 20 DLCIs which yield a total of 40 voice ports. The front panel **Next**, **Previous**, **Add**, and **Delete** keys are used to edit this table. The DLCI/Extension information is communicated to the remote units over the network so configuration is not required on the remote units.

L1 Ext
Extension for Line 1 on a remote FSU 5622 ESP.

L2 Ext
Extension for Line 2 on a remote FSU 5622 ESP.

DLCI
Local DLCI that carries L1/L2 data.

Port
When cascading units, select the port (Network, DTE 1, DTE 2) that the voice channel resides on.

L1 Volume

Output volume setting for Line 1 (ranges from 0 to 15).

L2 Volume

Output volume setting for Line 2 (ranges from 0 to 15).

Chapter 8
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 8-1. The network port is always used in frame relay protocol configurations. The network port terminates the user end of the frame relay UNI interface. The FSU 5622 ESP 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.

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

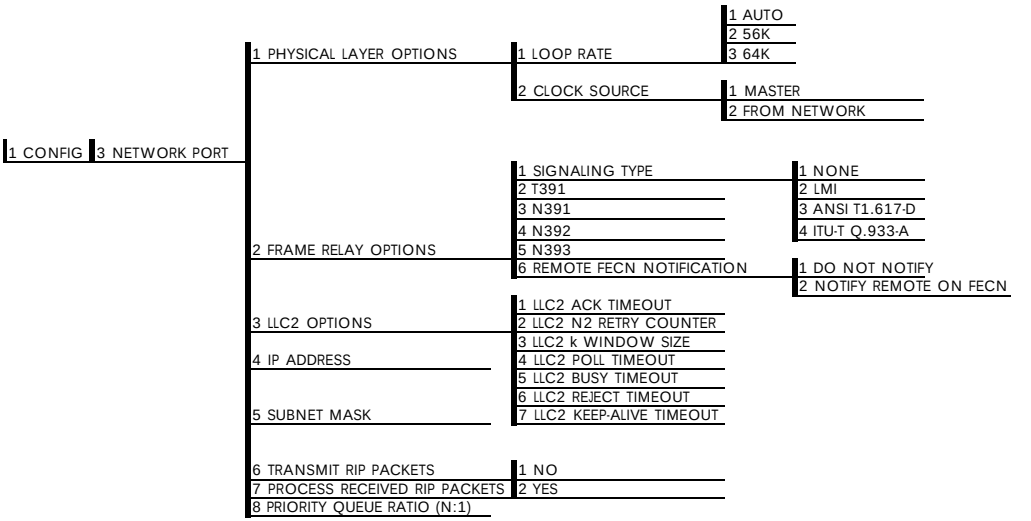


Figure 8-1
Network Port Configuration Menu Tree

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

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

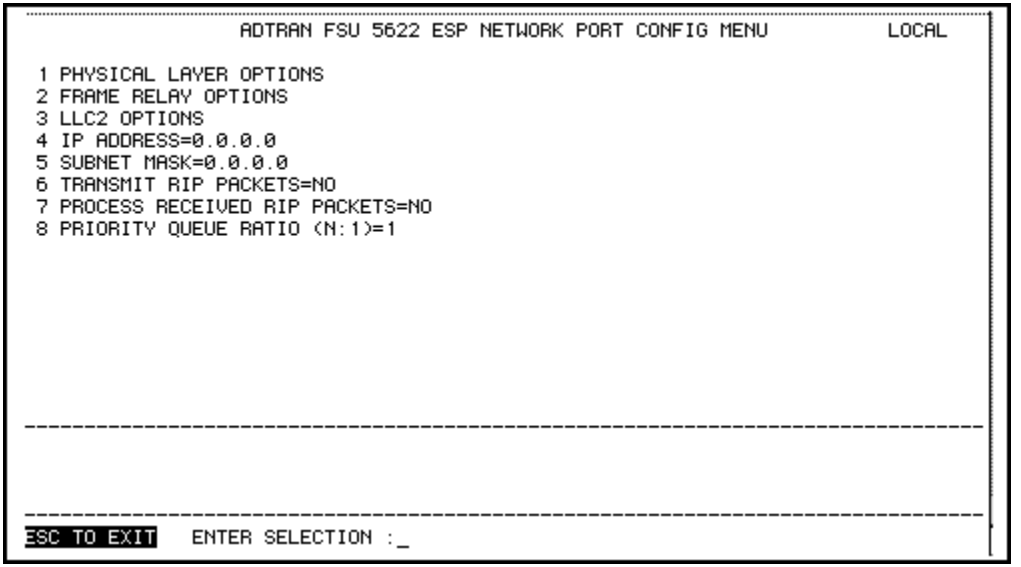


Figure 8-2
VT 100 Network Port Configuration Menu

Physical Layer Options (PHYS LYR OPT)

Loop Rate (NET RATE)

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

Clock Source (CLK SRC)

Configure the FSU 5622 ESP clocking source as either the master or slave (usually slave).

Frame Relay Options (FR OPT)

The VT 100 screen in Figure 8-3 appears when the Frame Relay Option is selected from the Network Port Configuration Menu.

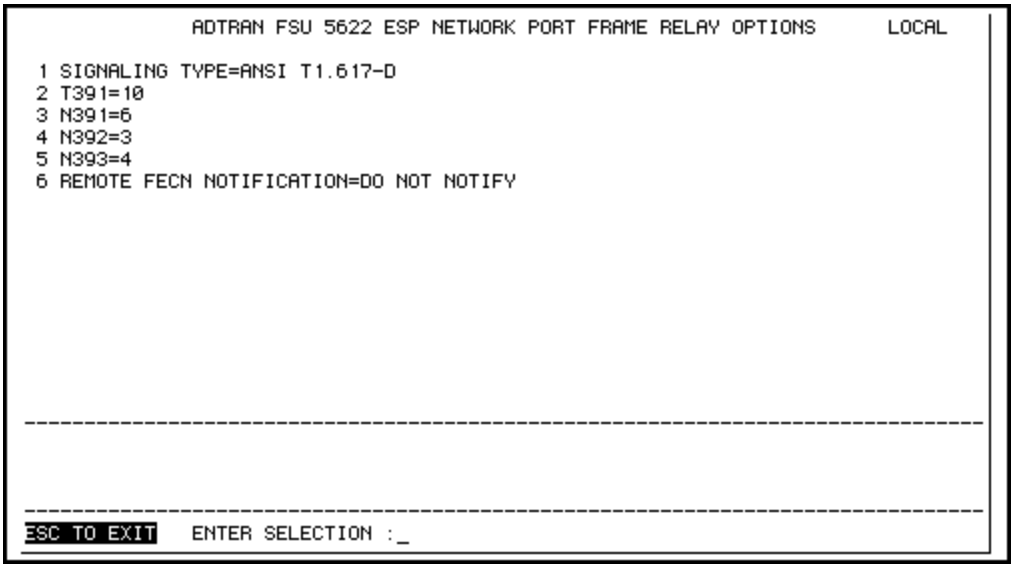


Figure 8-3
VT 100 Network Port Frame Relay Options Menu

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

For point-to-point DDS operation, signalling should be set to NONE.

T391
Set the time between polls to the frame relay network.

N391
Determine how many link integrity polls occur in between full status polls.

N392 and N393
These parameters define the error threshold for the UNI formed by the FSU 5622 ESP 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 FSU 5622 ESP 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 FSU 5622 ESPs and can only be used with an ADTRAN FSU 5622 ESP on both ends of the virtual circuit.

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 8-4 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.

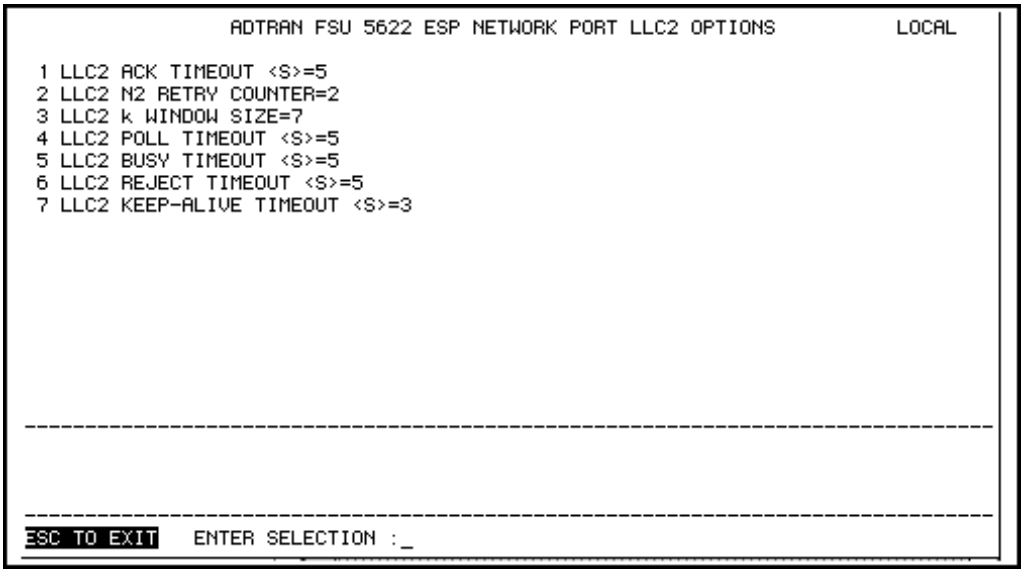


Figure 8-4
VT 100 Network Port LLC2 Options Menu

IP Address

Enter the internet protocol (IP) address of the FSU 5622 ESP Network port.

Subnet Mask

Enter the subnet number of the network formed by the FSU 5622 ESP and the other FRADs / routers across the frame relay network.

Transmit RIP Packets (XMIT RIP)

Enable or disable the FSU 5622 ESP's transmission of routing information protocol (RIP) messages. RIP broadcasts occur in 60 second intervals, advertising network addresses to the peer routers or FRADs. Routing tables are generated from these broadcasts.

Process Received RIP Packets (RIP PCKTS)

Enable or disable the FSU 5622 ESP's reply to the request from the peer routers or FRADs to issue RIP messages.

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

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

Chapter 9
Configuring Dial Backup Options

DIAL BACKUP OPTIONS

The Dial Backup Configuration menu (Figure 9-1) stores dial backup phone numbers, enables / disables the auto DBU capability, defines the DBU criteria when the DDS circuit fails, controls the DBU timer, and configures the unit for the appropriate switch type. See Figure 9-2 for a complete menu tree of the DBU selections.

```
                    ADTRAN FSU 5622 ESP DBU OPTIONS MENU              LOCAL

 1 AUTO DBU=DISABLED                      17 NUM 1=
 2 ANSWER/ORIGINATE=ORIGINATE             18 NUM 2=
 3 ANSWER ALWAYS=DISABLED                 19 NUM 3=
 4 PASSCODE=DISABLED                      20 NUM 4=
 5 PASSCODE=                              21 NUM 5=
 6 WITH OOS=ENABLED                       22 SPID=
 7 WITH NO RX=ENABLED                     23 LDN=
 8 WITH NO SEAL CURRENT=DISABLED
 9 FAIL TIMER=1
10 RESTORE TIMER=1
11 REDIAL COUNTER=5
12 WAIT TO REDIAL=15
13 DAILY LOCKOUT=DISABLED
14 LOCKOUT START=0
15 LOCKOUT END=0
16 SWITCH TYPE=AT&T 5ESS
--------------------------------------------------------------------------------




--------------------------------------------------------------------------------
ESC TO EXIT   ENTER SELECTION :_
```

Figure 9-1
DBU Options Menu

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

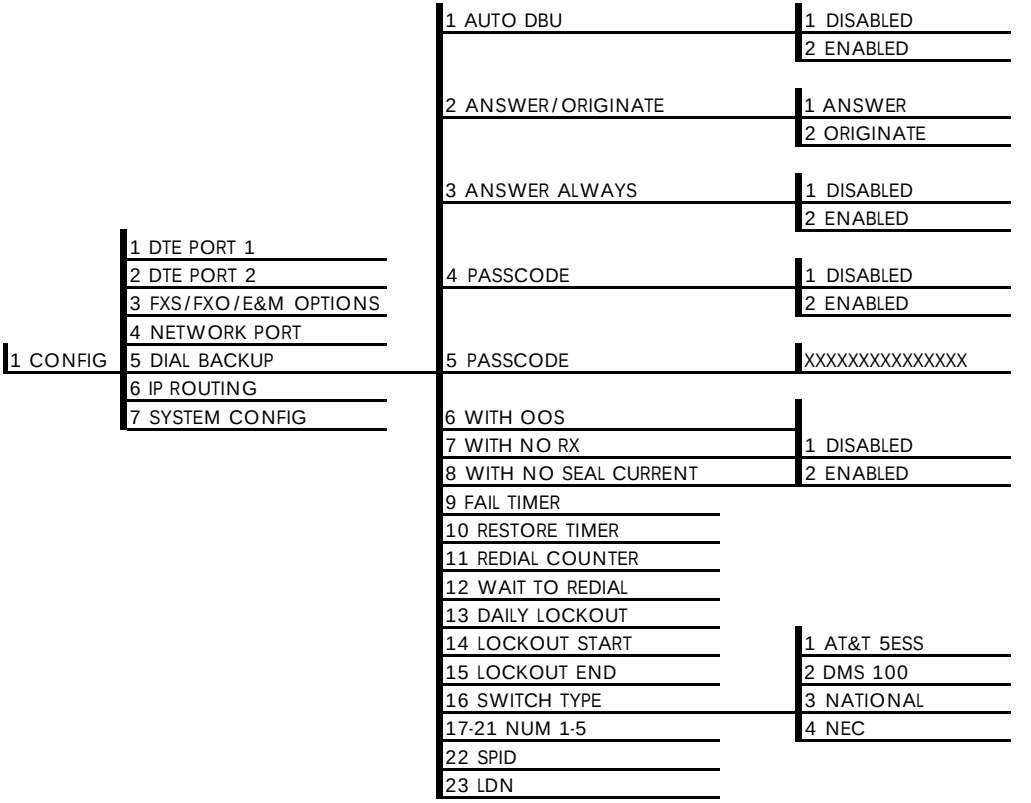


Figure 9-2
Dial Backup Menu Tree

Automatic DBU

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

Answer/Originate

This option specifies whether the FSU 5622 ESP originates or waits to answer if the dedicated circuit fails. One end must be set to Originate and the other to Answer. The factory default setting is Answer.

Answer Always

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

Passcode

The dial backup passcode adds an additional level of security to the FSU 5622 ESP. A passcode of one to ten characters can be programmed into the unit.

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

DBU Criteria

These options specify the DDS conditions that will cause the FSU 5622 ESP to enter the backup mode.

With Out of Service (OOS)

When enabled, the FSU 5622 ESP enters backup mode if an out-of-service condition is detected. The factory default setting is Enable.

With No Receive (RX) Signal

When enabled, the FSU 5622 ESP enters backup mode when a loss of signal is detected. The factory default setting is Enable.

With No Sealing Current

When enabled, the FSU 5622 ESP enters backup mode when a loss of sealing current is detected. The factory default setting is Enable.

DBU Timers

Fail Timer

This option sets the amount of time the dedicated circuit failure condition must be active before the FSU 5622 ESP attempts backup. The amount of time, which is manually entered, can be up to 990 seconds. The factory default setting is 30 seconds.

AUTO DBU FAIL
TIME: __ __ x 10sec

Restore Timer

Once the DDS circuit is down, the FSU 5622 ESP remains in backup until the DDS circuit is active for the length of time specified for the restore timer. The selection is entered in minutes (up to 255). If set to 0, the DDS must be restored manually. The factory default setting is 1 minute.

RESTORE TIMER
(0=OFF): __ __ MIN

Redial Counter

This option sets the number of times the FSU 5622 ESP re-dials the far end when entering backup mode. The redial count, which is manually entered, can be up to a maximum of 99 attempts. If the FSU 5622 ESP encounters a busy or reorder, it attempts to establish the call the specified number of times. The factory default setting is 5.

ENTER REDIAL COUNT: __ __

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

Daily Lockout

Enable / disable the daily lockout specified by the fields Enable Hour and Disable Hour.

Lockout Start

Enter the hour that the daily lockout begins and dial backup is disabled (0 to 23). Only applies if the Daily Lockout parameter is enabled.

Lockout End

Enter the hour that the daily lockout ends and dial backup is reactivated (0 to 23). Only applies if the Daily Lockout parameter is enabled.

Switch Type

When the ISDN DBU card is installed, this option selects the type of telco CO switch providing the ISDN service. There are four options for ISDN switch types:

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

PHONE NUMBERS

The FSU 5622 ESP stores up to 5 numbers of 36 digits each. Edit a phone number by reentering the entire number. This process overwrites the previously stored number.

ISDN Dial Backup

Setting the Service Profile Identifier (SPID)

For ISDN dial backup, the service profile identifier (SPID) is stored in Stored Number 6. The SPID is a sequence of digits identifying ISDN terminal equipment to the ISDN switch when more than one ISDN set has been attached to the same central office line. The SPID is assigned by the telco when the ISDN line is installed and normally resembles the phone number.

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

Setting the Local Directory (LDN) Number

For ISDN dial backup, the LDN is stored in Stored Number 7.

Chapter 10
IP Routing

IP ROUTING WITH THE FSU 5622 ESP

The FSU 5622 ESP 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 FSU 5622 ESP to share the internal routing table with other routers and FRADs attached to the port. The Rx RIP parameter enables the FSU 5622 ESP 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 FSU 5622 ESP can also respond to requests from peer routers/FRADs seeking an association for their tables. The transmit and receive inverse ARP section can be independently enabled.

Access IP Routing selections by first choosing 1 CONFIGURATION from the Main menu. Then choose IP ROUTING from the Configuration Menu. When using the VT 100 terminal interface, the screen in Figure 10-1 will appear. Full menu trees for these selections are shown in Figures 5-2 (*Front Panel Configuration Menu Tree*) and 5-3 (*VT 100 Configuration Menu Tree*).

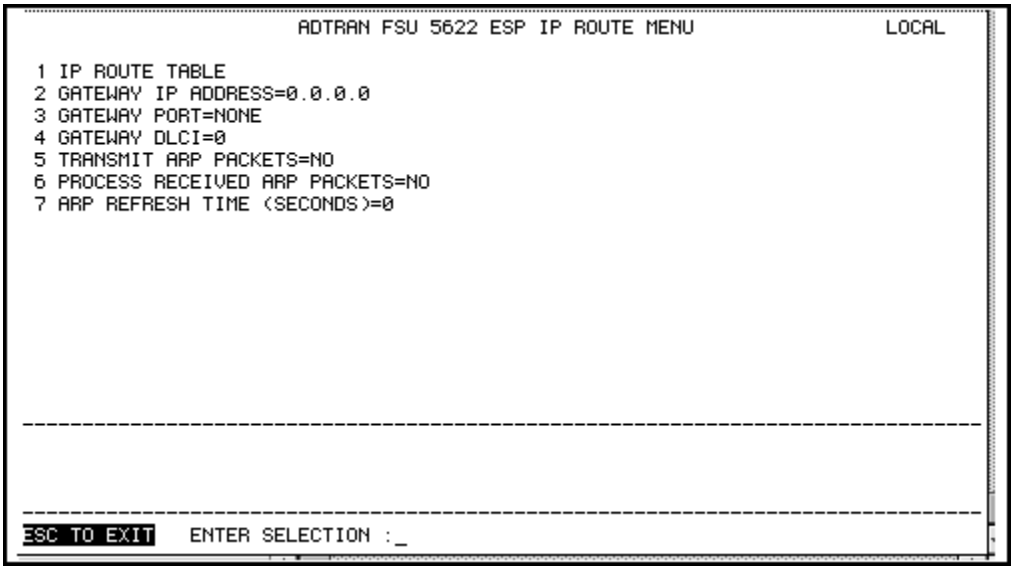


Figure 10-1
VT 100 IP Route Menu

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 10-2.

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.

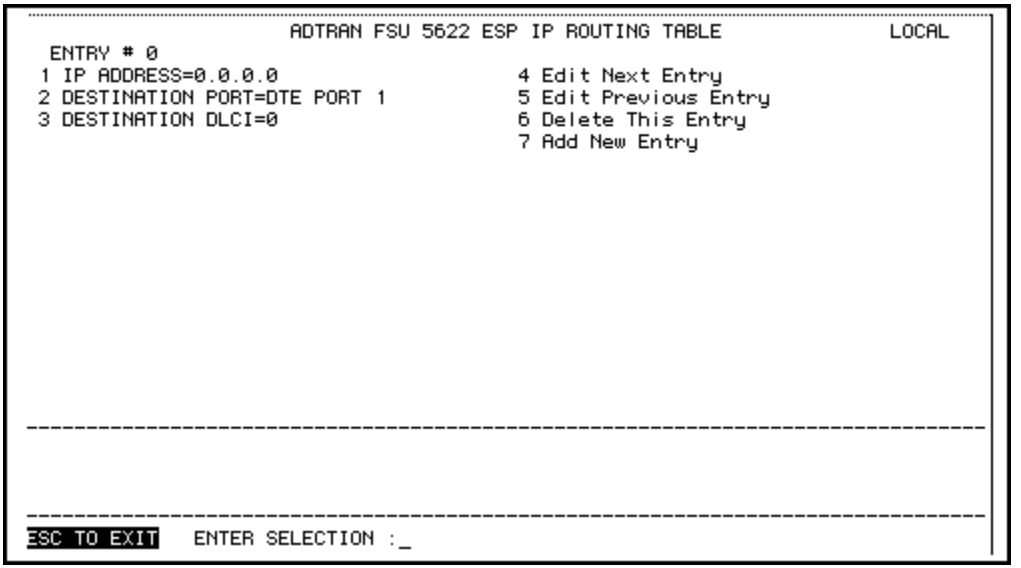


Figure 10-2
IP Routing Table Menu

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 FSU 5622 ESP 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 FSU 5622 ESP 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 Packets (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.

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

Chapter 11
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 Figures 5-2 (*Front Panel Configuration Menu Tree*) and 5-3 (*VT 100 Configuration Menu Tree*). The VT 100 System Configuration menu is shown in Figure 11-1.

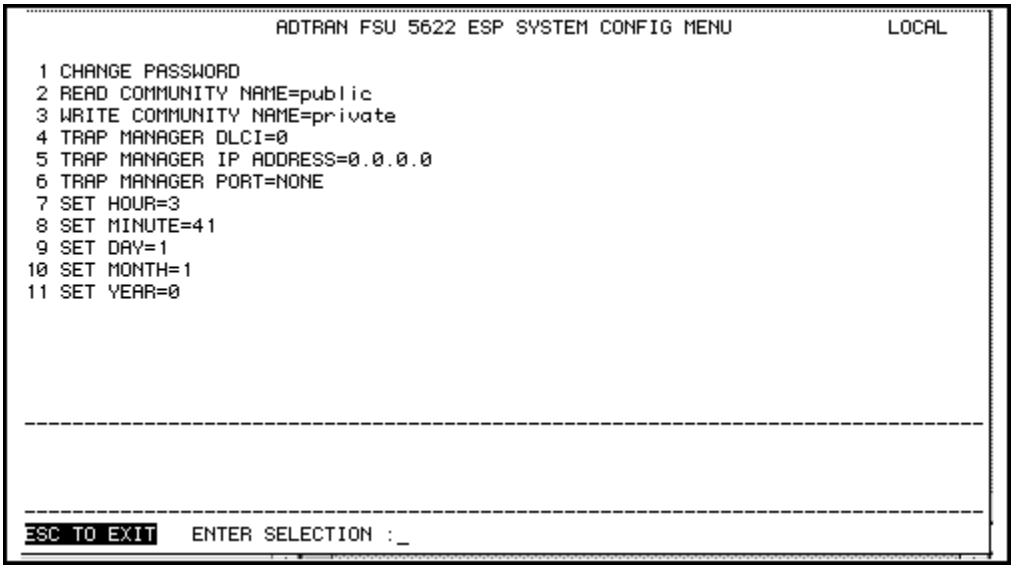


Figure 11-1
System Configuration Menu

Change Password

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

Read Community Name (RD COM NAME)

Enter the authentication strings used for SNMP management. Match the FSU 5622 ESP to the SNMP manager for read privileges.

Write Community Name (WR COM NAME)

Enter the authentication strings used for SNMP management. Match the FSU 5622 ESP 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 FSU 5622 ESP.

Trap Manager IP Address (TRAP IP ADDR)

Enter the IP address of the SNMP manager to which the FSU 5622 ESP sends traps.

Trap Manager Port (TRAP PRT)

Enter the FSU 5622 ESP port number used to transmit traps to the SNMP manager.

Time and Date

Enter time / date information. View this information in the System Status menu.

Chapter 12
Status

For descriptions of the VT 100 status menus see the following section, *Viewing Statistical Information (VT 100 Interface)*. For front panel menu descriptions, see the section *Viewing Statistical Information (Front Panel Interface)*.

VIEWING STATUS INFORMATION (VT 100 INTERFACE)

Select View Status from the Main menu to access the View Status Menu shown in Figure 12-1. From this menu, select to view port (DTE or Network), protocol, or system status. Select Reset Status to clear all current information.

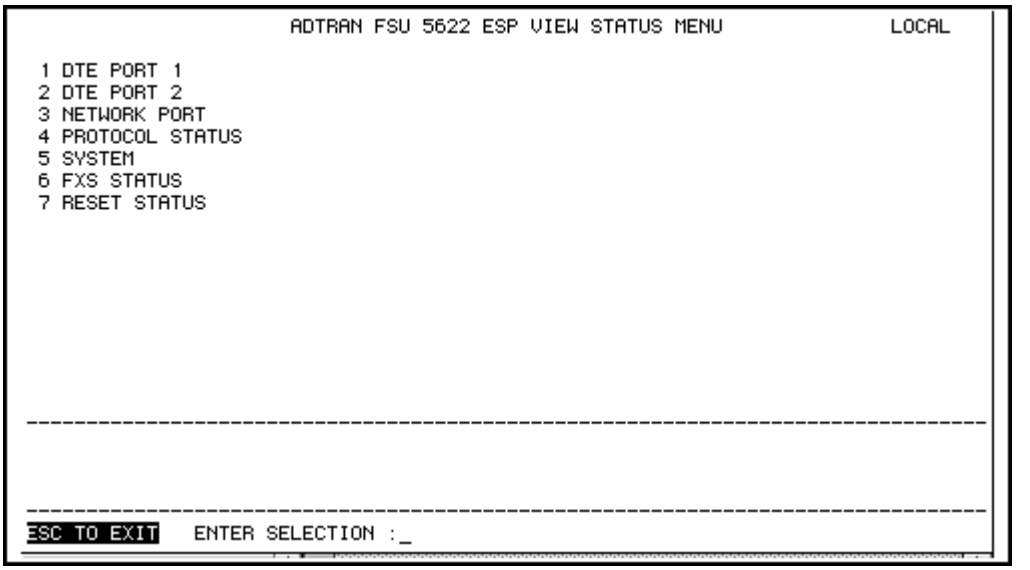


Figure 12-1
View Status Menu

DTE and Network Port Status

The following sections describe the information given on the DTE port and Network port status menus. See Figures 12-2 through 12-5.

Current Status

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

Leads On

If a lead has become active on the selected port since the last screen refresh, it is listed in the View Status menu. See Figure 12-3.

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 port 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 FSU 5622 ESP.
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 Status

This status information applies when the DTE port is configured for frame relay protocol or when viewing network status information.

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

```
 CURRENT                    ADTRAN FSU 5622 ESP VIEW STATUS                  LOCAL

DTE PORT 1         Leads On  -->  CTS  DSR  DCD

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

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


    Tx Signal Frm>         0                Rx Signal Frm>         0
    Sig Frm Err ->         0                Sig Timeouts >         1
    Sig State --->        UP


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

Figure 12-2
DTE Port Status Menu-Frame Relay Protocol

```
 CURRENT                    ADTRAN FSU 5622 ESP VIEW STATUS                  LOCAL

DTE PORT 2         Leads On  -->  CTS  DSR  DCD

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

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




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


_
```

Figure 12-3
DTE Port Status Menu-Transparent Async Protocol

```
 CURRENT                  ADTRAN FSU 5622 ESP VIEW STATUS                 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
    Inv Formats ->         0               Port Unavail >         0
    Buff Unavail >         0
    Unknown DLCI >         0               Inactive DLCI>         0



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

Figure 12-4
DTE Port Status Menu-All Other Protocols

```
 CURRENT                  ADTRAN FSU 5622 ESP VIEW STATUS                 LOCAL

NETWORK PORT
        DSU State -->  OPEN LOOP            OPEN LOOP
 TOTAL:
    Rx Frames --->         0               Rx Bytes ---->         0
    Tx Frames --->       661               Tx Bytes ---->     10576

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

 SIGNAL STATS:
    Tx Signal Frm>       661               Rx Signal Frm>         0
    Sig Frm Err ->         0               Sig Timeouts >       660
    Sig State --->      DOWN


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

Figure 12-5
Network Port View Status Menu

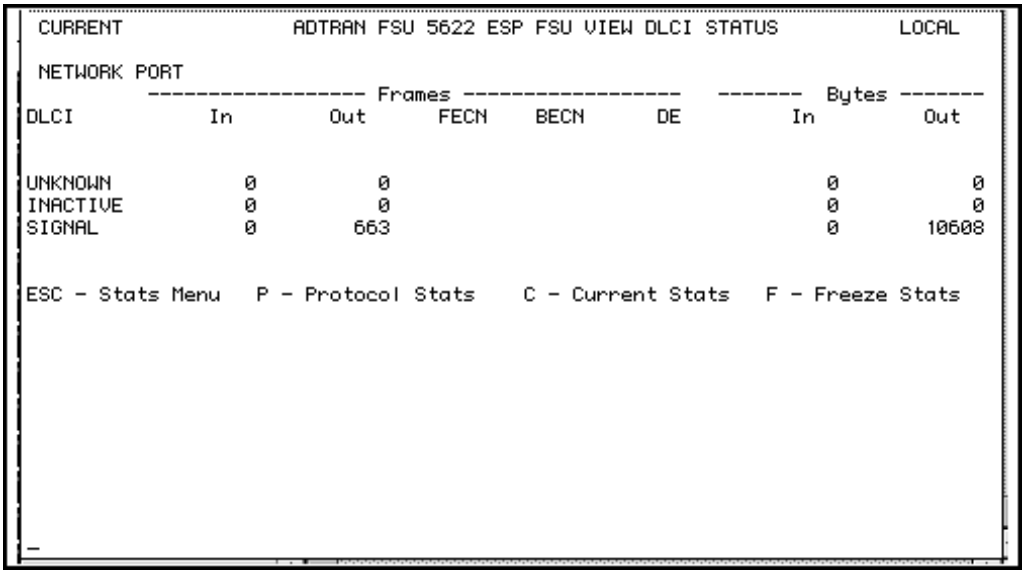


Figure 12-6
View DLCI Status Menu-Network Port and Frame Relay Protocol Only

DLCI Status

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

NOTE

DLCI information for the DTE port is only available when the frame relay protocol is enabled or when viewing network port status.

Protocol Status

This menu provides information on frames and bytes received/transmitted by the FSU 5622 ESP. The information is organized by DTE protocols. Protocols other than those included in the list

are placed in the Other Protocols section and are divided into signaling frames / bytes and frame / byte totals on the network side. See Figure 12-7.

```
CURRENT              ADTRAN FSU 5622 ESP VIEW PROTOCOL STATUS          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              668              0            10688
    Network              0              668              0            10688


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

_
```

Figure 12-7
Protocol Status Menu

System Status

Selecting System Status displays the software version and checksum. Press **ESC** to return to the Status menu.

Voice Status

Selecting FXO / FXS / E&M Status displays status information for lines one and two of the FXS, FXO, or E&M voice card (if installed). Possible states are on hook, off hook, and ringing.

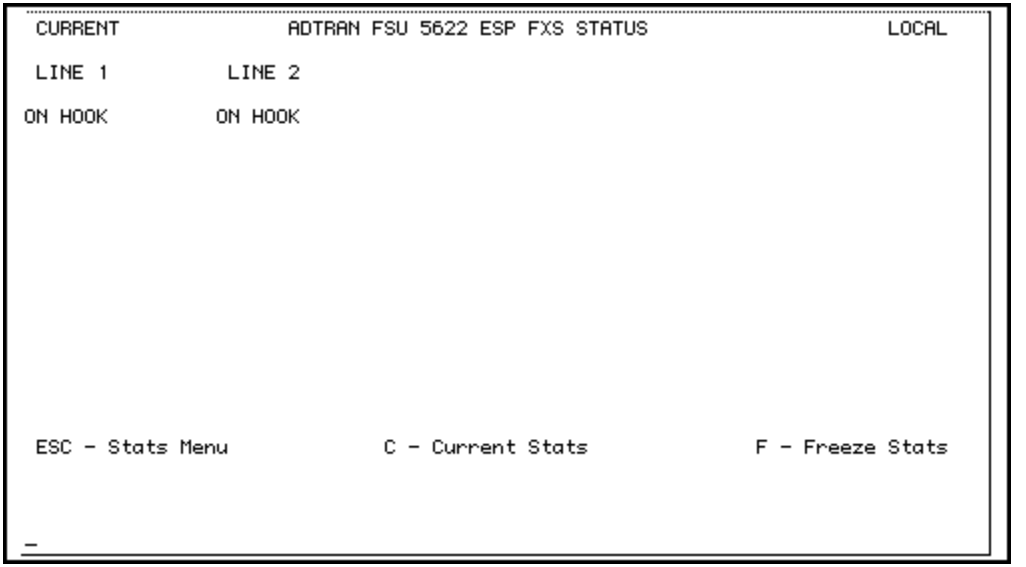


Figure 12-8
FXS Status Menu

Hot Keys

Once you have entered one of the status 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 Status menu (shown in Figure 12-1).

DLCI Status (D)
When viewing Network port status information or when configured for frame relay on the DTE Port, press **D** to view the DLCI Status menu shown in Figure 12-6.

Protocol Status (P) - DTE and Network Port Menus only
When in any Port Status menu, press **P** to view the Protocol Status menu shown in Figure 12-7.

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

Freeze Status (F)
Press the **F** key to freeze the current status information.

VIEWING STATUS INFORMATION (FRONT PANEL INTERFACE)

Select STATUS from the Main menu. From this menu, choose to view DTE 1 or 2, FXS/FXO/E&M 1 or 2, Network, or System status. The first Status 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).

Status Information Available for DTE and Network Ports

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

Control Signal Status Screen

An asterisk (*) indicates that the signal is active for the currently selected port. See Figure 12-9.

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

Figure 12-9
Front Panel Control Signal Status Screen

Frames In
Total received frames since last reset.

Frames Out
Total transmitted frames since last reset.

Errored Frames
Total errored frames received since last reset.

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

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

CRC Errors
Total occurrences of a cyclic redundancy check error since last reset. Not applicable when configured for Transparent Async protocol.

Abort Frames
Total frames aborted since last reset. Not applicable when configured for Transparent Async protocol.

Sync Frame Errors
Total synchronous frame errors received since last reset. Not applicable when configured for Transparent Async protocol.

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

Parity Errors
Frames received with parity errors (only available when Trans Async protocol is selected).

Breaks
Async break characters received (only available when Trans Async protocol is selected).

Status Information Available Only for the Network Port

The following information is available only when the Network port is selected from the Status menu.

Signal State
Current state of frame relay port (up or down). See Figure 12-10.

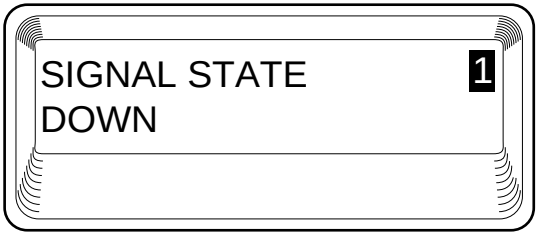


Figure 12-10
Front Panel Signal State Screen

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

Signal Errors
Total signal errors received since last reset.

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

FXS State
Current state of the voice port (On Hook, Off Hook, or Ringing).

System Status

Select SYS from the Status menu to display the software version and checksum. This screen is shown in Figure 12-11. Press the **Down Arrow** to view the current time and date. Press **Cancel** to return to the Status menu.

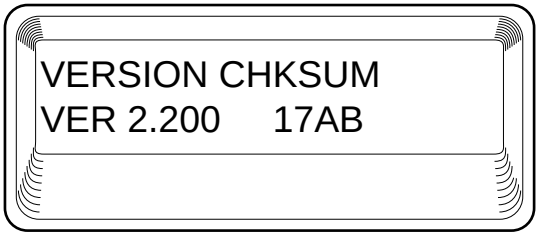


Figure 12-11
Front Panel System Status Screen

Chapter 13
Testing

TESTING

This menu allows you to send ping requests and perform voice port diagnostics. See Figure 13-1 for the VT 100 Test menu. See Figure 13-2 for the Front Panel menu tree.

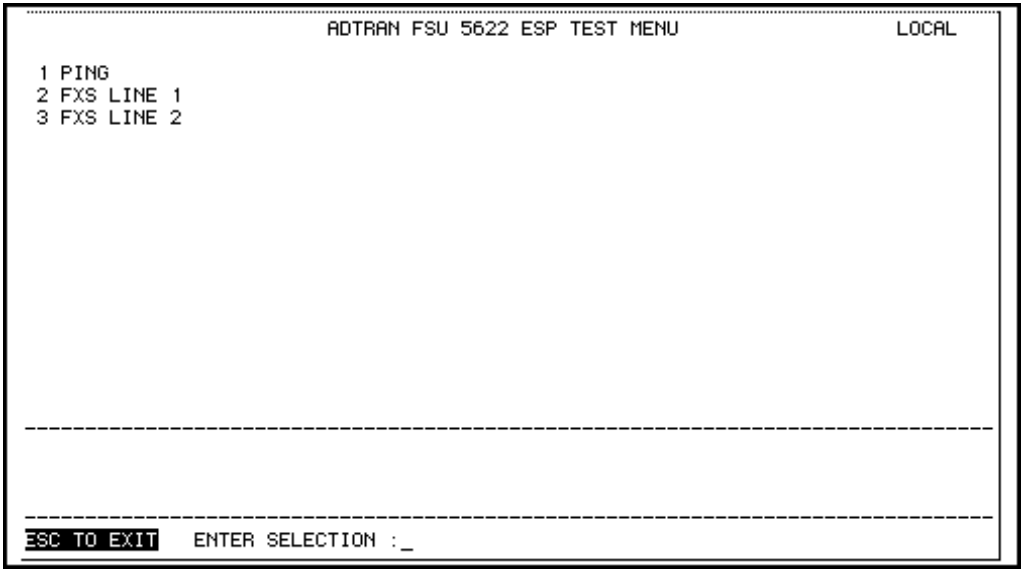


Figure 13-1
VT 100 Test Menu

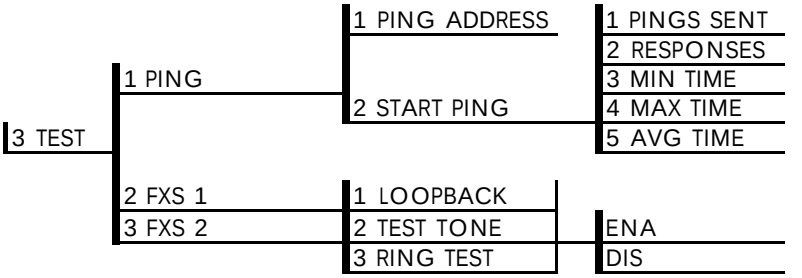


Figure 13-2
Front Panel Test Menu

Ping

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

Address to Ping (PING ADDRESS)

Enter the IP address of the unit the FSU 5622 ESP is sending an echo request (ping) to.

*If the IP address is not manually configured into the IP route table, the path will be determined dynamically through RIP and inverse ARP protocols (for more information, see the chapter **IP Routing**).*

Start Ping

Results are shown once you start the ping. The Start Ping command causes the FSU 5622 ESP 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.

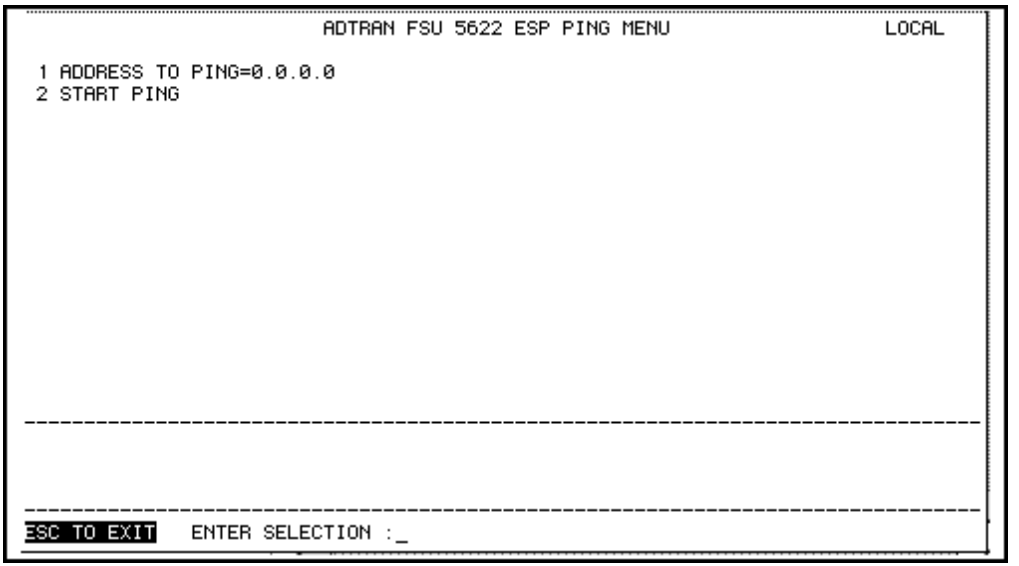


Figure 13-3
VT 100 Ping Menu

FXS/FXO/E&M Lines 1 and 2

Select FXS/FXO/E&M Line 1 or 2 to perform loopback tests , transmit a test tone, or initiate a ring test.

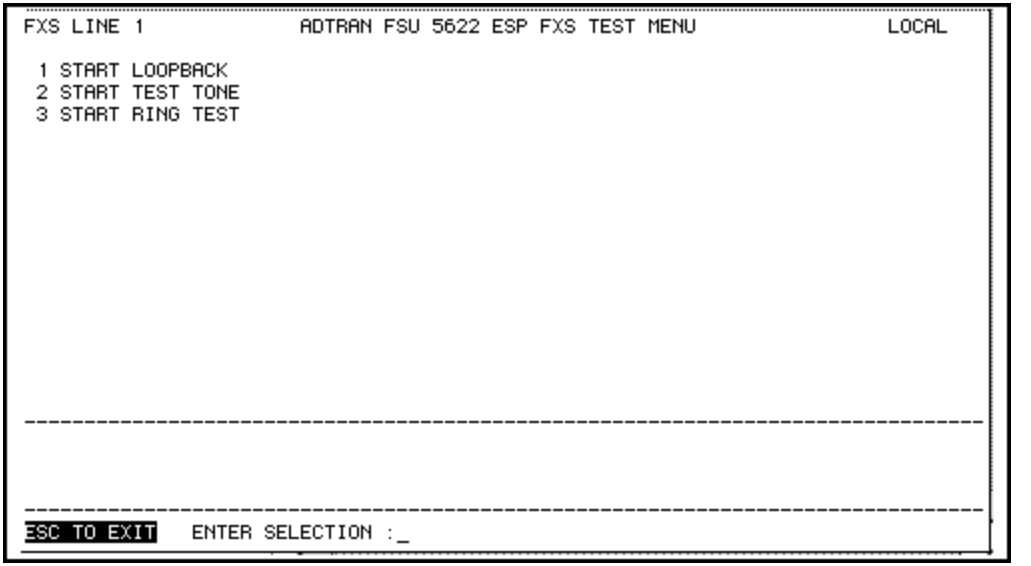


Figure 13-4
FXS Test Menu

Loopback

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

Test Tone

This command transmits a 1 KHz test tone towards the digital network.

Ring Test

This command cycles the ring generator in a standard 2Sec/4Sec pattern.

Chapter 14
Activating DBU Functions

DIAL OPTIONS

The dial options available from the Main menu (4=DBU) appear in Figure 14-1.

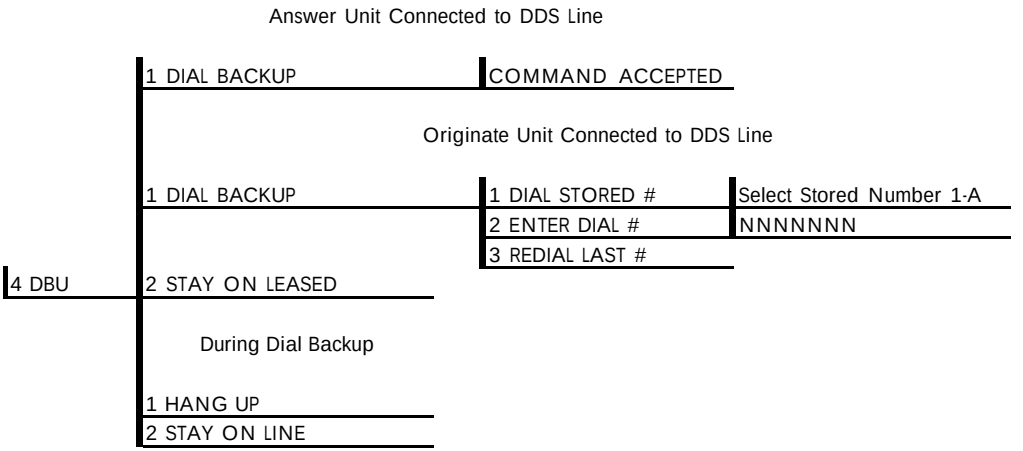


Figure 14-1
DBU Options Menu

Answer Unit Connected to DDS Line

Dial Backup

The message **COMMAND ACCEPTED** is displayed and the FSU 5622 ESP waits for an incoming call. When an incoming call is detected, the FSU 5622 ESP answers the call and enters dial backup.

Originate Unit Connected to DDS Line

Dial Backup

The FSU 5622 ESP prompts to dial a stored number or enter a number to dial for dial backup.

Stay on Leased

The FSU 5622 ESP remains on the leased line and does not enter dial backup mode.

Dial Options During Dial Backup

Hang Up

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

Stay On Line

The FSU 5622 ESP remains in dial backup mode and returns to the Status menu.

Appendix A
Pinouts

The following tables give the pin assignments for the connectors located on the back of the FSU 5622 ESP, the DBU cards, and the Voice Cards. For more information on the connectors, see the chapter *Installation*.

Table A-A
DTE Connector Pin Assignments

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

Table A-B

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-C

Control Connector Pin Assignments

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

I=Input
O=Output

Table A-D

ESP DBU Card Pin Assignments

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

Table A-E
Voice Card Connector Pin Assignments

RJ Pin #	Function
ESP Dual FXS Card	
4	Ring
5	Tip
ESP Dual FXO Card	
4	Ring
5	Tip
ESP Dual E&M Card	
1	Ring
2	Tip
3	E Lead
4	Frame Gnd
5	not used
6	M Lead
7	Tip
8	Ring

V.35 ADAPTER CABLE

The V.35 adapter cable allows the FSU 5622 ESP 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 FSU 5622 ESP.

Operating Modes

Dedicated point-to-point DDS
Frame relay utilizing DDS

Network Data Rates

Dedicated Mode Service Rates
56 and 64 kbps
ESP External DCE Card: up to 512 kbps

Dial backup
Switched 56: 56 kbps
V.34: 2.4 to 33.6 kbps
ISDN: 56 or 64 kbps

DTE Rates Provided

Synchronous rates: 2.4 to 64 kbps (achieve rates up to 512 kbps with the optional ESP external DCE card and an external DSU/CSU)
Asynchronous rates: 2.4 to 38.4 kbps

DTE Data Interfaces

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

Control Port Interface

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

SNMP

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

Voice Support

Compression

Voice compression (MP-MLQ)
4.7-16k compressed voice
MOS-3.9

FAX Support

Group III 0.3-9.6 kbps

Dual FXS

Loop Start 2-wire voice
Line current and ring voltage supplied
R.E.N. - 3
TIA 464A DTMF decode and regeneration
G.265 echo cancellation

Dual FXO

Loop start 2-wire voice

Dual E&M

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

Protocol Support

Concentrator
Frame relay

IBM Support
SNA / SDLC with local spoofing
SDLC / HDLC transparent
SDLC-LLC2 translation
Supports up to 20 SDLC PUs on each DTE port

LAN Protocol
SLIP
IP-PPP asynchronous or synchronous

Transparent
Asynchronous transparent
BOP transparent (HDLC)

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

Data Flow Control

Synchronous: clock slowing
Asynchronous: CTS or XON / XOFF

Diagnostics

CSU and DSU loopbacks
IP ping mode

Line Requirements

Loop transmission parameters as defined in
AT&T PUB 62310: Dedicated DDS
AT&T PUB 4146B: Switched 56 (DBU interface)

Line Interface

RJ-48S, 4-wire, full duplex

DBU Interfaces
Switched 56: RJ-48S
V.34: RJ-11
ISDN: RJ-11

Receiver Sensitivity

-45 dB at all rates

Agency Approvals

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

Environment

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

Physical

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

Acronyms and Abbreviations

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

FECN ..... forward explicit congestion notification
FEP ..... front end processor
FIFO ..... first in first out
FR ..... frame relay
FRAD ..... frame relay access device
FRF ..... frame relay forum
FSU ..... frame relay service unit
HDLC ..... high-speed data link control
IP ..... internet protocol
ISDN ..... integrated services digital network
ITU ..... International Telecommunications Union
KA ..... keep alive
LAN ..... local area network
LED ..... light emitting diode
LLC ..... logical link control
LMI ..... local management interface
LRC ..... lateral redundancy check
MIB ..... management information base
ms ..... millisecond
NRZ ..... non-return to zero
NRZI ..... non-return to zero inverted
OCU ..... office channel unit
OOS ..... out of service
PLAR ..... private line automatic ringdown
PPP ..... point to point protocol
PU ..... physical unit
PVC ..... permanent virtual circuit
RD ..... receive data
RDL ..... remote digital loopback
RFC ..... request for comments
RFECN ..... remote forward explicit congestion notification
RIP ..... routing information protocol
RMA ..... return material authorization
RR ..... receiver ready
RS ..... recommended standard
RTS ..... request to send
Rx ..... receive
SAP ..... service access point
SDLC ..... synchronous data link control
SLIP ..... serial line internet protocol

SNA ..... systems network architecture
SNMP ..... simple network management protocol
SNRM ..... set normal response mode
SR ..... data set ready
SVC ..... switched virtual circuit
SW56 ..... switched 56
sync ..... synchronous
TD ..... transmit data
TR ..... data terminal ready
Tx ..... transmit
UNI ..... user-to-network interface
VRC ..... vertical redundancy check
WAN ..... wide area network
XID ..... exchange identification
XMIT ..... transmit

Glossary

4-wire Switched 56

An AT&T proprietary 56/64 kbps switched digital data service offered by telco service providers and delivered to users over 4 copper wires. Compatible with the FSU 5622 ESP 4-wire Switched 56 DBU option.

American National Standards Institute (ANSI)

Devices and proposes recommendations for international communications standards.

asynchronous

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

backward explicit congestion notification (BECN)

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

bandwidth

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

bridge

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

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

CCITT

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

CD

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

channel service unit

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

clocking

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

CPE

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

CRC

Cyclic redundancy check. A computational means to ensure the accuracy of frames transmitted between devices in a frame relay network. The mathematical

function is computed, before the frame is transmitted, at the originating device. Its numerical value is computed based on the content of the frame. This value is compared with a recomputed value of the function at the destination device. See also frame check sequence (FCS).

CS

See CTS.

CSU

See *Channel Service Unit*.

CTS

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

data service unit

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

data communications equipment (DCE)

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

data link connection identifier (DLCI)

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

dB

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

DDS

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

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

DSU
See *Data Service Unit*.

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

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

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

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

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

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

forward explicit congestion notification (FECN)

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

frame check sequence (FCS)

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

frame-relay-capable interface device

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

frame relay frame

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

frame relay network

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

high level data link control (HDLC)

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

hop

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

host computer

The primary or controlling computer in a multiple computer operation.

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

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

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

ISDN
Integrated Services Digital Network. A network architecture that enables end-to-end digital connections. The network supports diverse services through integrated access arrangements and defines a limited set of standard, multipurpose interfaces for equipment vendors, network providers, and customers. Interworking with a public switched telephone network is retained.

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

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

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

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

parameter

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

permanent virtual circuit (PVC)

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

ping

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

point-to-point

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

RDL

Remote digital loopback.

remote configuration

A feature designed into ADTRAN DSU/CSU products that allow remote DSU/CSU to be configured from a local DSU/CSU or VT100 compatible terminal.

router

A device that supports LAN-to-LAN communications. Routers may be equipped to provide frame relay support to the LAN devices they serve. A frame-relay-capable router encapsulates LAN frames in a frame relay frames and feeds those frame relay frames to a frame relay switch for transmission across the network. A frame-relay-capable router also receives frame relay frames from the network, strips the frame relay frame off each frame to produce the original LAN frame, and passes the LAN frame on to the end device. Routers connect multiple LAN

segments to each other or to a WAN. Routers route traffic on the Level 3 LAN protocol (e.g., the internet protocol address). See also *bridge*.

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

SNMP
Simple Network Management Protocol. A control and reporting scheme widely used to manage devices from different vendors. SNMP operates on top of the Internet protocol.

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

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

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

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

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

T1

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

trunk line

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

VT 100

A non-intelligent terminal or terminal emulation mode used for asynchronous communications. Used to configure the FSU 5622 ESP.

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Product Support Information

Pre-Sale 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 Return Material Authorization (RMA) department to issue an RMA number. For information regarding equipment currently in house or possible fees associated with repair, contact RMA directly at the following number:

RMA Department	(205) 963-8722

Identify the RMA number clearly on the package, and return to the following address:

ADTRAN, Inc.
RMA Department
901 Explorer Boulevard
Huntsville, Alabama 35806-2807