ATLAS Frame Relay
User Manual

Part Number 1200263L1-1

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Chapter 1 Introducing ATLAS Frame Relay

FRAME RELAY OVERVIEW

Frame relay is a packet-switched service that allows efficient transfer of bursty traffic in a wide area network (WAN) environment (see also *Frame Relay* on page 2-3). It offers lower-cost data transfer, when compared to typical point-to-point applications, by using virtual connections within the frame relay network and by combining those connections into a single physical connection at each location. Frame relay providers use a frame relay switch to route the data on each virtual circuit to the appropriate destination.

Figure 1-1 and Figure 1-2 illustrate a conversion from a typical point-to-point application to a frame relay application.

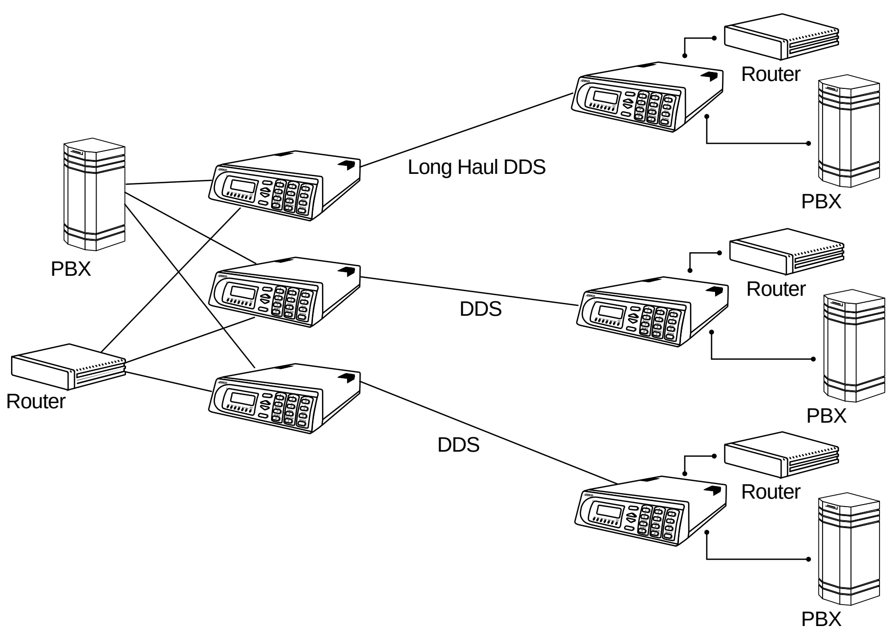


Figure 1-1. Typical Point-to-Point Circuit

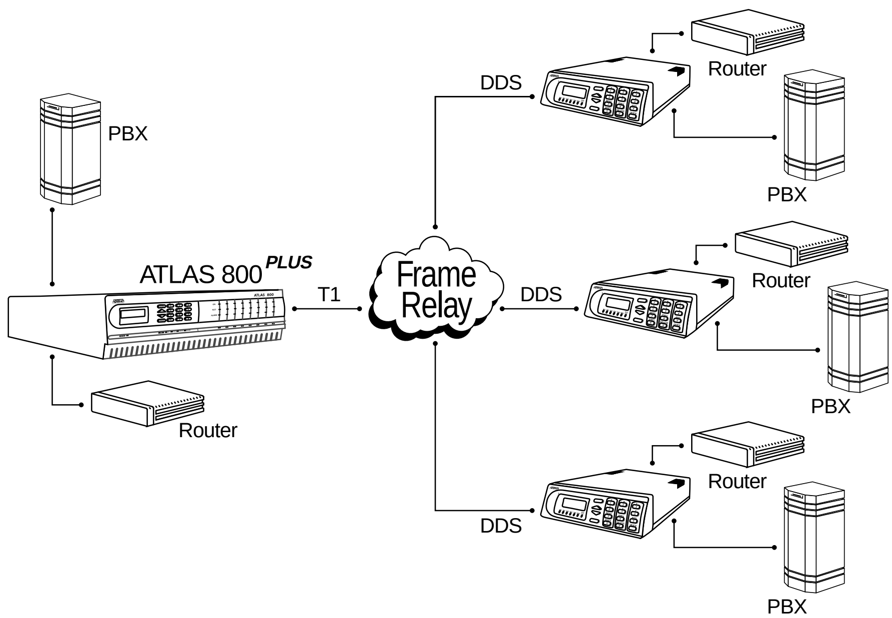


Figure 1-2. Frame Relay Circuit

The ATLAS Frame Relay / Router option allows the ATLAS series of Integrated Access Devices to act as a voice / data frame relay access device (FRAD), a private network frame relay switch, a frame relay concentrator, and an internal IP router. In addition, the ATLAS Frame Relay / Router option manages currently available bandwidth and switching applications.

FRAME RELAY FEATURES

The Frame Relay / Router option provides the following functions:

- Routes Internet Protocol (IP) traffic between a public or private frame relay network and the integral 10BaseT Ethernet port.
- Concentrates IP traffic from a public or private frame relay network to one or more serial ports (V.35). The protocol passed over the serial port is frame relay.
- Passes Systems Network Architecture (SNA), Bisync, and other legacy protocols between a public or private frame relay network and an external DTE running frame relay to ATLAS. (May require the HDLC Module—P / N 1200222L1.)
- Performs voice compression / decompression (G.723.1) and interfaces to either a Private Branch Exchange (PBX) or the Public Switched Telephone Network (PSTN). (This feature requires an additional option module, the VCOM Module—P / N 1200221L1.)

SPECIFICATIONS

Table 1-1 lists the specifications for the frame relay features.

Table 1-1. Frame Relay Specifications

Option	Feature	Specification
Frame Relay		
	Packet throughput	7000 pkts/sec (minimum)
	Management signaling interfaces	UNI (user and network) NNI
	Management signaling types	ANSI T1.617-D (Annex D) ITU-T Q.933-A (Annex A) LMI (Group of four) Auto
	Encapsulation	RFC 1490 for IP and LLC2
	PVC support	1000 PVCs
	Congestion control	FECN / BECN Discard eligible (DE)
	Quality of service (QOS)	Prioritization on a per-PVC basis
	Testing (ADTRAN proprietary)	PVC loopback Round trip delay measurement
	SNMP support	RFC 1315
IP Routing		
	Route discovery	RIP V1 RIP V2 ICMP ARP IARP UDP Relay OSPF
	Virtual connections supported	100 PVCs
	SNMP support	MIB II
Voice Compression		
	Algorithm	G.723.1 or Netcoder (proprietary)
	Number of channels supported	Up to 64 compression channels
	PCM coding	MU-Law, A-Law (future)
	Fax support	9600 bps
	DTMF generation and detection	TIA 464A

Chapter 2 Technology Overview

This chapter discusses the OSI Model, Frame Relay Protocol, and Transparent Bit Oriented Protocol (TBOP).

OSI MODEL

The Open Systems Interconnection (OSI) model is an internationally accepted standard for communication between multiple vendors' communication equipment. It relies on a seven-layer model to allow communication between communication equipment. Table 2-1 describes these layers.

Table 2-1. Seven-Layer OSI Model

Layer	Title	Description
Layer 7	Application	Contains functions for end-user services. These include FTP, remote file access, and network management. This is not the application, but the interface.
Layer 6	Presentation	Provides transparent communication by creating code and syntax compatibility between systems.
Layer 5	Session	Takes care of the communication facility provided by the transport layer (layer 4). Allows sessions to be established, recovered, and terminated.
Layer 4	Transport	Provides some error correction and end-to-end flow control. Also decides best route for the information being transmitted.
Layer 3	Network	Determines the method for transmitting data and also deals with routing the data between networks. Moves data based on addressing.
Layer 2	Data Link	Deals with procedures and protocols for controlling the transmission line. Provides some error detection and correction.
Layer 1	Physical	Deals with the electrical, mechanical, and functional control of sending data over the transmission lines.

By defining standard interfaces between each of the seven layers, an individual layer only has to know about the interface to the layer above, to the layer below, and to the same layer on the other end of the network. This interface definition simplifies the process of networking.

The Router and Frame Relay software in ATLAS involves layer 3 and layer 2 data processing. The OSI model is not limited to digital data networks, but can be extended to such networks as the U.S. Postal Service. The examples below should clarify the roles of the first three layers and how they interface with each other. Example 1 relates the OSI model to the process of mailing a letter.

Example 1: OSI Model Related to Process of Mailing a Letter

Upper Layers		Letters and Advertisements
Layer 3	Network	Envelopes and Boxes
Layer 2	Data Link	Mailbags
Layer 1	Physical	Planes and Trucks

Send Process		Receive Process
Person A writes a letter.	Upper Layers	Person B reads the letter.
Person A places the letter in an envelope, addresses it to person B, and puts envelope in mailbox.	Layer 3	Person B opens envelope and removes the letter.
The envelope is collected from mailbox and placed into a mailbag destined for post office B.	Layer 2	The mailbag is opened and the envelope is placed in person B’s post office box.
A truck takes the mailbag and drives to post office B.	Layer 1 Roads and Interstates	The truck delivers the mailbag to post office B.

Since the postal service specifies how mail is transferred between layers, the person addressing the letter only needs to know the address of the person receiving the letter to pass the letter down to the next layer. The letter writer has no knowledge of the details of mailbags and moving letters between post offices, but knows to place the letter in the mailbox so that the post office delivers the letter to the reader. The lower layers have no knowledge of the letter, but take responsibility for getting it to the appropriate location.

Example 2: OSI Model Related to Process of Moving Data Packet

A more typical example of the OSI model involves moving a data packet across an IP network.

Upper Layers	E-mail message
Layer 3	Network - IP/IPX
Layer 2	Data Link - Frame Relay/PPP
Layer 1	Physical - T1/DDS

Send Process		Receive Process
Creates a data packet.	Upper Layers	Data packet is processed.
Wraps the data in an IP packet, specifies the IP address of the far end computer, and determines the appropriate route.	Layer 3	The IP wrapper is removed and the data is then passed to the upper layers.
The IP packet is placed inside a frame relay packet with the appropriate DLCI and placed on the correct DS-1.	Layer 2	The frame packet is unwrapped and the IP packet is sent to layer 3.
The frame relay packet is placed in the appropriate DS0s.	Layer 1 LEC and IXC	The frame relay packet is removed and passed to layer 2.

FRAME RELAY

Frame relay is one of several layer 2 (data link) protocols that transport data across a serial data network. These protocols also include Point-to-Point Protocol (PPP) and High-level Data Link Connection Protocol (HDLC). Frame relay networks are composed of virtual circuits that connect customer locations. To reduce a customer's overall monthly connection, multiple virtual circuits could be delivered to the customer's location over a single physical connection.

Virtual Circuits

Virtual circuits can be either permanent (PVC) or switched (SVC). PVC bandwidths are determined when the circuit is ordered from the frame relay provider. PVCs are always active, even when no data is being transmitted. SVC bandwidths are created and used only when needed and allow for negotiation of the bandwidth parameters during the circuit setup. SVCs are currently unavailable from most frame relay providers, and ATLAS only supports PVCs.

PVC Physical Connections

Figure 2-1 illustrates three PVCs being delivered over one physical circuit. The frame relay switch within the frame relay provider’s circuit makes a physical connection for each PVC. Each of the PVCs could connect to a different physical location at the other end of the circuit. Figure 2-2 illustrates a frame relay network topology.

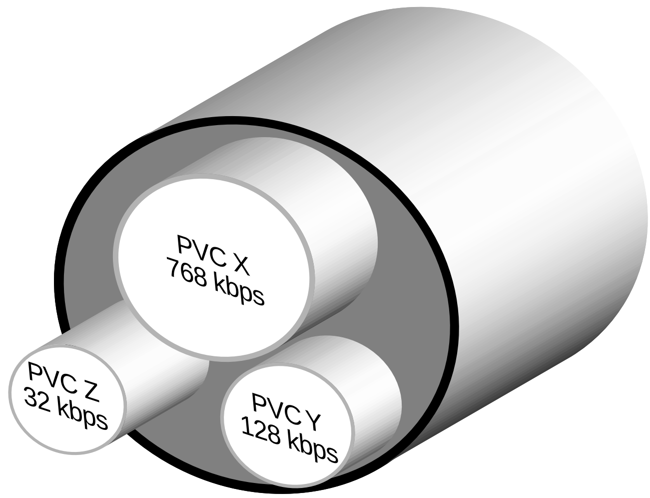


Figure 2-1. Three Virtual Circuits in One Physical Circuit

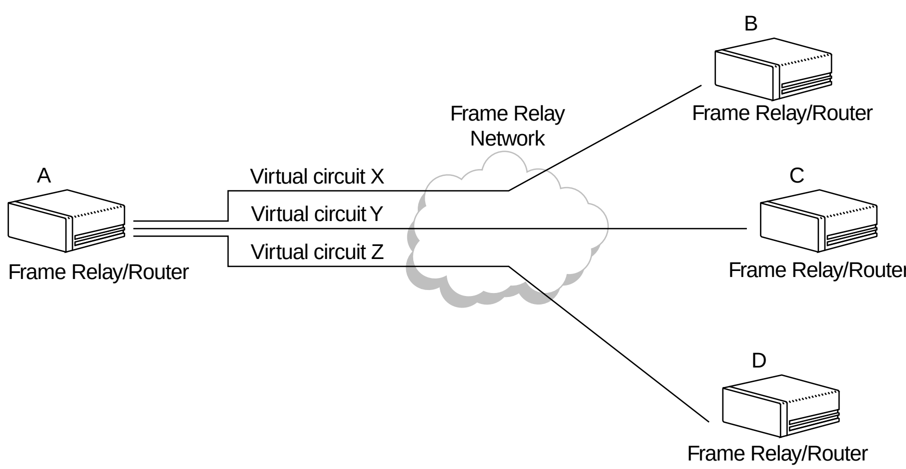


Figure 2-2. Frame Relay Network using Virtual Circuits

Data Link Connection Identifier (DLCI)

An address called a Data Link Connection Identifier (DLCI) uniquely identifies each of the virtual circuits in the frame relay network. A DLCI does not address the equipment at the far end of the virtual circuit, but addresses the next piece of frame relay equipment within the network. The next piece of frame relay equipment now becomes responsible for transporting all frames from the incoming port to the appropriate outgoing port.

Figure 2-3 illustrates a network using DLCI assignments. In this example, the router at site A sends a frame packet to site B, by placing the data on DLCI 100. Knowing that all packets coming in DLCI 100 must go out DLCI 225, Frame Relay Switch A places the packets on DLCI 225 and sends them out to Frame Relay Switch B. Frame Relay Switch B then takes the frame packets from DLCI 225 and places them on DLCI 35 for delivery to the site B router. From this example, you can see that each piece of frame relay equipment only knows about the DLCIs local to it. Hence, you will hear "DLCIs only have local significance."

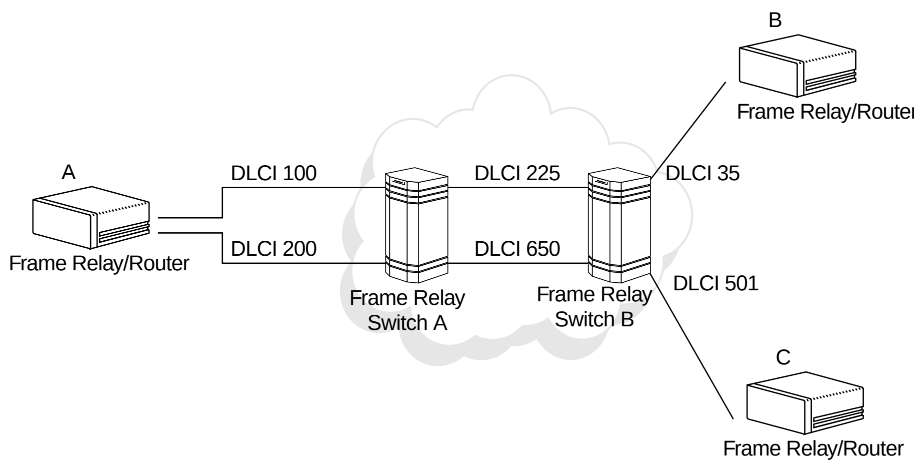


Figure 2-3. Network Using DLCI Assignments

User-to-Network Interface

The interface between the customer and the frame relay switch is called the User-to-Network Interface (UNI). Three different types of signaling can transmit across this interface: LMI (Group of Four), Annex A (ITU-T Q.933-A), and Annex D (ANSI T1.617-D). Unfortunately, due to signaling differences among the three types, they are incompatible with one another, and DLCI assignments vary among the three types. Tables 2-2 and 2-3 give the assignments for the three types.

Local Management Interface (LMI)

LMI is the standard published by the Frame Relay Consortium in 1990 to create a defined interface on the UNI. The Consortium, composed of Cisco Systems, DEC, Nortel, and StrataCom, is commonly referred to as the Group of Four.

Table 2-2. LMI (Group of Four) DLCI Assignments

DLCI	Use
0	Call control signaling channel.
1-15	Reserved for future use.
16-1007	Available for customer data.
1008-1022	Reserved for future use.
1023	LMI channel.

Annex A and Annex D

The International Telecommunications Union Telecommunication Standardization Sector (ITU-T) adopted Annex A as the interface standard for international frame relay applications. The American National Standards Institute (ANSI) modified the Frame Relay Consortium's interface specification and ratified it as Annex D—an interface standard for the United States.

Table 2-3. Annex A and Annex D DLCI Assignments

DLCI	Use
0	Carries frame relay signaling (LMI channel).
1-15	Reserved for future use.
16-991	Available for customer data.
992-1007	Management DLCIs for layer 2.
1008-1022	Reserved for future use.
1023	Higher layer protocol communication channel.

Committed Information Rate (CIR)

Customers can order a circuit with a guaranteed amount of bandwidth for their virtual connections. This amount is called the Committed Information Rate (CIR), and it defines how much bandwidth the customer is guaranteed during normal network operation. Any data transmitted above this purchased rate is discard eligible (DE) by the network. That is, this data can be discarded in the event of network congestion.

The CIR can be thought of as the size of the virtual connection from end to end. The CIR can be purchased in different increments up to the wire speed of the slowest link. For example, if the circuit in Figure 2-3 had T1 access from site A to the frame relay network and a 56-kbps DDS line from site B to the frame relay network, the largest CIR available for purchase would be

56k. Although data could burst from site A to the frame relay network at the full T1 speed of 1.536 Mbps, it would queue up in the frame relay network until it could be sent across the 56-kbps DDS circuit. This queue could cause network congestion.

Managing Network Congestion

If congestion becomes a problem within the network due to excessive data being delivered from one of the sites, the frame relay switch attempts to flow control the data by sending bits that notify network devices that transmissions in the opposite direction are congested. These bits are called Backward Explicit Congestion Notification (BECN) and Forward Explicit Congestion Notification (FECN).

For example, if a frame relay switch begins to experience congestion, it sends the upstream site a FECN and the downstream site a BECN. This notification indicates to the frame relay equipment that the frame relay switch is experiencing difficulty and that the frame relay device should begin to flow control its traffic.

Figure 2-4 shows an example of FECN and BECN messages being transmitted to the frame relay equipment when congestion occurs. Both ends are notified that congestion is occurring within the switch. You might wonder why the receiving end should receive notification of congestion and then flow control its data when the other end is causing the problem by sending large amounts of data. Flow control is used by the receiving end so that upper layer acknowledgments from the destination slow down, thereby reducing the amount of data being transmitted from the source.

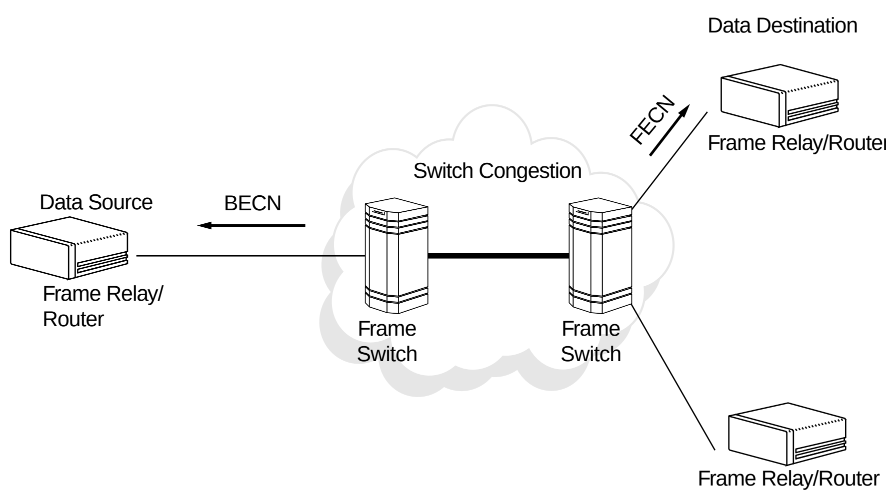


Figure 2-4. Network Congestion and Flow Control

> **NOTE** *This overview is not intended to be all inclusive of the operation of a frame relay network. It is intended to help simplify the frame relay configuration within ATLAS.*

TBOP

Transparent Bit Oriented Protocol (TBOP) is an ADTRAN-proprietary protocol that is used to transmit HDLC-formatted traffic across the frame relay network. TBOP allows the transportation of protocols “unknown” to ATLAS to be encapsulated in frame relay and sent to a remote location via frame relay. This protocol can be useful in transporting other vendors’ proprietary protocols across the WAN.

ATLAS accepts HDLC-formatted data on one of the V.35 or T1 ports and forwards that data across a frame relay network to another ATLAS or an ADTRAN frame relay device (for instance, if ATLAS is communicating with an IQ product).

PPP

The Point-to-Point Protocol, PPP, is the Internet standard for the transmission of IP packets over serial lines. PPP is not confined to serial links though; it runs on async or sync lines. PPP is also a multi-protocol transport mechanism. This means that PPP transports several different types of other protocols: IP, IPX, Appletalk, Bridged Ethernet, etc. All of these protocols can be transported at the same time. There are various compression protocols to increase the transmission rate of the link. The ATLAS only supports the IP protocol over dedicated links. As per RFC 1661, PPP comprises three main components:

1. A method for encapsulating multi-protocol datagrams.
2. A Link Control Protocol (LCP) for establishing, configuring, and testing the data-link connection.
3. A family of Network Control Protocols (NCPs) for establishing and configuring different network-layer protocols (such as IP).

Link Control Protocol

To be portable to a wide variety of environments, PPP provides an LCP. The LCP is used to automatically agree upon the encapsulation format options, handle varying limits on sizes of packets, detect a looped-back link and other common misconfiguration errors, and terminate the link. Other optional facilities provided are authentication of the identity of its peer on the link, and determination of when a link is functioning properly and when it is failing.

Network Control Protocols

Point-to-Point links tend to exacerbate many problems with the current family of network protocols. For instance, assignment and management of IP addresses, which is a problem even in LAN environments, is especially difficult over circuit-switched point-to-point links (such as dial-up modem servers). These problems are handled by a family of NCPs, and each manage the specific needs required by their respective network-layer protocols.

Chapter 3

Enabling Frame Relay

The Frame Relay upgrade for the ATLAS 800^{PLUS} includes the following:

- ATLAS Software Activation Request Fax Form
- ATLAS Frame Relay User Manual
- Alphanumeric temporary license key

The temporary license key enables the Frame Relay software for 30 continuous days of operation. Within this 30-day period, you must fax the registration sheet to ADTRAN with the upgraded unit's serial number. A unique, permanent software key for the upgraded ATLAS is then faxed back to you.

NOTE

If a permanent license key is not installed within 30 days, the Frame Relay portion of ATLAS will cease operation.

CAUTION

If a temporary license key expires before the permanent license key is installed, the system will reboot and all frame relay configuration will be lost.

INSTALLING THE TEMPORARY LICENSE KEY

Instructions for Installing the Temporary License Key	
Step	**Action**
1	Select **SYSTEM CONFIG** from the ATLAS main menu.
2	Select **LICENSES** from **SYSTEM CONFIG**.
3	Select **FRAME RELAY**.
4	Under **LICENSE CODE**, enter **FRAME RELAY** to enable the temporary license for 30 days.
5	Enter the serial number on the registration sheet into the **SERIAL NUMBER** field.

> NOTE: *After installing the temporary license key, you must reboot the system to enable Frame Relay. ATLAS will automatically prompt for a reboot when a Frame Relay license key is installed.*

OBTAINING THE PERMANENT LICENSE KEY

To obtain a permanent license key, complete the Fax Form and fax it to ADTRAN at (256) 963-8030.

Instructions for Completing the Fax Form	
Step	**Action**
1	Telnet[a] to your ATLAS unit and locate the following information from **SYSTEM INFO**: **SERIAL NUMBER**: Enter into the field *System Serial Number*. **FIRMWARE REVISION**: Enter into the field *ATLAS Chassis Software Revision*.
2	Find the product number located on the outside of the unit, and enter it into the field *ATLAS Chassis Part Number.*
3	***Optional:*** Fill in *Application Used (Optional)*. This field provides information to ADTRAN about how you are using the ATLAS 800*PLUS*.

a. A Telnet utility is provided on the ADTRAN Utilities diskettes that come with the ATLAS 800PLUS unit. See the *ATLAS User Manual* for instructions.

INSTALLING THE PERMANENT LICENSE KEY

Instructions for Installing the Permanent License Key

Step	Action
1	Select **SYSTEM CONFIG** from the ATLAS main menu.
2	Select **LICENSES** from **SYSTEM CONFIG**.
3	Select **FRAME RELAY.**
4	Enter the license key faxed from ADTRAN into the **LICENSE CODE** field.
5	Enter the serial number faxed from ADTRAN into the **SERIAL NUMBER** field.
6	Continuously press the left arrow key until you see a message asking to confirm the change. Enter **Y**.
7	End the Telnet session and reconnect to the unit. The **STATUS** field under **SYSTEM CONFIG/LICENSES** now reads **PERMANENT**.

NOTE

If the frame relay feature was not previously enabled, the system will automatically reboot to enable the new feature.

CAUTION

If a temporary key expires before the permanent key is installed, the system will automatically reboot, and all frame relay configuration will be lost.

Chapter 4 Defining Packet Endpoints

OVERVIEW

A packet endpoint is a virtual port within ATLAS into which a specified physical port (a T1 or an Nx56 / 64) terminates its data for further routing by the system. All packet services, including frame relay or PPP, must have defined packet endpoints. The **PACKET MANAGER** menu contains submenus used to define packet endpoints.

Your frame relay provider furnishes specific information on defining the packet endpoint. This information includes signaling type (Annex A, Annex D, or LMI) and definitions for all active PVCs. The **PACKET CNCTS** submenu map connects protocols from packet endpoint to packet endpoint.

For PPP, the only information needed is IP address and user name / password.

In addition to defining packet endpoints, you must also configure the physical port before it can run frame relay (see Chapter 5).

For a detailed look at configuring frame relay connections, refer to Chapter 6, Frame Relay Configuration Examples.

PASSWORDS

You must have the appropriate password level to edit items using the terminal menu. Security level 1 users can view and edit every available field. Security level 5 users can view any field, but they cannot edit. (See the section *Access Passwords* in the *ATLAS 800^PLUS User Manual* for detailed information on working with passwords.)

NAVIGATING THE TERMINAL MENUS

ATLAS uses hierarchical menus to access all of its features. All menus display in the terminal window. The top-most menu level (in this case, the **PACKET MANAGER**) leads to submenus (**PACKET ENDPNTS**, **PACKET CNCTS**, **CNCTS SORT**, and **FRAME RELAY IQ**) which are grouped by functionality. Refer to the *ATLAS 800^PLUS User Manual* for detailed instructions on how to navigate through the terminal menu.

THE PACKET MANAGER MENU

The **PACKET MANAGER** submenus (see Figure 4-1) define and configure all layer 2 connections, including frame relay endpoints. These submenus, discussed in this chapter, include **PACKET ENDPNTS**, **PACKET CNCTS**, and **CNCTS SORT**. The **FRAME RELAY IQ** submenu provides frame relay statistics and is discussed separately in Chapter 6.

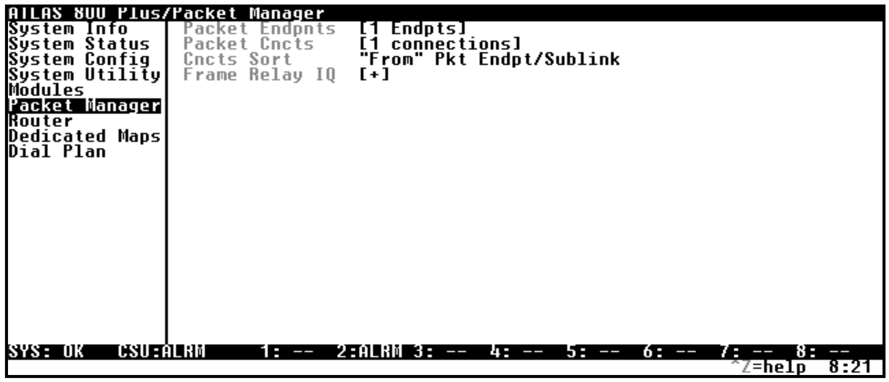


Figure 4-1. Packet Manager Menu

PACKET ENDPNTS

The **PACKET ENDPNTS** menu defines, monitors, and tests a packet endpoint. Submenus include **STATUS**, **PERFORMANCE**, **CONFIG**, **TEST**, **ENDPNT COUNT**, and **ENDPNTS SORT**.

STATUS

STATUS submenus display the status of each packet endpoint including the packet endpoint name (**ENDPNT NAME**), the protocol type (**PROT**), the signaling role (**SIG ROLE**), the signaling type (**SIG TYPE**), the signaling activity (**ACTIVE**), and the connections (**CURRENT PORT**). The following sections discuss each of these fields. Figure 4-2 shows the **STATUS** menu tree.

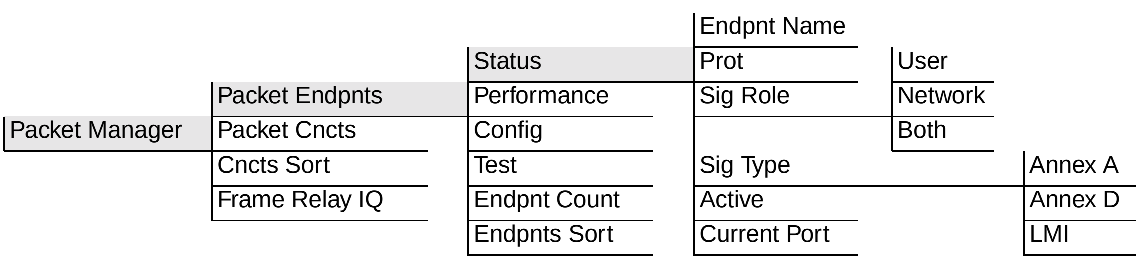


Figure 4-2. Status Menu Tree

ENDPNT NAME

Read Security: 5
Displays the packet endpoint name as defined in the **PACKET ENDPNTS/CONFIG MENU** (also see *Config* on page 4-9).

PROT

Read Security: 5
Displays the layer 2 protocol that this packet endpoint terminates. **FR** indicates that this packet endpoint is configured for frame relay. **TBOP** indicates that this packet endpoint is configured for Transparent Bit Oriented Protocol (TBOP). **PPP** indicates this packet endpoint is configured for the Point-to-Point Protocol.

SIG ROLE

Read Security: 5
Displays the frame relay signaling role for this packet endpoint. The following options indicate the signaling role this packet endpoint is performing. *These settings are not applicable for PPP.*

USER
Indicates user side of the User to Network Interface (UNI).

NETWORK
Indicates network side of the UNI interface.

BOTH
Indicates that the packet endpoint is operating in Network-to-Network Interface (NNI) mode.

SIG TYPE

Read Security: 5
Displays the frame relay signaling type used on this packet endpoint. *These settings are not applicable for PPP.*

ANNEX A
Signaling using ITU-T Q.933-A.

ANNEX D
Signaling using ANSI T1.617-D.

LMI
Signaling using Group of Four.

ACTIVE (FRAME RELAY)

Read Security: 5
Indicates that there is active frame relay signaling on this packet endpoint. The packet endpoint must be defined by the frame relay configuration settings to show active frame relay signaling.

ACTIVE (PPP)

This indicates the status of the PPP negotiation.

INITIAL
This is the first state of the LCP negotiation. This will usually go directly to the starting state to start the PPP negotiation, unless the packet endpoint has not been tied to a physical port in the dedicated maps.

STARTING
This packet endpoint is in this state when the physical line is down.

REQ-SENT
This packet endpoint is in this state when an LCP configuration request has been sent to the peer.

ACK-RCVD
This packet endpoint is in this state when we have received an "acknowledge" from the peer for our configuration request.

ACK SENT
This packet endpoint is in this state when we have acknowledged the peer's configuration request and he has not acknowledged us.

OPENED
This packet endpoint is in this state when LCP negotiation has finished; authentication, if enabled, is occurring now.

CLOSING
This packet endpoint is in this state when we have sent the peer a "terminate" request and are waiting for the peer's acknowledgement.

CLOSED
This packet endpoint is in this state when we have received the peer's acknowledgement to our terminate request; this will go to the initial state.

STOPPING
This packet endpoint is in this state when we have received a terminate request from the peer.

STOPPED
This packet endpoint is in this state when we have acknowledged the peer's terminate request.

NOT CONNECTED
This packet endpoint is in this state when the packet link has not yet been connected to the router.

CURRENT PORT

Read Security: 5
Displays the connections for the packet endpoint. The letter **U** in this field indicates that this packet endpoint is used in the **PACKET CNCTS** map (also see *Packet Cncts* on page 4-22). The remainder of the field indicates the physical port to which this packet endpoint is connected, as defined in the **DEDICATED MAP** (also see *Dedicated Maps* on page 5-1). If the port is a channelized interface such as a T1, the DS0 assignment is also provided.

PERFORMANCE

Displays performance information for each packet endpoint including **ENDPNT NAME** (endpoint name), **PROTOCOL**, **LINK STATS**, and **SUBLINK STATS** (see the menu tree in Figure 4-3).

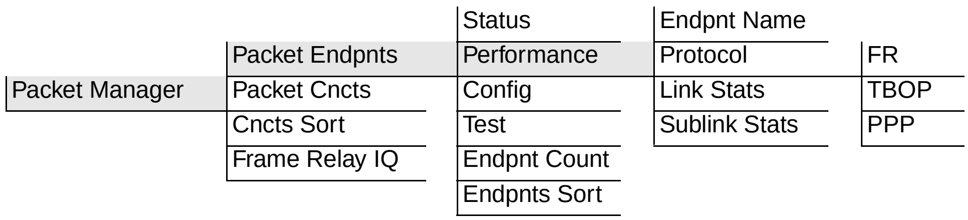


Figure 4-3. Performance Menu Tree

ENDPNT NAME

Read Security: 5
Displays the packet endpoint name as defined in **PACKET ENDPNTS/CONFIG** (also see *Config* on page 4-9).

PROTOCOL

Read Security: 5
Displays the layer 2 protocol that this packet endpoint terminates as defined in **PACKET ENDPNTS/CONFIG** (also see *Config* on page 4-9).

LINK STATS (FRAME RELAY)

Read Security: 5
This field is dependent on the type of protocol selected in **PACKET ENDPNTS/CONFIG** (also see *Config* on page 4-9). Displays layer 2 performance statistics (see Figure 4-4). The statistics fields for frame relay reflect the total count since last cleared. Descriptions for each of these fields begin following the menu tree.

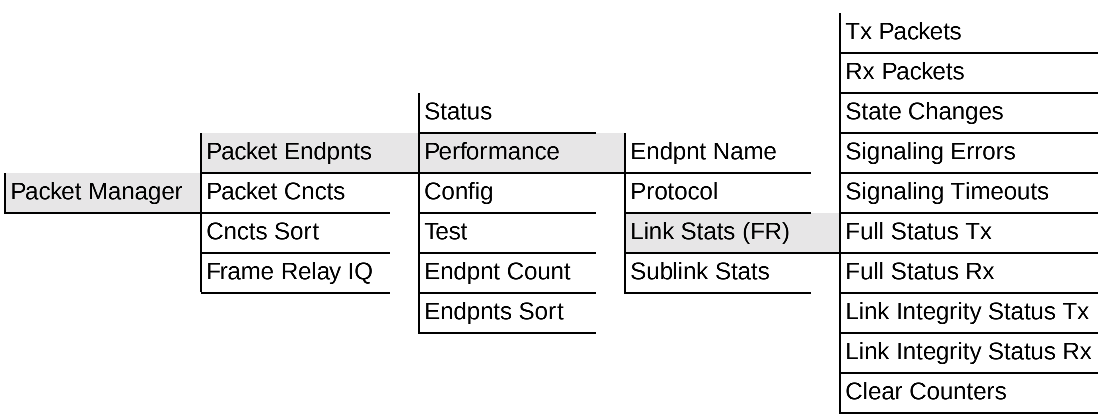


Figure 4-4. Frame Relay Link Stats Menu Tree

TX PACKETS

Total number of frame relay packets transmitted through this packet endpoint, including both user data (on all PVCs) and signaling.

Rx Packets
Total number of frame relay packets received through this packet endpoint (on all PVCs).

State Changes
Total number of times that frame relay signaling has gone active or inactive.

Signaling Errors
Total number of signaling frames received with PVC signaling protocol violations.

Signaling Timeouts
Number of times signaling polls were not received in the time specified in T391 in the **Packet Endpnts/Config** menu (also see *Config* on page 4-9).

Full Status Tx
Number of full status polls transmitted by this packet endpoint.

Full Status Rx
Number of full status polls received by this packet endpoint.

Link Integrity Status Tx
Number of link integrity polls transmitted by this packet endpoint.

Link Integrity Status Rx
Number of link integrity polls received by this packet endpoint.

Clear Counters
Clears all values in this submenu.

Link Stats (TBOP)

Read Security: 5
This field is dependent on the type of protocol selected in **Packet Endpnts/Config** (also see *Config* on page 4-9). Displays layer 2 performance statistics (see the menu tree in Figure 4-5). The statistics fields for TBOP reflect the total count since last cleared.

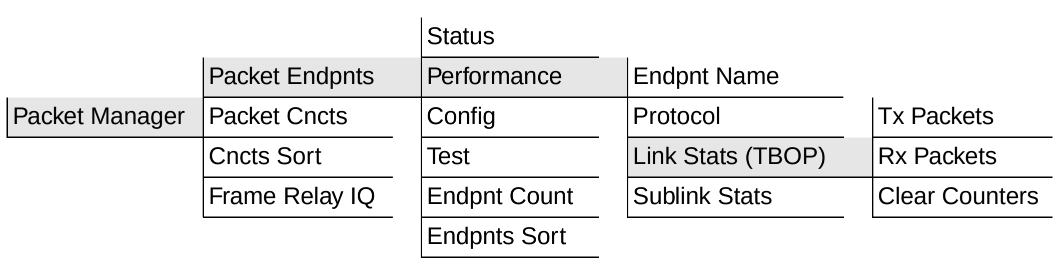


Figure 4-5. TBOP Link Stats Menu Tree

Tx Packets
Displays the total number of HDLC packets transmitted through this packet endpoint.

RX PACKETS
Displays the total number of HDLC packets received through this packet endpoint.

CLEAR COUNTERS
Clears all values in this submenu.

LINK STATS (PPP)

Read Security: 5
This field is dependent on the type of protocol selected in **PACKET ENDPNTS/CONFIG** (also see *Config* on page 4-9). Displays layer 2 performance statistics (see Figure 4-6). Descriptions for each of these fields begin following the menu tree.

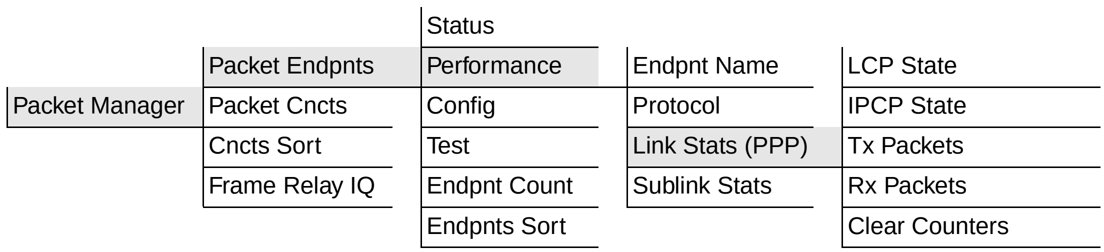


Figure 4-6. PPP Link Stats Menu Tree

LCP STATE
This reflects the LCP layer state.

IPCP
This shows the UP if PPP IP control has negotiated successfully.

TX PACKETS
Number of packets transmitted over this link.

RX PACKETS
Number of packets received over this link.

CLEAR COUNTERS
Resets the Tx packets and Rx packets.

SUBLINK STATS Read Security: 5

Displays frame relay performance statistics for supported packet endpoint sublinks (see the menu tree Figure 4-5). These statistics fields reflect the total count since last cleared. *These settings are not applicable for PPP.*

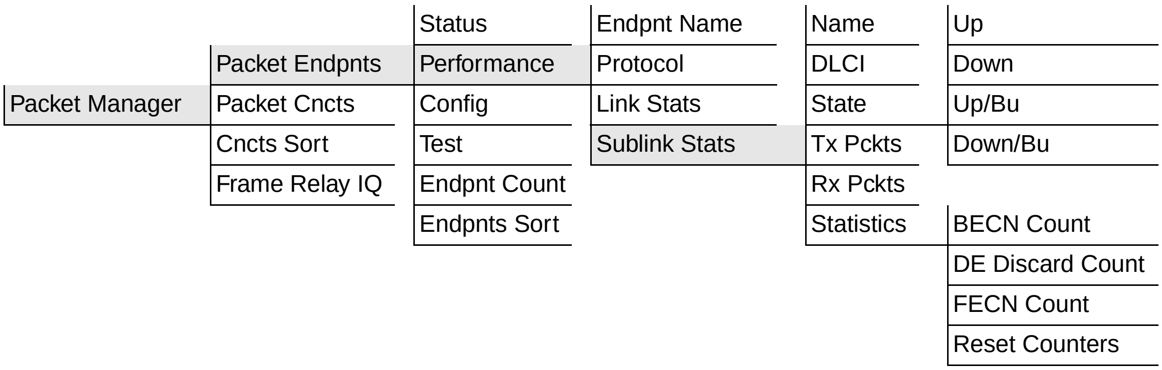


Figure 4-7. Frame Relay Sublink Stats Menu Tree

NAME
User-defined name of a sublink (PVC).

DLCI
DLCI for sublink as defined in **PACKET ENDPNTS/CONFIG** (also see *Config* on page 4-9).

STATE
Indicates if this particular sublink (PVC) has been defined as active by a full status poll, and also indicates if the PVC is in backup mode.

UP
PVC is up (active).

DOWN
PVC is down (inactive).

UP/BU
PVC is up but in backup mode.

DOWN/BU
PVC is down and in backup mode.

TX PCKTS
Total number of frame relay user data packets transmitted over this PVC.

RX PCKTS
Total number of frame relay user data packets received over this PVC.

STATISTICS
Provides additional information, as follows, on the individual sublink:

BECN COUNT
Total number of BECN bits received on this PVC.

DE DISCARD COUNT
Total number of Discard Eligible bits that have been received on this PVC.

FECN COUNT
Total number of FECN bits received on this PVC.

RESET COUNTERS
Resets all sublink counters.

CONFIG

Creates and configures packet endpoints (see the menu tree in Figure 4-8).

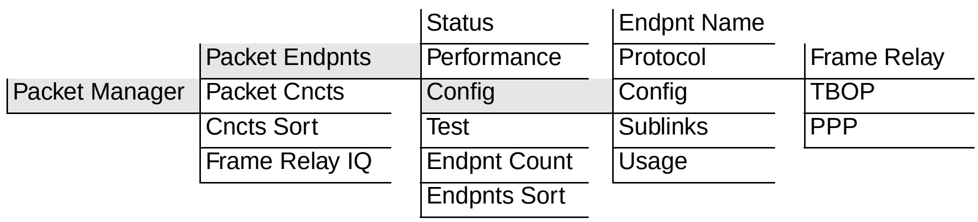


Figure 4-8. Config Menu Tree

ENDPNT NAME

Write Security: 3; Read Security: 5
Simplifies configuration with user-definable names such as the name of the frame relay provider or the circuit ID.

PROTOCOL

Write Security: 3; Read Security: 5
Defines the protocol operating on this port. **FRAME RELAY** configures this packet endpoint to frame relay. **TBOP** configures this packet endpoint as transparent bit oriented protocol. **PPP** configures this packet endpoint as point-to-point protocol.

CONFIG

Write Security: 3; Read Security: 5
Displays the configuration for this packet endpoint. This menu is protocol-dependent. TBOP requires no configuration. The selections for this menu when Frame Relay is the protocol are listed in *Config (Frame Relay as protocol)* on page 4-10 and shown in Figure 4-9 , and the selections for this menu when PPP is the protocol are listed in *Config (PPP as protocol)* on page 4-13 and shown in Figure 4-9.

CONFIG (FRAME RELAY AS PROTOCOL)

Figure 4-9 shows the selections for this menu when Frame Relay is the protocol.

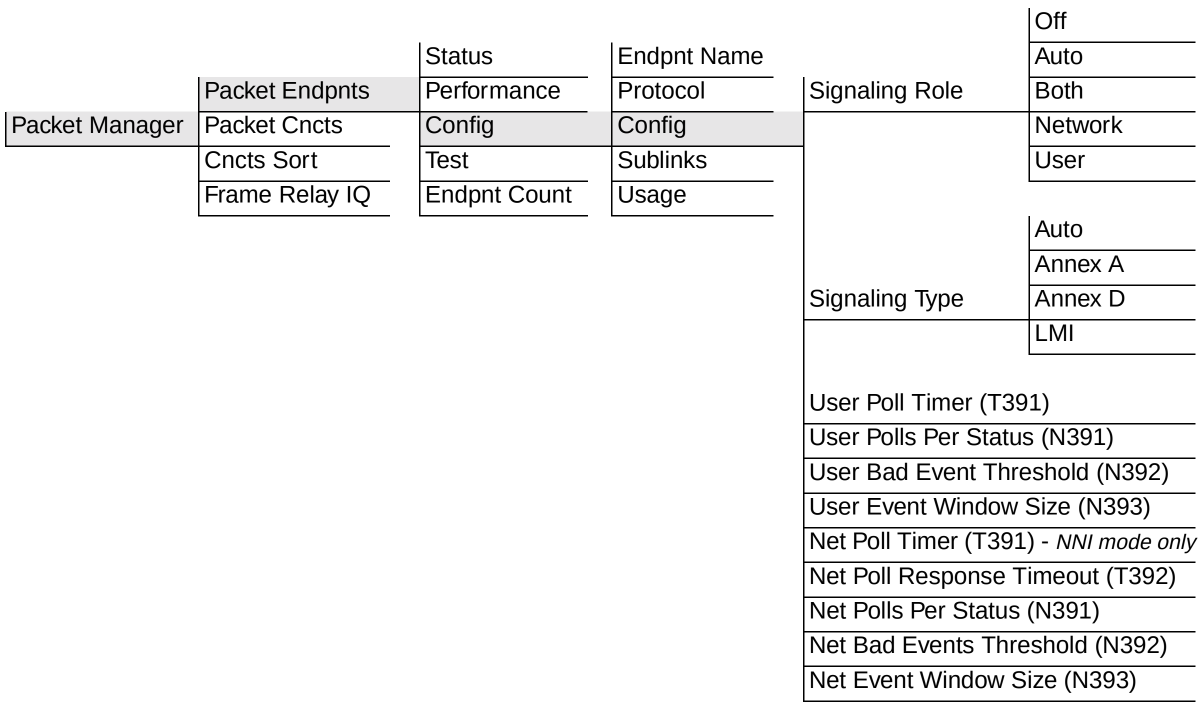


Figure 4-9. Config/Config Menu Tree (Frame Relay)

SIGNALING ROLE

Defines whether this packet endpoint acts as the network or user side of the UNI or as an NNI.

OFF

Use when the remote device does not support frame relay signaling.

AUTO

Detects the role of the device on the other end of the circuit and automatically sets this packet endpoint to the appropriate value.

BOTH

Operates in NNI mode.

NETWORK

Acts as the network side of the UNI interface.

USER

Acts as the user side of the UNI interface.

Choosing the Signaling Role for Backup Links

Carefully choose the **SIGNALING ROLE** of a packet endpoint that is configured with backup sublinks. Please note that the ADTRAN IQ and Express families of products do NOT support frame relay signaling on the backup sublink.

For cases where...	Set SIGNALING ROLE to...
The backup sublink is connected to a switched network (e.g., ISDN DBU), and the remote device DOES NOT support frame relay signaling.	**OFF**
The remote device DOES support signaling on the backup sublink.	**BOTH**
The backup sublink is a dedicated connection to the remote device, and the network is Private Frame Relay.	**BOTH**
The backup sublink is a dedicated connection to the remote device, and the network is Public Frame Relay.	**USER**

SIGNALING TYPE

Controls the frame relay signaling type that operates on this packet endpoint.

AUTO
Detects the signaling type of the device on the other end of the circuit and sets this packet endpoint to the same signaling type.

ANNEX A
Transmits and responds to ITU-T Q.933-A standards.

ANNEX D
Transmits and responds to ANSI T1.617-D standards.

LMI
Transmits and responds to Group of Four specifications.

USER POLL TIMER (T391)

Sets the polling interval to the network in seconds.

USER POLLS PER STATUS (N391)

Controls how many link integrity polls occur between full status polls.

USER BAD EVENT THRESHOLD (N392)

Sets the number of bad polling events that will cause the link to be declared down in N393 Polls.

USER EVENT WINDOW SIZE (N393)
Defines the number of poll events in each monitored window.

> NOTE
> *If the number of polls reaches N392 in any N393 period, the link will be declared down. When N393 good polls are received, the link will be declared active again.*

NET POLL RESPONSE TIMEOUT (T392)
Determines how long this packet endpoint will wait without receiving a poll before declaring the poll bad.

> NOTE
> *Ensure that this timer is greater than the T391 on the user side of the UNI; otherwise, erratic behavior will result.*

NET POLLS PER STATUS (N391)
Sets the number of link integrity polls before a full status is transmitted.

NET BAD EVENTS THRESHOLD (N392)
Sets the number of bad polling events that will cause the link to be declared down in N393 Polls.

NET EVENT WINDOW SIZE (N393)
Defines the number of poll events in each monitored window.

> NOTE
> *If the number of bad polls reaches N392 in any N393 period, the link will be declared down. When N393 good polls are received, the link will be declared active again.*

CONFIG (PPP AS PROTOCOL)

Figure 4-10 shows the selections for this menu when Frame Relay is the protocol.

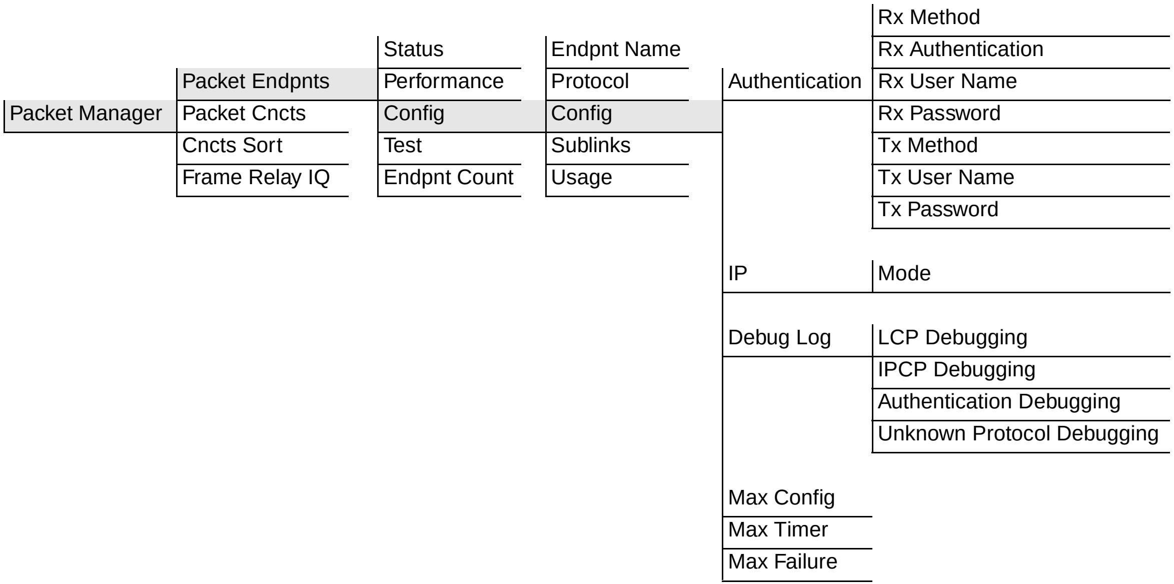


Figure 4-10. Config/Config Menu Tree (PPP)

AUTHENTICATION

RX METHOD

These are the methods we will use to authenticate the peer. **NONE** is selected when you do not want to authenticate the peer. **PAP, CHAP, OR EAP** is selected when you will allow the peer to be authenticated with one of the listed authentication protocols. In this case, the most secure method will be used first (**EAP**, then **CHAP**, then **PAP**). **CHAP OR EAP** is selected when you will authenticate the peer only using one of the encrypted authentication protocols. **EAP** is selected when you will authenticate the peer only using the EAP authentication protocol.

RX AUTHENTICATION

This selects the different types of authentication to use to authenticate the peer. **LOCAL** is used when you want to use the local username and password for this port to authenticate the peer. (In the future we will have **RADIUS**, to use a radius server to authenticate the peer.)

RX USERNAME

The username we use to authenticate the peer.

RX PASSWORD

The password we use to authenticate the peer.

TX METHOD
These are the methods that we will allow the peer to authenticate us with. This is of use when a peer wants to do PAP just to get your password. **NONE** is selected when you do not want to be authenticated by the peer. **PAP, CHAP,** or **EAP** is selected when you will let the peer use one or all of the authentication protocols. **CHAP** or **EAP** is selected when you will let the peer use only one of the encrypted authentication protocols. **EAP** is selected when you will let the peer use only the EAP authentication protocol.

TX USERNAME
The username that the peer uses to authenticate us.

TX PASSWORD
The password that the peer uses to authenticate us.

IP

MODE
This turns the IPCP protocol ON or OFF

DEBUG LOG
The following events can be viewed in the event log when PPP events have been turned to 'Info'.

LCP DEBUGGING
This turns on LCP negotiation debugging.

IPCP DEBUGGING
This turns on IPCP negotiation debugging.

AUTHENTICATION DEBUGGING
This turns on authentication debugging.

UNKNOW PROTOCOL DEBUGGING
This turns on debugging for unknown protocols.

MAX CONFIG
This value is the number of unanswered configuration-requests that should be transmitted before giving up on the negotiation. The default value is 10.

MAX TIMER
This value is the number of seconds to wait between unanswered configuration-requests. The default value is 2 seconds.

MAX FAILURE
Due to the nature of PPP, configuration options may not be agreed upon between two PPP peers. This value is the number of configuration-NAK's that should occur before an option is configuration-rejected. This allows a connection to succeed that might otherwise fail. The default value is 5.

SUBLINKS

Write Security: 3; Read Security: 5
Allows PVC creation and configuration within a frame relay link that uses sub-link DLCIs (see Figure 4-11). Sublinks are not supported in TBOP or PPP.

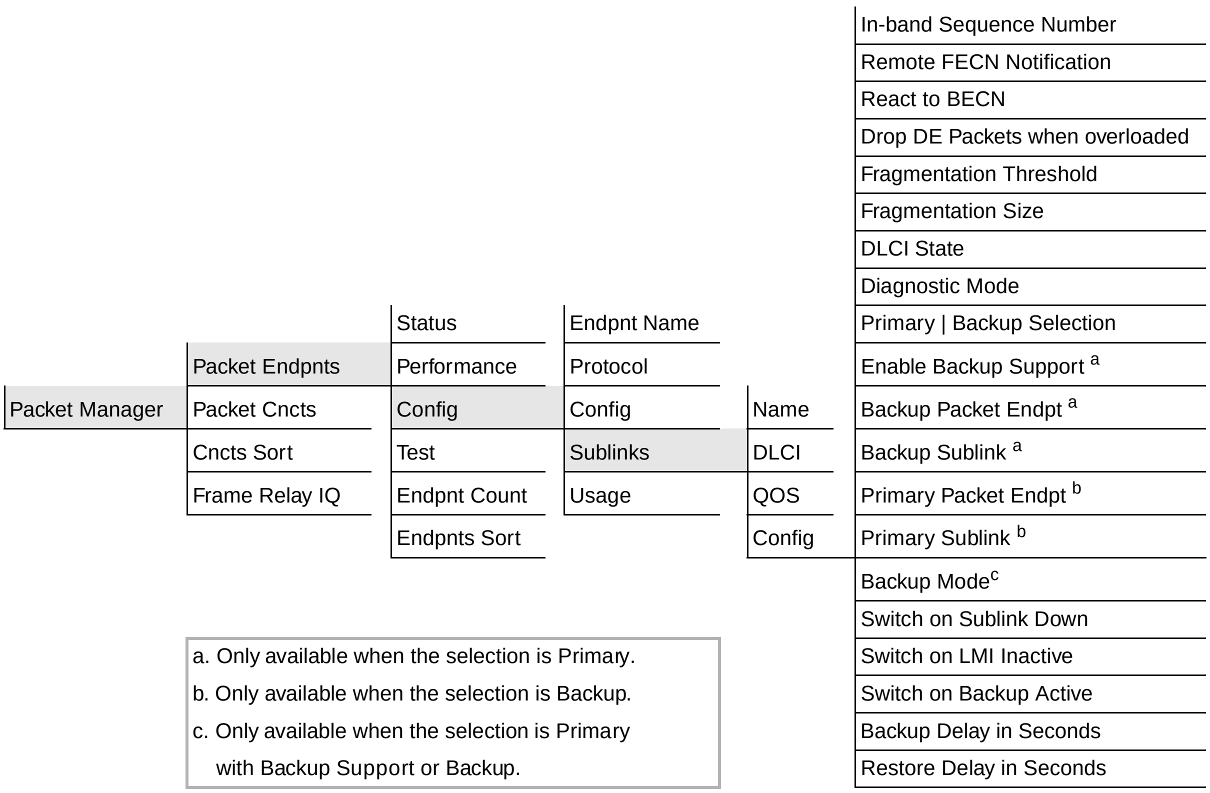


Figure 4-11. Sublinks Menu Tree

NAME

User-defined name for the DLCI.

DLCI

Local address for each PVC as assigned by the carrier.

QOS

Quality of service. These values can be used to assign a guaranteed amount of bandwidth available for this connection. The sum of all QOS values for the sublink should not exceed the Committed Information Rate (CIR).

CONFIG

Allows configuration of parameters for each DLCI.

IN-BAND SEQUENCE NUMBER

This option will not appear when **DIAGNOSTIC MODE** is set to **PASS THROUGH DIAGNOSTIC PACKETS**. All packets on this PVC will get a numbered tag so that ADTRAN IQ products can detect lost packets in the frame relay network. Only turn this option **ON** if there is an ADTRAN IQ-capable product on the other end of the PVC.

REMOTE FECN NOTIFICATION
If FECN is received on the interface, a notification is sent to frame relay equipment on other end of the PVC.

REACT TO BECN
If BECN is received, traffic to the frame relay network is flowed off.

DROP DE PACKETS WHEN OVERLOADED
If traffic congestion occurs, discard eligible (DE) packets drop.

FRAGMENTATION THRESHOLD
Defines the maximum data packet size that will be transmitted without fragmenting the data to support voice. Table 4-1 provides suggested values based on the PVC CIR.

FRAGMENTATION SIZE
Defines packet size when fragmentation is active.

Table 4-1. Suggested Fragmentation Values Based on the PVC CIR

PVC CIR	Frag Size	Frag Threshold	PVC CIR	Frag Size	Frag Threshold
64	56	112	832	1016	2032
128	136	272	896	1096	2192
192	216	432	960	1176	2352
256	296	592	1024	1256	2512
320	376	752	1088	1336	2672
384	456	912	1152	1416	2832
448	536	1072	1216	1496	2992
512	616	1232	1280	1576	3152
576	696	1392	1344	1656	3312
640	776	1552	1408	1736	3472
704	856	1712	1472	1816	3632
768	936	1872	1536	1896	3792

DLCI STATE
Controls how the state of this DLCI is reported to any packet connections within ATLAS attempting to send or receive data on this DLCI.

AUTO
Passes the state as reported by the frame relay switch. Set **DLCI STATE** to **AUTO** for normal operation.

FORCE UP
This DLCI disregards the status as reported from the switch and reports **ACTIVE** to all packet endpoints within ATLAS.

FORCE DOWN
Reports status as **DOWN** to all packet endpoints within ATLAS.

DIAGNOSTIC MODE

Controls operation of PVC testing options. To allow the far end to measure delay, select **ECHO FAR-END LOOPBACKS**. To continuously measure in-band delay, select **IN-BAND DELAY MEASUREMENT**. To turn off continuous diagnostic functions, select **PASS-THROUGH DIAGNOSTIC PACKETS**.

ECHO FAR-END LOOPBACKS

Generates and transmits a response on this DLCI to the remote equipment if an ADTRAN proprietary diagnostic message is received on this DLCI.

IN-BAND DELAY MEASUREMENT

Generates a diagnostic packet to measure delay through the frame relay network. This process requires that the equipment at the remote site be ADTRAN IQ compatible.

PASS-THROUGH DIAGNOSTIC PACKETS

Used when ATLAS is acting as a frame relay switch. Transmits a diagnostic packet out the packet endpoint connected to this DLCI, if a diagnostic packet is received on this packet endpoint.

PRIMARY | BACKUP SELECTION

Allows you to define a sublink as a primary or a backup sublink. **PRIMARY** defines a normal sublink and includes the menus **ENABLE BACKUP SUPPORT**, **BACKUP PACKET ENDPT**, and **BACKUP SUBLINK. BACKUP** defines a backup sublink and includes the menus **PRIMARY PACKET ENDPT** and **PRIMARY SUBLINK.**

ENABLE BACKUP SUPPORT

Visible only if the sublink type is **PRIMARY. YES** displays the backup menus. **NO** hides the backup menus.

BACKUP PACKET ENDPT

Visible only if **ENABLE BACKUP SUPPORT** is set to **YES**. Selects **BACKUP PACKET ENDPT** that contains the **BACKUP SUBLINK** to be tied to this sublink.

BACKUP SUBLINK

Visible only if **ENABLE BACKUP SUPPORT** is set to **YES**. Selects the **BACKUP SUBLINK** to be tied to this sublink.

PRIMARY PACKET ENDPT

Visible only if **BACKUP** is selected. Selects the **PRIMARY PACKET ENDPT** that contains the **PRIMARY SUBLINK** to be tied to this sublink.

PRIMARY SUBLINK

Visible only if **BACKUP** is selected. Selects the **PRIMARY SUBLINK** to be tied to this sublink.

NOTE

The fields **BACKUP MODE**, **SWITCH ON SUBLINK DOWN**, **SWITCH ON LMI INACTIVE**, **SWITCH ON BACKUP ACTIVE**, **BACKUP DELAY IN SECONDS**, *and* **RESTORE DELAY IN SECONDS** *display if* **PRIMARY** *(with* **BACKUP SUPPORT***) or* **BACKUP** *is enabled.*

BACKUP MODE
Provides switching options.

AUTO
Provides normal operation.

FORCED
Forces a switch to backup.

DISABLED
Disables backup switching.

SWITCH ON SUBLINK DOWN
Provides switching options if the sublink goes down. Select **YES** to switch to backup if the primary sublink goes down, otherwise select **NO**.

SWITCH ON LMI INACTIVE
Provides switching options for LMI signaling. Select **YES** to switch to backup if LMI signaling is inactive on the primary link, otherwise select **NO**.

SWITCH ON BACKUP ACTIVE
Provides switching options if the backup sublink goes active. Select **YES** to switch to backup if the backup sublink goes active, otherwise select **NO**.

BACKUP DELAY IN SECONDS
The amount of time within which any of the enabled switch criteria must be met before service is switched to the backup circuit.

RESTORE DELAY IN SECONDS
The amount of time within which the criteria for switching to backup are reached before service is returned to the primary circuit.

Sublinks Example

Assume the following sublink packet endpoint is connected to the frame relay network via a full T1:

Name	DLCI	QOS
Atlanta	903	768
New York	805	384
San Francisco	615	384

If the PVC to San Francisco needs to transmit data, it will be able to access the network at full T1 rates. If, at the same time, data needs to be transmitted to the PVC to New York, the San Francisco and New York PVCs would equally share the T1 to the frame relay provider because they have the same QOS value. If, also at the same time, data needed to be transmitted to the PVC to Atlanta, the T1 would be divided three ways: traffic to Atlanta gets half of the T1, and the New York and San Francisco PVCs equally share the remaining half of the T1, since they share the same QOS value.

USAGE

Read Security: 5
This field displays a 7-character summary of the references to this link. Each character can be a dash (-), or it can be a character indicating the resource represented by the character position. The character positions follow:

1 Packet connection in the first dedicated connections map.
2 Packet connection in the second dedicated connections map.
3 Packet connection in the third dedicated connections map.
4 Packet connection in the fourth dedicated connections map.
5 Packet connection in the fifth dedicated connections map.
s Switched packet connection in the dial plan.
u Used by one or more packet switch connections or packet voice entries.

> NOTE
> *Packet voice entries are in either the* ***DEDICATED MAPS*** *or the* ***DIAL PLAN*** *on page 5-1.*

TEST

Provides menus for controlling options and settings for packet endpoints (see the menu tree in Figure 4-12).

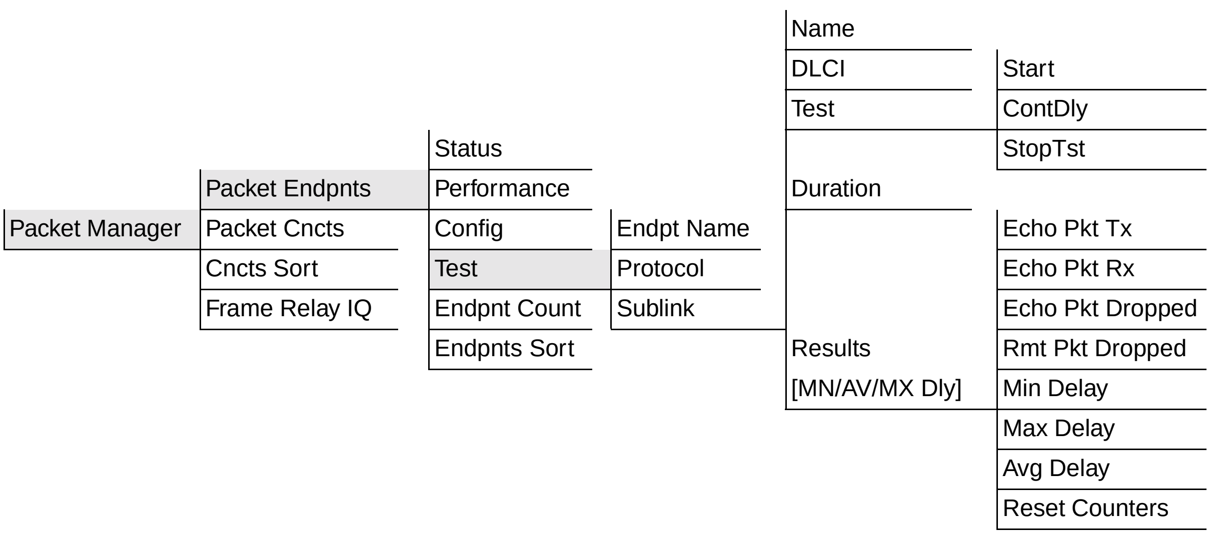


Figure 4-12. Test Menu Tree

ENDPNT NAME

Read Security: 5
Displays the name of the packet endpoint.

PROTOCOL

Read Security: 5
Displays the protocol running on this packet endpoint.

SUBLINK Write Security: 3; Read Security: 5
Displays test menus for the packet endpoint sublinks. The menus vary depending on the protocol. Testing is not supported on TBOP or PPP.

NAME
User-defined name for the DLCI.

DLCI
Local address for each PVC as assigned by the carrier.

TEST
Shows the test mode for this PVC.

START
The fixed duration that **TEST** is not running and the DLCI is not configured for continuous in-band delay measurement. To change this option, set **DIAGNOSTIC MODE** to **IN-BAND DELAY MEASUREMENT** (also see *In-Band Delay Measurement* on page 4-17).

CONTDLY
The fixed duration **TEST** is not running and the DLCI is configured for continuous in-band delay measurement. The following **RESULTS** menu accumulates these measurements.

STOPTST
The fixed duration **TEST** is running. The following **DURATION** field shows the time remaining in the current test.

DURATION
Shows the duration in seconds for the fixed-duration test.

RESULTS [MN/AV/MX DLY]
Displays the minimum, average, and maximum delay for the delay-measurement test.To display the additional test results, place the cursor over this field and press **Enter** on the keyboard. These times are in milliseconds.

ECHO PKT TX
Displays the total number of test packets that have been transmitted.

ECHO PKT RX
Displays the total number of test packets that have been received.

ECHO PKT DROPPED
Displays the total number of packets lost in the receiving direction (traveling from the remote ADTRAN frame relay device to the ATLAS).

RMT PKT DROPPED
Displays the total number of packets lost in the transmit direction (traveling from the ATLAS to the remote ADTRAN frame relay device).

MIN DELAY
Displays the minimum round trip delay for the current test period.

MAX DELAY
Displays the maximum round trip delay for the current test period.

AVG DELAY
Displays the average round trip delay for the current test.

RESET COUNTERS
Resets the counters.

ENDPNT COUNT

Read Security: 5
Displays the total number of packet endpoints configured (see the menu tree in Figure 4-13).

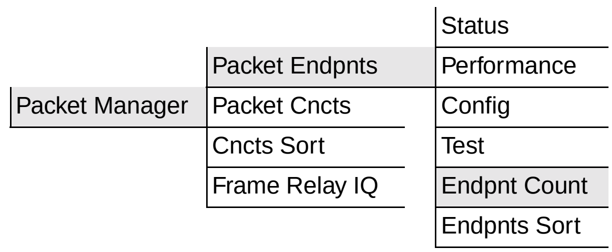


Figure 4-13. Endpnt Count Menu Tree

ENDPNTS SORT

Write Security: 3; Read Security: 5
Provides sorting options (see the menu tree in Figure 4-14). **SORTING BY NAME** sorts packet endpoints alphabetically by name. If you do not want to sort packet endpoints, set this option to **OFF**.

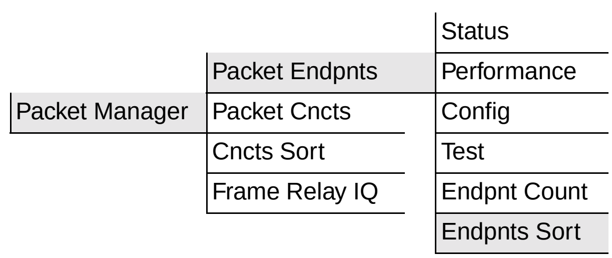


Figure 4-14. Endpnts Sort Menu Tree

PACKET CNCTS

After packet endpoints are defined, they are connected in the packet connects (**PACKET CNCTS**) map (see the menu tree in Figure 4-15). **PACKET CNCTS** connects upper layer protocols from packet endpoint to packet endpoint. You can think of it as a dedicated map for virtual ports rather than physical ports.

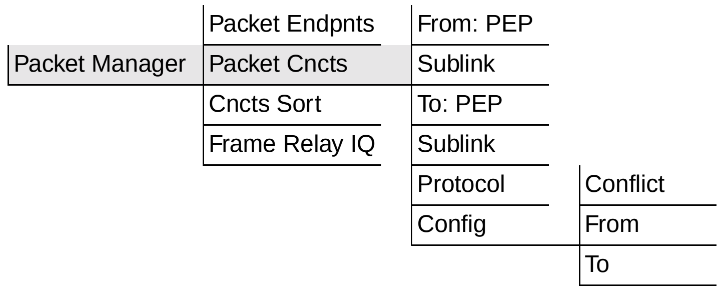


Figure 4-15. Packet Connects Menu

FROM: PEP

Write Security: 3; Read Security: 5
Selects one packet endpoint for the packet connection. Packet endpoints created in the packet endpoint configuration are visible on a pull-down menu which includes the option, **ROUTER**. Additionally, a router option is available in this pull-down menu. The router is the internal ATLAS router and can be used multiple times within the **PACKET CNCTS** menu.

SUBLINK

Write Security: 3; Read Security: 5
If the packet endpoint selected in **FROM: PEP** supports sublinks, they are available in this menu. In frame relay, this is the PVC from which you are selecting to groom data.

TO: PEP

Write Security: 3; Read Security: 5
Selects the other packet endpoint for the packet connection. Refer to **FROM: PEP** for more detail.

SUBLINK

Write Security: 3; Read Security: 5
If the **TO: PEP** packet endpoint supports sublinks, the available sublinks are shown within this menu, which includes the **ROUTER** option.

PROTOCOL

Write Security: 3; Read Security: 5
Selects the protocols for this packet connection. Selecting the protocols on each individual connection allows the mixing of data from multiple sources onto a single PVC. Available protocols include the following: **ALL**, **IP**, **BRIDGE IP**, **PACKET VOICE**, **SNA - LLC2**, **SNAP**, and **TRANSPARENT PROTOCOLS** (**TBOP** and **TASYNC**).

> NOTE
>
> *Keep in mind the following:*
>
> 1. If **ALL** is selected, additional connections from that PVC are not allowed.
> 2. If **ROUTER** is selected as one packet endpoint, **IP** is automatically set as the **PROTOCOL**.
> 3. If a **TBOP** packet endpoint is selected as one packet endpoint, **TRANSPARENT** is automatically set as the **PROTOCOL**.

CONFIG

Write Security: 3; Read Security: 5
Determines data source and destination. The available options depend on the protocol selected.

CONFLICT

Indicates DLCI mismatch.

FROM

Indicates data source.

TO

Indicates data destination.

CNCTS SORT

Determines the order in which connections are displayed within **PACKET CNCTS** (see the menu tree in Figure 4-16). Options include **FROM PKT ENDPT/SUBLINK**, **TO PKT ENDPT/SUBLINK**, **CONNECTION PROTOCOL**, and **OFF**.

	Packet Endpnts	From Pkt Endpt/Sublink
Packet Manager	Packet Cncts	To Pkt Endpt/Sublink
	Cncts Sort	Connection Protocol
	Frame Relay IQ	Off

Figure 4-16. Cncts Sort Menu

FRAME RELAY IQ

This menu is discussed separately in *Using Frame Relay IQ* on page 7-1.

Chapter 5 Connecting Packet Endpoints

After packet endpoints are created, they must be connected to a physical port. You can connect the endpoints using either the **DEDICATED MAP** or the **DIAL PLAN**. **DEDICATED MAPS** "nail" the endpoints to a service, and the **DIAL PLAN** associates a phone number with the endpoint.

DEDICATED MAPS

The **DEDICATED MAPS** menu (see Figure 5-1) connects packet endpoints to a physical port. With the frame relay option installed, you can pick a packet link that was created within the **PACKET MANAGER MENU**. To nail the endpoint to a service, go to **DEDICATED MAPS** and pick a physical slot (**FROM SLT**) and port (**PORT/PEP**) for the data. Assign the DS0s (**FROM CONFIG**), and then set the service (**TO SLT/S**) to **PKT ENDPT** or **PKT VOICE**. The examples in Chapter 6 provide clarification of this procedure.

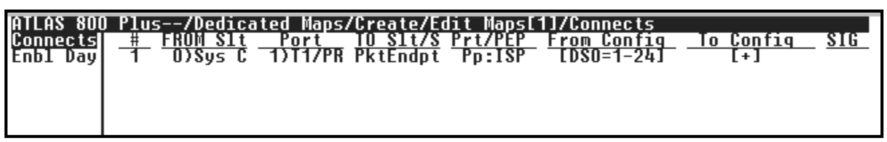


Figure 5-1. Dedicated Maps Menu

DIAL PLAN

You can enter two types of packet-switched endpoints into the **DIAL PLAN**: Packet Endpoints (**PKTENDPT**) and Packet Voice (**PKTVOICE**); see Figure 5-2. When using **PKTENDPT**, endpoints are entered via **USER TERM.** When using **PKTVOICE** , endpoints are entered via **NETWORK TERM** or **USER TERM**. (See also, *Network Term* on page 5-8 and *User Term* on page 5-8.)

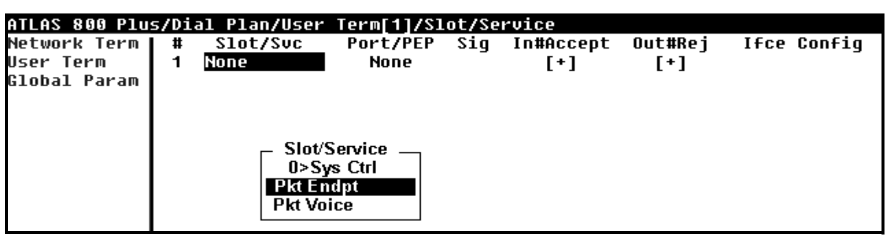


Figure 5-2. Dial Plan Menu

PKTENDPT

To facilitate dial-up packet services, the ATLAS **DIAL PLAN** supports packet endpoints. These endpoints must be entered in the **USER TERM/ PKTENDPT** menu. The **PKTENDPT** menu includes **SLOT/SVC**, **PORT/PEP**, **SIG**, **IN#ACCEPT**, **OUT#REJ**, and **IFCE CONFIG.**

SLOT/SVC

Write security: 3; Read security: 5
Selects the service. Select **PKTENDPT**.

PRT/PEP

Write security: 3; Read security: 5
Accepts the packet endpoint you wish to configure. Select from a specific packet link that was configured with the **PACKET MANAGER** menus or select **GROUP** (see Figure 5-3). The **GROUP** option allows you to define a hunt group. The interface configuration (**IFCE CONFIG**) parameters vary, depending on whether a specific packet link (endpoint) or the **GROUP** option is selected.

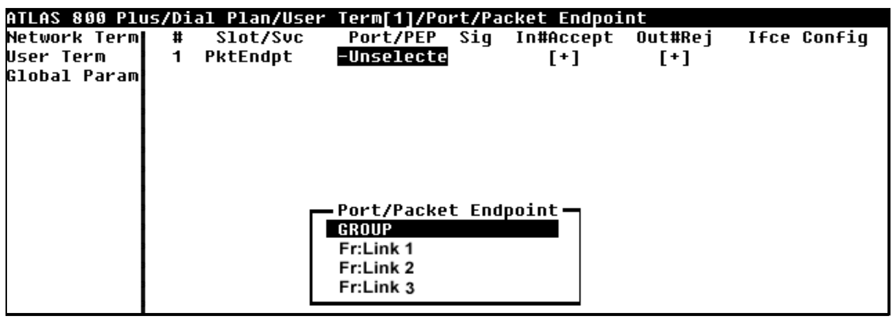


Figure 5-3. Port/PEP Options in the Dial Plan

SIG

Write security: 3; Read security: 5
Not used for specific packet links (endpoints).

IN#ACCEPT

Write security: 3; Read security: 5
Configured as defined in the *ATLAS 800PLUS User Manual*.

OUT#REJ

Write security: 3; Read security: 5
Configured as defined in the *ATLAS 800PLUS User Manual*.

IFCE CONFIG

Write security: 3; Read security: 5
Figure 5-4 shows an example of the interface configuration for a normal packet link. Figure 5-5 shows a similar configuration; however, in this example, the selected packet link has been configured within the **PACKET MANAGER** menus to include backup sublinks (see also, *Primary | Backup Selection* on page 4-17). Figure 5-6 shows the interface configuration when the **GROUP** option is selected.

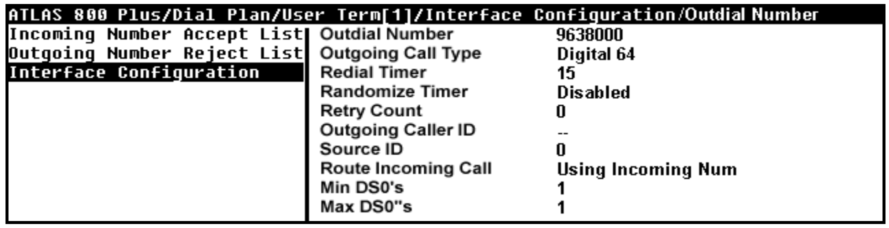


Figure 5-4. Packet Link Interface Configuration

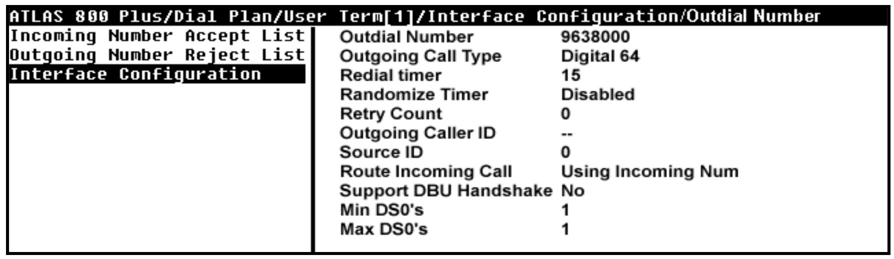


Figure 5-5. Packet Link Interface Configuration with FR Backup Support

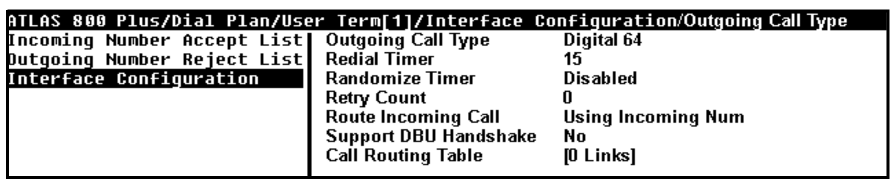


Figure 5-6. Packet Link GROUP Interface Configuration

OUTDIAL NUMBER

Write security: 3; Read security: 5
Defines the number dialed to originate a call.

OUTGOING CALL TYPE

Write security: 3; Read security: 5
Selects the terminating resource type, either **DIGITAL 64K** or **DIGITAL 56K**.

REDIAL TIMER

Write security: 3; Read security: 5
Selects the time delay in seconds between redial attempts.

RANDOMIZE TIMER

Write security: 3; Read security: 5
Enables/disables random delay added to the redial timer to avoid glare.

RETRY COUNT

Write security: 3; Read security: 5
Defines the number of redials to attempt.

Outgoing Caller ID
Write security: 3; Read security: 5
Defines the presentation of the calling party number for this endpoint.

Source ID
Write security: 3; Read security: 5
Used to simplify the creation of a **Dial Plan** in applications where the criterion for switching calls to a certain endpoint is a function of which endpoint originated the call. For further details, see the *ATLAS 800*^PLUS^ *User Manual*.

Route Incoming Call
Write security: 3; Read security: 5
Used to define the method which incoming calls are associated to the packet endpoints. This item can have three options:

Using Incoming Num
Endpoint selection based on the incoming number.

Using Calling Party Num
Selection based on the Call ID as presented by the calling party. If this option is selected, the **Call Party Number** field is made available to the interface configuration. This number allows you to configure the calling part number used to select this packet endpoint.

Using DBU Handshake
Selection based on a proprietary protocol. This option is only available to packet endpoints with backup sublinks. **DBU Handshake** is required to interoperate with ADTRAN IQ and Express family products. It enables the association of incoming calls with packet endpoints in cases where there is a single call-in number (hunt group) and no Caller ID information available.

Support DBU Handshake
Write security: 3; Read security: 5
This option is only available when the packet endpoint selected in the **Port/PEP** field has backup sublinks. **Support DBU Handshake** enables/disables the generation and acceptance of ADTRAN frame relay handshake upon connection. If the endpoint is configured to route incoming calls based on the handshake information, this option is automatically enabled. If another call routing method is in effect, however, this option can be enabled to support the use of handshake information at the far end of the link.

Min DS0's
Write security: 3; Read security: 5
Set this to 1 for typical single-call connections. Setting this greater than 1 will restrict connections to endpoints supporting aggregation (e.g., BONDING) of the specified number of DS0s.

Max DS0's
Write security: 3; Read security: 5
Set this to 1 for typical single-call connections. Setting this greater than 1 will accommodate connections to endpoints supporting aggregation (e.g. BONDING) of up to the specified number of DS0s. This also sets the number of DS0s presented in the negotiation of outgoing aggregate calls.

CALL ROUTING TABLE

Read security: 5

This table is only visible if **GROUP** is selected in the **PRT/PEP** field. The table format changes, based on the selected routing option. See Figures 5-7 through 5-9. For each case, **CALL PARAMS** contain **OUTDIAL#**, **CALLER ID, SOURCE ID**, and **MIN/MAX DS0S**, as described above.

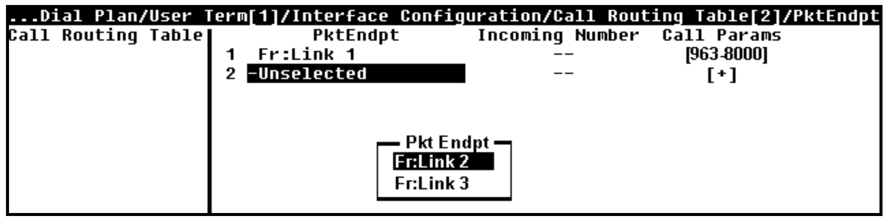


Figure 5-7. Call Routing Table for Routing Using Incoming Number

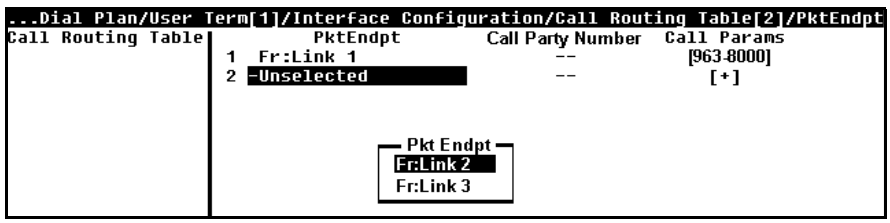


Figure 5-8. Call Routing Table for Routing Using Call Party Number

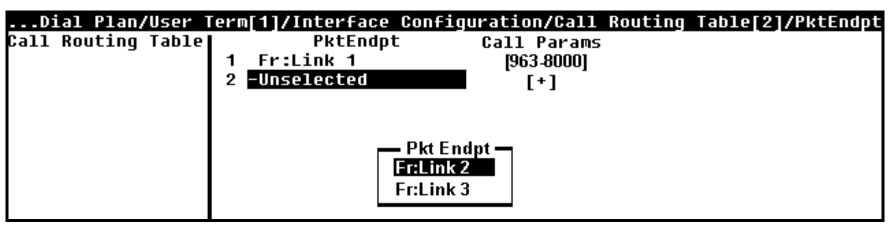


Figure 5-9. Call Routing Table for Routing Using DBU Handshake

PKTVOICE

ATLAS provides the same level of capability for packet-switched voice as originally provided for circuit-switched voice.

INTERFACE CONFIGURATION (under **DIAL PLAN > USER TERM** or **NETWORK TERM**) sets configuration parameters for the endpoint. These parameters vary by the type of port selected. The following section describes the configuration options available for packet-switched voice (see Figure 5-10). The **DIAL PLAN** is only accessible when you are using the terminal mode.

The first step in configuring the **DIAL PLAN** for packet voice is to select **NETWORK TERM** or **USER TERM**. Refer to the *ATLAS 800^PLUS^ User Manual* for details on determining **NETWORK TERM** or **USER TERM** (see also *Network Term* on page 5-8 and *User Term* on page 5-8). Once this selection is made, a number of fields become available. These fields are discussed in the following sections.

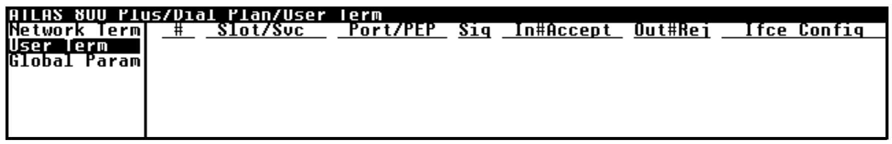


Figure 5-10. Packet Switched Voice Options

SLOT/SVC

Write Security: 3; Read Security: 5
Select **PKTVOICE** as the service.

PRT/PEP

Write Security: 3; Read Security: 5
Select the port / packet endpoint that you want to configure.

SIG

Not used for packet voice.

IN#ACCEPT

Write Security: 3; Read Security: 5
Configured as defined in the *ATLAS 800^PLUS^ User Manual*.

OUT#REJ

Write Security: 3; Read Security: 5
Configured as defined in the *ATLAS 800^PLUS^ User Manual*.

IFCE CONFIG

Write Security: 3; Read Security: 5
Provides interface configuration parameters (see Figure 5-11).

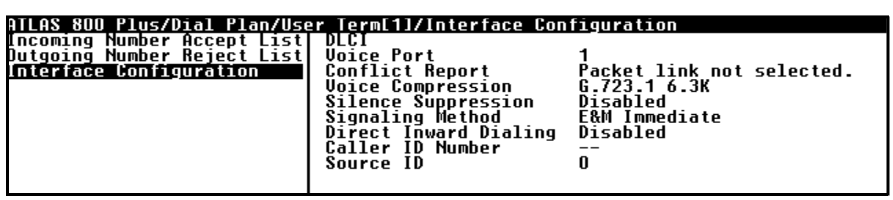


Figure 5-11. Interface Configuration Panel

DLCI
Write Security: 3; Read Security: 5
Selects the appropriate DLCI for this dial plan entry.

VOICE PORT
Write Security: 3; Read Security: 5
Identifies the voice port address of the remote unit. FSU 5622s support ports 1 and 2. A remote ATLAS supports ports 1 through 255.

CONFLICT REPORT
Read Security: 5
Provides a description of a conflict if it exists. Potential problems include DLCI unavailable or Voice port already in use.

VOICE COMPRESSION
Write Security: 3; Read Security: 5
Selects the voice compression algorithm used by this endpoint. Older ADTRAN 5622 FRADs use CCITT G.723.1 compression at 6.3 kbps. Newer FRADs also support the proprietary NETCODER algorithm at 6.4 kbps. Both endpoints must agree about the compression algorithm choice.

SILENCE SUPPRESSION
Write Security: 3; Read Security: 5
Reduces the total system bandwidth load by preventing ATLAS from sending frames containing a special silence code during periods of silence. Both endpoints must agree to use silence suppression. By default, silence suppression is **DISABLED**. To prohibit silence frames from transmitting and to decrease the total system bandwidth, **ENABLE** this feature.

SIGNALING METHOD
Write Security: 3; Read Security: 5
Selects the type of signaling that the remote port is configured to expect. Available options include the following: **E&M IMMEDIATE**, **E&M WINK**, and **LOOP START**.

DIRECT INWARD DIALING
Write Security: 3; Read Security: 5
Defines whether or not Direct Inward Dialing (DID) is used by the remote equipment. If DID is enabled, then the following options must be configured for **NETWORK** and **USER TERM** configurations.

CALLER ID
Write Security: 3; Read Security: 5
Defines the number ATLAS uses to provide caller ID to the network for outgoing calls sent through this endpoint. This field only displays if **DIRECT INWARD DIALING** is set to **DISABLED**, and **USER TERM** is selected. Setting this menu item is optional.

SOURCE ID
Write Security: 3; Read Security: 5
Defines the source ID. This field only displays if **DIRECT INWARD DIALING** is set to **DISABLED**, and **USER TERM** is selected. Setting this menu item is optional.

NETWORK TERM

DID DIGITS TRANSFERRED
Write Security: 3; Read Security: 5
Defines the number of digits sent to ATLAS from the Network if **DIRECT INWARD DIALING** (see page 5-7) is enabled.

DID PREFIX
Write Security: 3; Read Security: 5
Defines to ATLAS the prefix digits which are not received as a part of the DID number. ATLAS uses the combination of prefix and DID number to determine the user endpoint that should receive the incoming call.

TRUNK NUMBER
Write Security: 3; Read Security: 5
Determines which user endpoint should receive the incoming call when the network connection does not provide DID digits. This field only displays if **DIRECT INWARD DIALING** (see page 5-7) is set to Disabled, and **NETWORK TERM** (see page 5-8) is selected.

USER TERM

DID DIGITS TRANSFERRED
Write Security: 3; Read Security: 5
Defines the number of digits ATLAS is to send to the user equipment. This field only displays if **DIRECT INWARD DIALING** (see page 5-7) is set to Enabled.

CALLER ID NUMBER
Write Security: 3; Read Security: 5
Defines the number ATLAS uses to provide caller ID to the network for outgoing calls sent through this endpoint. This field only displays if **DIRECT INWARD DIALING** (see page 5-7) is set to **DISABLED**, and **USER TERM** is selected. Setting this menu item is optional.

SOURCE ID
Write Security: 3; Read Security: 5
Defines the source ID. This field only displays if **DIRECT INWARD DIALING** (see page 5-7) is set to **DISABLED**, and **USER TERM** is selected. Setting this menu item is optional.

Chapter 6 Frame Relay Configuration Examples

This chapter provides several step-by-step examples to help you configure your ATLAS for frame relay. Figure 6-1 illustrates an ATLAS configured to support packet data.

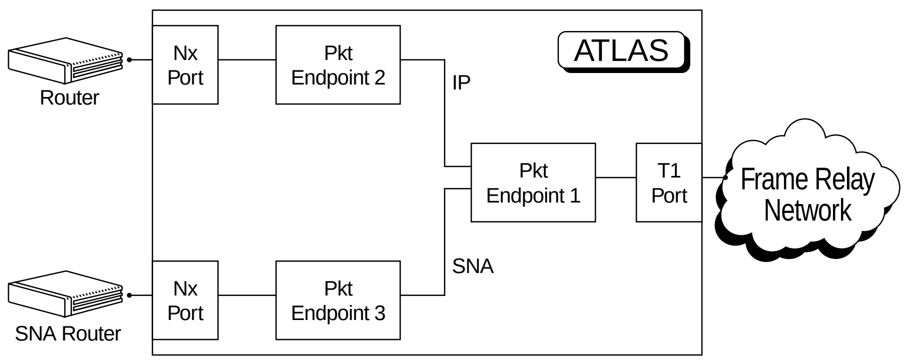


Figure 6-1. ATLAS to Support Packet Data Configuration

The general procedure for configuring the ATLAS depicted in Figure 6-1 is as follows:

1. From **PACKET MANAGER / PACKET ENDPNTS / CONFIG**, create three packet endpoints.
2. From **PACKET MANAGER / PACKET CNCTS**, make the IP and SNA protocol connections.
3. From **DEDICATED MAP**, connect the packet endpoints to the physical ports.

EXAMPLE 1: IP ROUTING NETWORK—ATLAS AS THE CENTRAL-SITE ROUTER

Example 1 (see Figure 6-2) depicts a typical IP routing network using an ATLAS as the central-site router. (This ATLAS unit is the ATLAS 800*PLUS* with a frame relay upgrade.) A TSU 100e with a router module is located at each of the two remote sites, and an FSU with an external router is located at a third site. The central-site ATLAS terminates a full T1 frame relay connection from the XYZ service provider, and the internal router terminates the IP traffic. To re-create this example, follow the process discussed below.

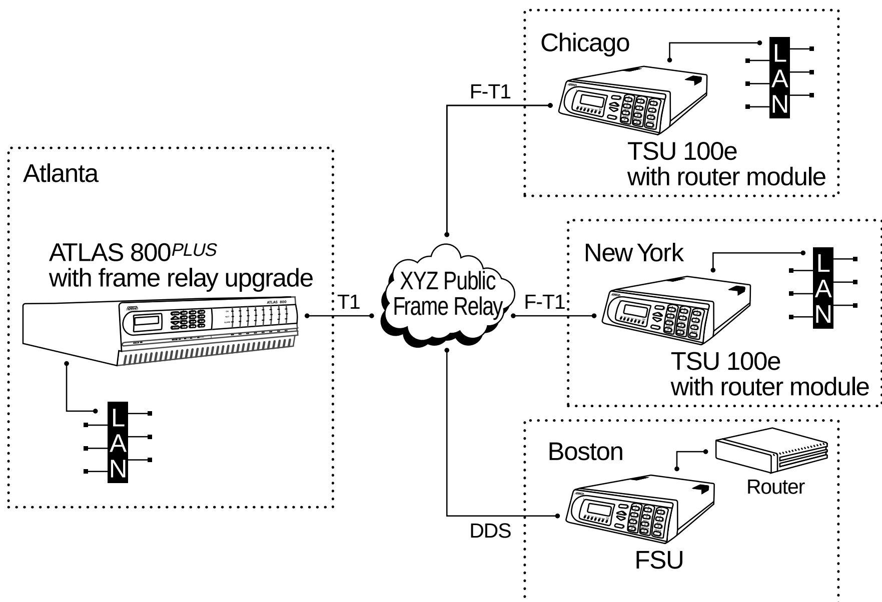


Figure 6-2. IP Routing Network with ATLAS as the Central-Site Router

Step 1 From **PACKET MANAGER/PACKET ENDPOINTS/CONFIG**, create the packet end-point (see Figure 6-3).

```
ATLAS 800 Plus/Packet Manager/Packet Endpnts/Config
Status      |   Endpnt Name          Protocol     Config Sublinks  Usage
Performance | 1 Example 1            Frame Relay  [+]    [+]       1-----u
Config      |
Test        |
```

Figure 6-3. Menu for Creating Packet Endpoints

Step 2 From **PACKET MANAGER/PACKET ENDPOINTS/CONFIG/SUBLINKS**, create three sublinks or DLCIs for frame relay (see Figure 6-4).

```
ATLAS 800 Plus--/Packet Manager/Packet Endpnts/Config[1]/Sublinks
Config   |        Name            DLCI     QOS     Burst   Config
Sublinks | 1 Boston               101       64       0      [+]
         | 2 Chicago              102      384       0      [+]
         | 3 New York             103      384       0      [+]
```

Figure 6-4. Menu for Creating Sublinks or DLCIs

Step 3 From **PACKET MANAGER/PACKET CNCTS**, connect the IP traffic to the internal router (see Figure 6-5).

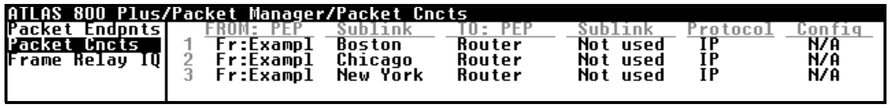


Figure 6-5. Menu for Connecting IP Traffic to Internal Router

Step 4 From **DEDICATED MAPS/CREATE/EDIT MAPS/CONNECTS**, attach the packet endpoint to the appropriate physical interface (see Figure 6-6).

Figure 6-6. Menu for Attaching Packet Endpoint to Physical Interface

EXAMPLE 2: IP ROUTING NETWORK—EXTERNAL ROUTERS

Example 2 (see Figure 6-7) depicts an IP network with external routers. An ATLAS 800*PLUS* with a frame relay upgrade is located at the central site. A TSU 100e with an external router connected to an Nx56/64 module is located at each of two remote sites, and an FSU with an external router is located at the third remote site. At the central site, ATLAS terminates a full T1 frame relay connection from the XYZ service provider and switches the PVCs to the external router. To re-create this example, follow the process discussed below.

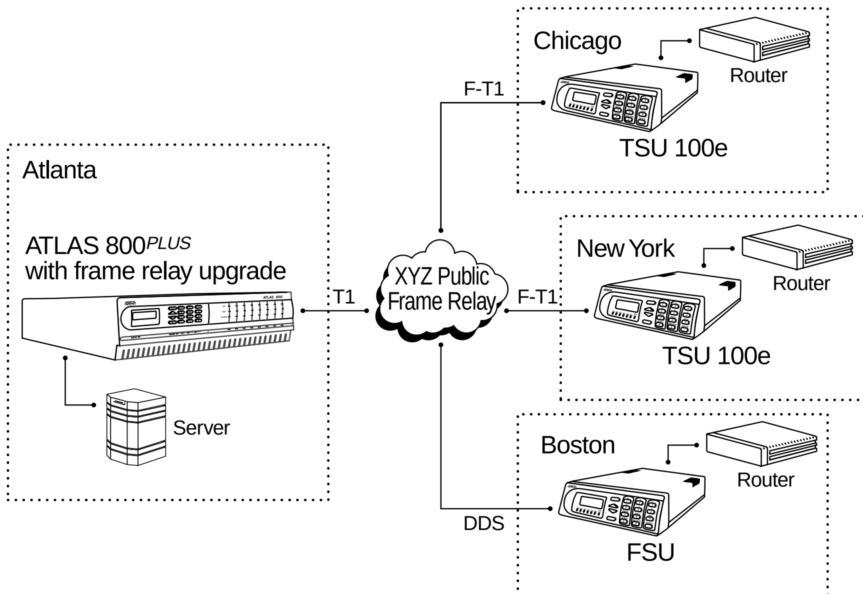


Figure 6-7. IP Network With External Routers

Step 1 From **PACKET MANAGER/PACKET ENDPOINTS/CONFIG**, create the packet endpoints (see Figure 6-8).

```
ATLAS 800 Plus--/Packet Manager/Packet Endpnts/Config
Status          Endpnt Name         Protocol    Config  Sublinks  Usage
Performance   1 Example 2           Frame Relay [+]     [+]       1-----u
Config        2 Server              Frame Relay [+]     [+]       1-----u
Test
```

Figure 6-8. Menu for Creating the Packet Endpoints

Step 2 From **PACKET MANAGER/PACKET ENDPOINTS/CONFIG/SUBLINKS**, configure the sublinks for both packet endpoints. For simplicity, use the same DLCI number going to the server as going to the frame relay network (see Figures 6-9 and 6-10).

```
ATLAS 800 Plus--/Packet Manager/Packet Endpnts/Config[1]/Sublinks
Config   |        Name           DLCI      QOS      Burst    Config
Sublinks | 1 Boston               16        64        0       [+]
         | 2 Chicago              17       384        0       [+]
         | 3 New York             18       384        0       [+]
```

Figure 6-9. Menu for Configuring Packet Endpoints (1) Sublinks

```
ATLAS 800 Plus--/Packet Manager/Packet Endpnts/Config[2]/Sublinks
Config   |        Name           DLCI      QOS      Burst    Config
Sublinks | 1 S_Boston             16         0        0       [+]
         | 2 S_Chicago            17         0        0       [+]
         | 3 S_New York           18         0        0       [+]
```

Figure 6-10. Menu for Configuring Packet Endpoints (2) Sublinks

Step 3 Make the packet connections (see Figure 6-11).

```
ATLAS 800 Plus--/Packet Manager/Packet Cncts
Packet Endpnts|    FROM: PEP   Sublink     TO: PEP    Sublink    Protocol  Config
Packet Cncts  | 1  Fr:Exampl   Boston      Fr:Server  S_Boston   All         N/A
Frame Relay IQ| 2  Fr:Exampl   Chicago     Fr:Server  S_Chicago  All         N/A
              | 3  Fr:Exampl   New York    Fr:Server  S_New Yor  All         N/A
```

Figure 6-11. Menu for Making the Packet Connections

Step 4 Connect the packet endpoints to the physical port. The server connects to an Nx56/64 module, and the frame relay network connects to a T1 port on the controller (see Figure 6-12).

```
ATLAS 800 Plus--/Dedicated Maps/Create/Edit Maps[1]/Connects
Connects |  #  FROM Slt   Port    TO Slt/S Prt/PEP  From Config    To Config   SIG
Enbl Day |  1   0)Sys C  1)T1/PR PktEndpt Fr:Exam    [DS0=2]         [+]
         |  2   4)V35Nx  1)Nx56/ PktEndpt Fr:Serv  [Rate=64k]        [+]
```

Figure 6-12. Menu for Connecting Packet Endpoints to Physical Port

EXAMPLE 3: PRIVATE FRAME RELAY NETWORK—ATLAS CENTRAL-SITE ROUTER

Example 3 (see Figure 6-13) depicts a private frame relay network using ATLAS as the central-site router and a frame relay switch. (This ATLAS unit is the ATLAS 800*PLUS* with a frame relay upgrade.) A TSU 100e with a router module is located at each of three remote sites. At the central site, ATLAS terminates a full T1 with eight DS0s from each of the remote sites DACSed onto the single T1. (See, also, the discussion of DACSing in the *ATLAS User Manual.*) To re-create this example, follow the process discussed below.

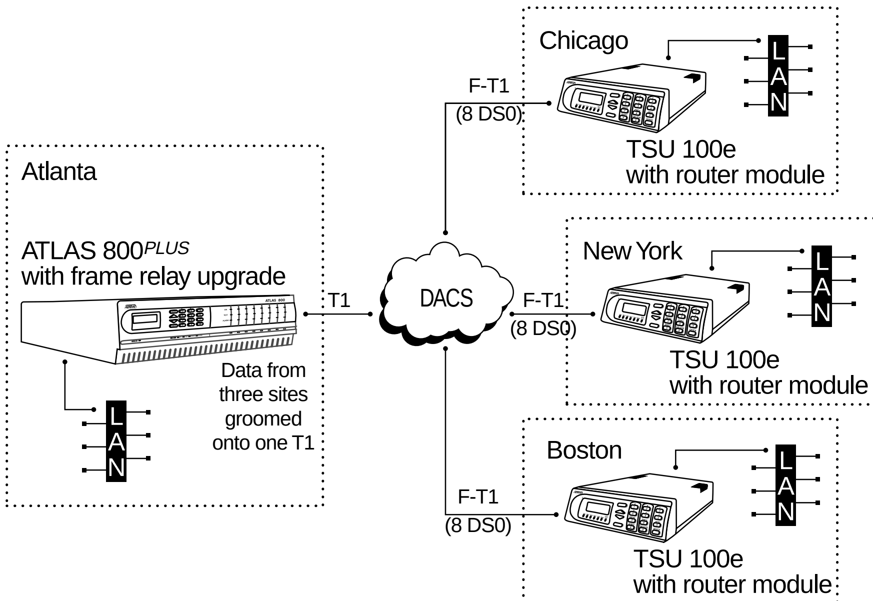


Figure 6-13. Private Frame Relay Network—ATLAS Central-Site Router

Step 1 From **PACKET MANAGER/PACKET ENDPOINTS/CONFIG**, create the packet endpoints (see Figure 6-14).

```
ATLAS 800 Plus--/Packet Manager/Packet Endpnts/Config
Status      |     Endpnt Name        Protocol    Config Sublinks   Usage
Performance |  1 Boston              Frame Relay [+]    [+]        1-----u
Config      |  2 Chicago             Frame Relay [+]    [+]        1-----u
Test        |  3 New York            Frame Relay [+]    [+]        1-----u
```

Figure 6-14. Menu for Creating Packet Endpoints

Step 2 From **PACKET MANAGER/PACKET ENDPOINTS/CONFIG/SUBLINKS**, create three identical sublinks. (Only one sublink is shown in Figure 6-15).

```
ATLAS 800 Plus--/Packet Manager/Packet Endpnts/Config[1]/Sublinks
Config   |        Name          DLCI     QOS     Burst    Config
Sublinks |  1 DLCI 100          100      512      0        [+]
```

Figure 6-15. Menu for Creating Sublinks

Step 3 From **PACKET MANAGER/PACKET CNCTS**, connect the packet endpoints (see Figure 6-16).

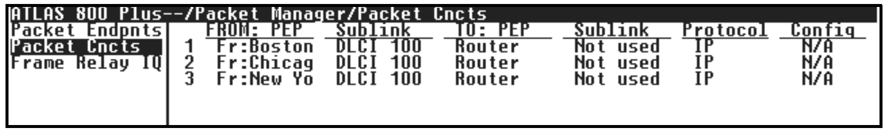


Figure 6-16. Menu for Connecting Packet Endpoints

Step 4 Connect the packet endpoint to the physical interface (see Figure 6-17).

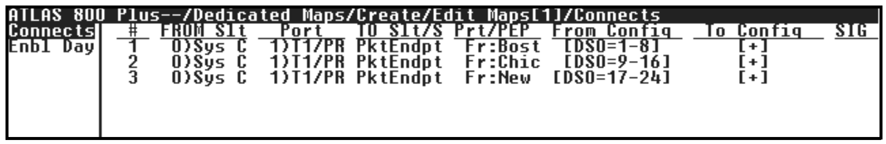


Figure 6-17. Menu for Connecting Packet Endpoint to Physical Interface

EXAMPLE 4: PUBLIC FRAME RELAY NETWORK—IP DATA AND PACKET VOICE

Example 4 (see Figure 6-18) depicts a public frame relay network with IP data and packet voice. An ATLAS 800*PLUS* with the frame relay upgrade installed is located at the central site, and an Express 5200 is located at each remote site. ATLAS acts as the central-site router and performs voice switching. To re-create this example, follow the process discussed below.

> **NOTE** *Packet voice termination requires the* **PACKET VOICE MODULE**.

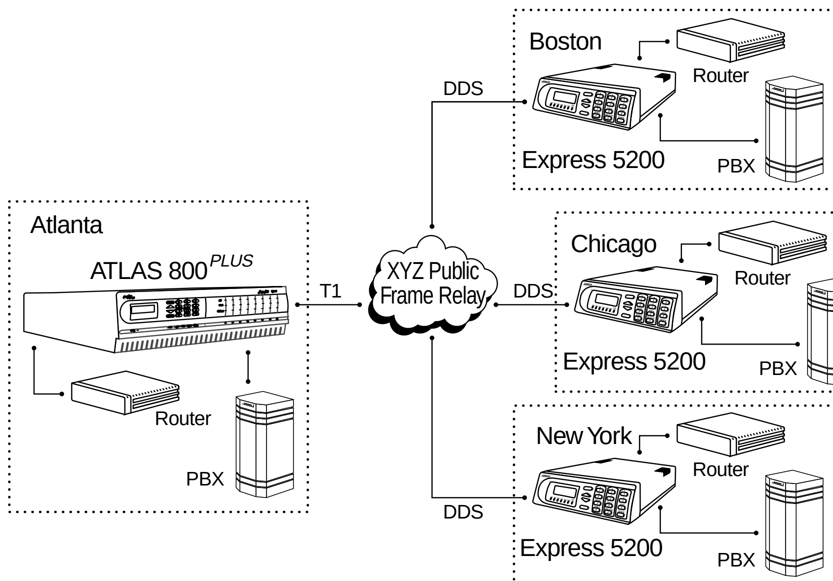


Figure 6-18. Public Frame Relay Network

Step 1 From **PACKET MANAGER/PACKET ENDPNTS/CONFIG**, create the packet endpoint (see Figure 6-19).

```
ATLAS 800 Plus--/Packet Manager/Packet Endpnts/Config
Status     |     Endpnt Name      Protocol    Config Sublinks  Usage
Performance|  1 Public            Frame Relay [+]    [+]       1-----u
Config     |
Test       |
```

Figure 6-19. Menu for Creating Packet Endpoint

Step 2 From **PACKET MANAGER/PACKET ENDPNTS/CONFIG**, configure the sublinks (see Figure 6-20).

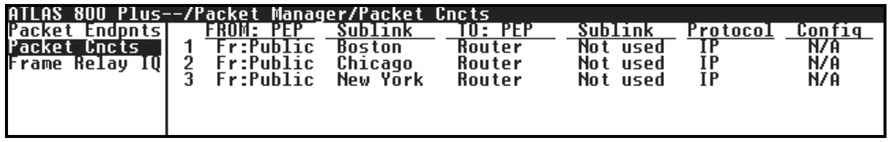


Figure 6-20. Menu for Configuring Sublinks

Step 3 From **PACKET MANAGER/PACKET CNCTS**, connect the packet data to the internal router (see Figure 6-21).

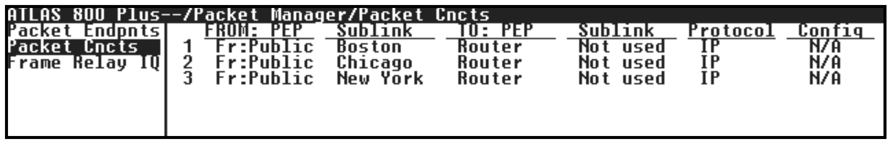


Figure 6-21. Menu for Connecting Packet Data

Step 4 Configure the dial plan for packet voice. Refer to *ATLAS User Manual* for detail on dial plan configuration (see Figure 6-22).

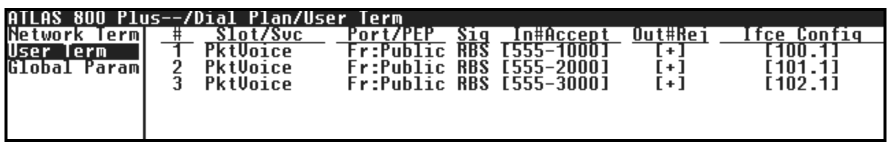


Figure 6-22. Menu for Configuring Dial Plan

Step 5 Connect the packet endpoint to the physical interface (see Figure 6-23).

Figure 6-23. Menu for Connecting Packet Endpoints

EXAMPLE 5: PRIVATE FRAME RELAY NETWORK—PACKET VOICE

Example 5 (see Figure 6-24) shows a private frame relay network using compressed voice in a private frame relay network. An ATLAS 800 *PLUS* with the frame relay upgrade is located at each site and a PBX is connected to the ATLAS using a clear-channel T1 connection. Each PBX uses DS0s 1—23 for voice and DS0 24 for signaling; all calls are to be completely managed by the PBXs. In this network, ATLAS does not terminate the signaling information, but forwards the signaling between endpoints using a transparent bit oriented protocol (TBOP) frame relay connection. To re-create this example, follow the process discussed below.

> **NOTE** *Packet voice transmission requires the Voice Compression Module.*

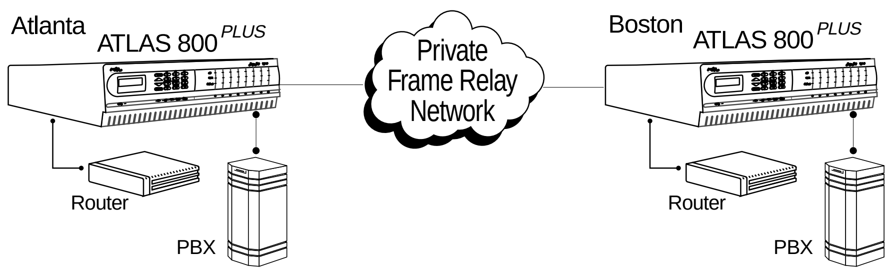


Figure 6-24. Private Frame Relay Network Using Compressed Voice

Step 1

From **PACKET MANAGER/PACKET ENDPNTS/CONFIG**, create the packet endpoints: create a frame relay endpoint for the private frame relay link, and create a TBOP link to carry the signaling between the PBXs (see Figure 6-25).

```
ATLAS 800 Plus--/Packet Manager/Packet Endpnts/Config
Status     |     Endpnt Name       Protocol    Config Sublinks  Usage
Performance| 1 Atlanta - TBOP     Trans BOP                      1-----u
Config     | 2 Boston              Frame Relay [+]    [+]         1-----u
Test       |
```

Figure 6-25. Menu for Creating Packet Endpoints

Step 2

From **PACKET MANAGER/PACKET ENDPOINTS/CONFIG/SUBLINKS**, configure the sublinks.

All 23 voice channels can be carried by one DLCI transported on five DS0 channels. One DS0 and one DLCI are required for the TBOP channel carrying the signaling between the PBXs. To ensure that both the voice and the TBOP DLCIs are allocated their necessary frame relay bandwidth, set the Quality-Of-Service (**QOS**) parameter with 64K allocated to the TBOP channel and 320K (5*64) allocated to the voice channels (see Figure 6-26).

```
ATLAS 800 Plus--/Packet Manager/Packet Endpnts/Config[2]/Sublinks
Config           Name          DLCI      QOS      Burst    Config
Sublinks  1 D16 - Voice         16       320        0       [+]
          2 D17 - Signaling     17        64        0       [+]
```

Figure 6-26. Menu for Configuring Sublinks

Step 3

Connect the TBOP packet endpoints. Connect the TBOP data path between the DS0 containing the signaling information and the private frame relay resource (see Figure 6-27).

```
ATLAS 800 Plus--/Packet Manager/Packet Cncts
Packet Endpnts    FROM: PEP   Sublink    TO: PEP    Sublink    Protocol  Config
Packet Cncts   1  Tb:Atlant  Not used  Fr:Boston  D17 - Sig  Transpa    [+]
Frame Relay IQ
```

Figure 6-27. Menu for Connecting the TBOP Endpoints

Step 4

Connect packet endpoints to the physical links. Each DS0 carrying voice from the PBX must be connected to the frame relay endpoint (see Figure 6-28).

```
ATLAS 800 Plus--/Dedicated Maps/Create/Edit Maps[1]/Connects
Connects  #  FROM Slt   Port    TO Slt/S Prt/PEP  From Config    To Config  SIG
Enbl Day  1  0)Sys C  1)T1/PR PktVoice Fr:Bost  [DS0=1]        [16.1]    Off
          2  0)Sys C  1)T1/PR PktVoice Fr:Bost  [DS0=2]        [16.2]    Off
          3  0)Sys C  1)T1/PR PktVoice Fr:Bost  [DS0=3]        [16.3]    Off
          4  0)Sys C  1)T1/PR PktVoice Fr:Bost  [DS0=4]        [16.4]    Off
          5  0)Sys C  1)T1/PR PktVoice Fr:Bost  [DS0=5]        [16.5]    Off
          6  0)Sys C  1)T1/PR PktVoice Fr:Bost  [DS0=6]        [16.6]    Off
          7  0)Sys C  1)T1/PR PktVoice Fr:Bost  [DS0=7]        [16.7]    Off
```

Figure 6-28. Menu for Connecting Packet Endpoints to Physical Links

Step 4-a

TBOP Connection Details. The PBX DS0 carrying the signaling information must be connected to the frame relay endpoint (see Figure 6-29).

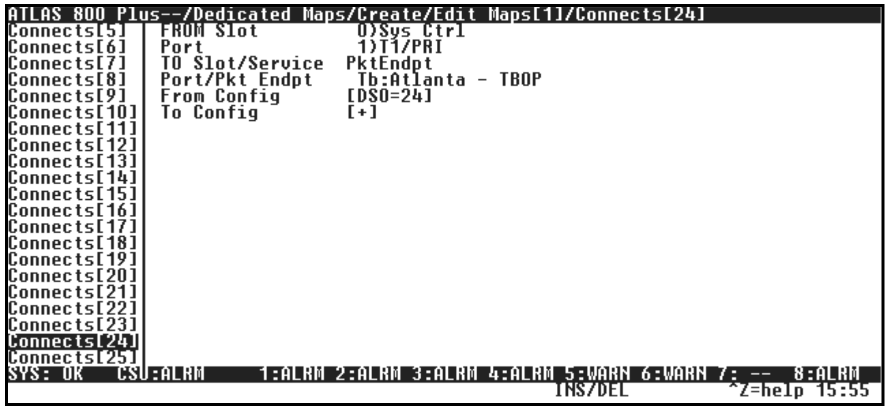


Figure 6-29. Connecting PBX DS0 to Frame Relay Endpoint

Step 4-b

Frame Relay Connection Details. Connecting the frame relay endpoint to the private frame relay network requires six DS0s, one for the TBOP connection and five for the compressed voice connections (see Figure 6-30).

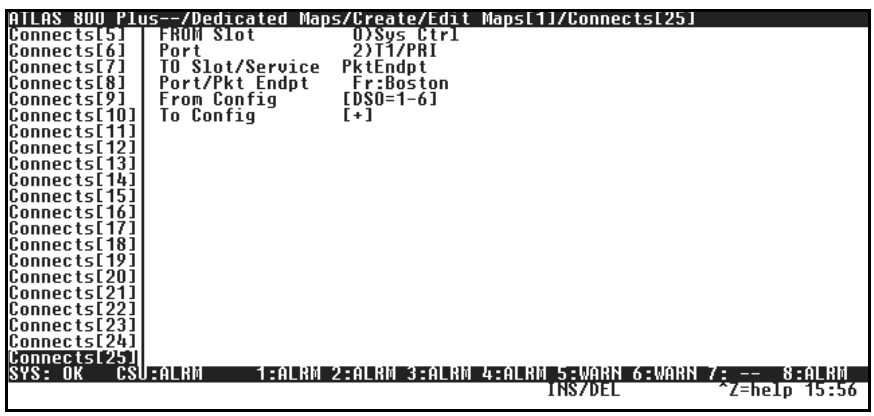


Figure 6-30. Connecting FR Endpoint to FR Private Network

EXAMPLE 6: IP ROUTING NETWORK WITH DIAL BACKUP

Example 6 depicts an IP network with external routers (see Figure 6-31). An ATLAS 800*PLUS* with a frame relay upgrade is located at both the central site and at one of the remote sites (Boston). A TSU IQ with an external router connected to an Nx56/64 module is located at each of the two remaining remote sites (Chicago and New York). At the central site, ATLAS terminates a full T1 frame relay connection from the XYZ service provider and switches the PVCs (sublinks) to the external router.

In the event of problems in the connections to the XYZ public frame relay provider, each device can redirect traffic to a backup network. In this example, each TSU IQ uses an ISDN DBU module to connect to the PSTN via BRI. Each ATLAS is connected to the PSTN via PRI. To re-create this example, follow the process discussed below to configure the central site ATLAS.

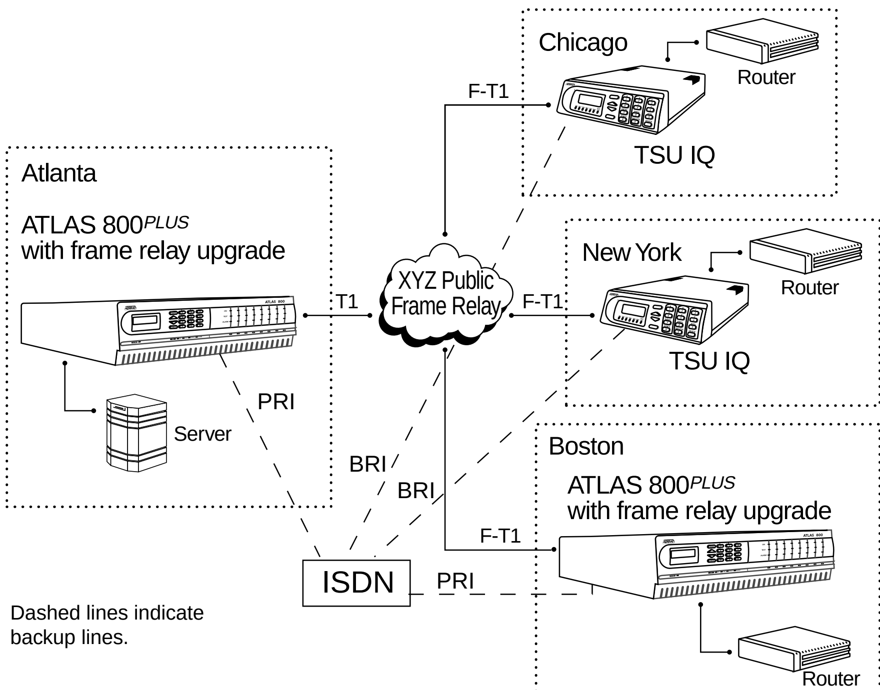
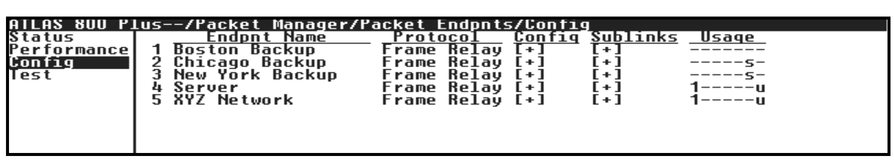


Figure 6-31. IP Routing Network with Dial Backup

Step 1 From **PACKET MANAGER/PACKET ENDPNTS/CONFIG**, create the packet endpoints (see Figure 6-32).



```
ATLAS 800 Plus--/Packet Manager/Packet Endpnts/Config
Status         Endpnt Name        Protocol    Config  Sublinks   Usage
Performance  1 Boston Backup      Frame Relay [+]     [+]        -------
Config       2 Chicago Backup     Frame Relay [+]     [+]        -----s-
Test         3 New York Backup    Frame Relay [+]     [+]        -----s-
             4 Server             Frame Relay [+]     [+]        1-----u
             5 XYZ Network        Frame Relay [+]     [+]        1-----u
```

Figure 6-32. Menu for Creating the Packet Endpoints

Step 2 Configure the sublinks for the packet endpoints. For simplicity, use the same DLCI number going to the server as going to the frame relay network (see Figures 6-33 through 6-37).

```
ATLAS 800 Plus--/Packet Manager/Packet Endpnts/Config[4]/Sublinks
Config            Name            DLCI      QOS      Burst    Config
Sublinks  1 S-Boston              16        0        0        [+]
          2 S-Chicago             17        0        0        [+]
          3 S-New York            18        0        0        [+]
```

Figure 6-33. Menu for Configuring Packet Endpoint 1 (Server) Sublinks

```
ATLAS 800 Plus--/Packet Manager/Packet Endpnts/Config[5]/Sublinks
Config            Name            DLCI      QOS      Burst    Config
Sublinks  1 Boston                16        0        0        [+]
          2 Chicago               17        0        0        [+]
          3 New York              18        0        0        [+]
```

Figure 6-34. Menu for Configuring Packet Endpoint 2 (XYZ Network) Sublinks

```
ATLAS 800 Plus--/Packet Manager/Packet Endpnts/Config[2]/Sublinks
Config            Name            DLCI      QOS      Burst    Config
Sublinks  1 Chicago_Bkup          17        0        0        [+]
```

Figure 6-35. Menu for Configuring Packet Endpoint 3 (Chicago Backup) Sublink

```
ATLAS 800 Plus--/Packet Manager/Packet Endpnts/Config[3]/Sublinks
Config            Name            DLCI      QOS      Burst    Config
Sublinks  1 New York_Bkup         18        0        0        [+]
```

Figure 6-36. Menu for Configuring Packet Endpoint 4 (New York Backup) Sublink

```
ATLAS 800 Plus--/Packet Manager/Packet Endpnts/Config[1]/Sublinks
Config            Name            DLCI      QOS      Burst    Config
Sublinks  1 Boston_Bkup           16        0        0        [+]
```

Figure 6-37. Menu for Configuring Packet Endpoint 5 (Boston Backup) Sublink

Step 3 Configure the backup sublinks for use as backup, and tie them to the primary sublinks. See Figure 6-38 for the sublink configuration for the Boston backup sublink. Follow similar steps to configure the Chicago and New York sublinks.

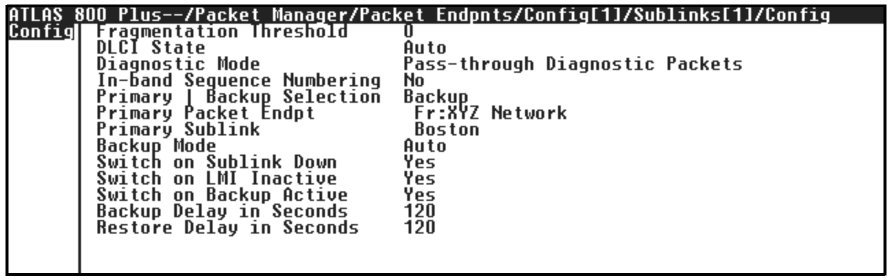


Figure 6-38. Menu for Configuring Backup Sublink 1

Step 4 Make the packet connections (see Figure 6-39).

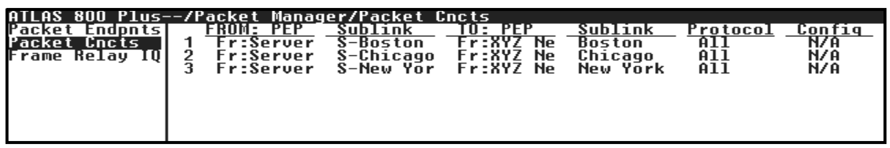


Figure 6-39. Menu for Making the Packet Connections

Step 5 Connect the packet endpoints to the physical port. The server connects to an Nx56/64 module, and the frame relay network connects to a T1 port on the controller (see Figure 6-40).

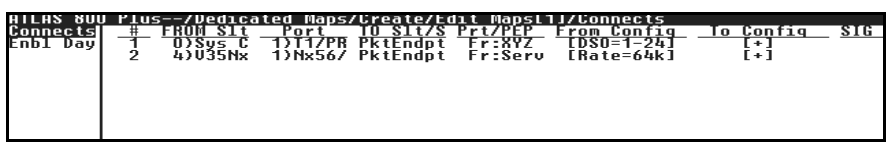


Figure 6-40. Menu for Connecting Packet Endpoints to Physical Port

Step 6 Add the backup endpoints to the dial plan, as shown below (see also Figure 6-41). Refer to the ATLAS manual for details on dial plan configuration.

Backup Sublink	OutDial Number	Accept #
Chicago Backup	(454) 111-9999	(444) 963-1111
New York Backup	(545) 222-8888	(444) 963-2222
Boston Backup	(555) 333-7777	(444) 963-3333

```
ATLAS 800 Plus--/Dial Plan/User Term
Network Term   #   Slot/Svc    Port/PEP   Sig  In#Accept    Out#Rej   Ifce Config
User Term      1   PktEndpt    Fr:Chicag       [(444)963-]  [+]           [+]
Global Param   2   PktEndpt    Fr:New Yo       [(444)963-]  [+]           [+]
               3   PktEndpt    Fr:Boston       [(444)963-]  [+]           [+]
```

Figure 6-41. Menu for Adding Backup Packet Endpoints to the Dial Plan

Step 7 Configure the interface options for the Boston endpoint under the **IFCE CONFIG** menu (see Figure 6-42). Follow similar steps to configure the New York and Chicago endpoints, using dial numbers of (545) 222-8888 and (454) 111-9999, respectively.

> *The ADTRAN IQ and Express families of products require that the* **SUPPORT DBU HANDSHAKE** *option be set to* **YES** *for proper operation.*
>
> *For those products that allow enabling or disabling of this option, the devices at each end of the connection must be set the same for proper operation.*
>
> *In this example, this option is set to* **NO** *for the Atlanta-to-Boston connection, but set to* **YES** *for the Atlanta-to-Chicago and Atlanta-to-New York connections.*

```
ATLAS 800 Plus--/Dial Plan/User Term[3]/Interface Configuration
Incoming Number Accept List  Outdial Number          (555)333-7777
Outgoing Number Reject List  Outgoing Call Type      Digital 64
Interface Configuration      Redial Timer            15
                             Randomize Timer         Disabled
                             Retry Count             0
                             Outgoing Caller ID      (444)963-3333
                             Source ID               0
                             Route Incoming Call     Using Incoming Num
                             Support DBU Handshake   No
                             Min DS0's               1
                             Max DS0's               1
```

Figure 6-42. Menu for Configuring the Switched Packet Endpoint Interface Configuration

Step 8 Configure the PRI under the **NETWORK TERM** list of the dial plan (see Figure 6-43). Add three entries to the outgoing accept number list: (454)111-9999, (545) 222-8888, and (555) 333-7777.

```
ATLAS 800 Plus/Dial Plan/Network Term
Network Term   #   Slot/Svc     Port/PEP   Sig  Out#Accept   Out#Rej   Ifce Config
User Term      1   0)Sys Ctrl   2)T1/PRI   PRI  [(454)111-]  [+]           [+]
Global Param
```

Figure 6-43. Menu for Configuring the PRI Connections to the PSTN

EXAMPLE 7: PRIVATE FRAME RELAY NETWORK WITH DEDICATED BACKUP

Example 7 depicts a private frame relay network connecting two sites (see Figure 6-44). An ATLAS 800*PLUS* with a frame relay upgrade exists at each site. A full T1 private frame relay connection exists for routing compressed voice traffic. Another full T1 private frame relay connection exists between the two sites to route IP traffic (data and compressed voice). Each ATLAS must include a Voice Compression and T1 / PRI module to support these requirements.

In the event of a problem on the T1 circuit dedicated for voice traffic, the second T1 can be used to reroute the voice traffic, sharing bandwidth with the IP traffic. To re-create this example, follow the process discussed below to configure the ATLAS in Atlanta. The ATLAS in Boston requires a similar configuration.

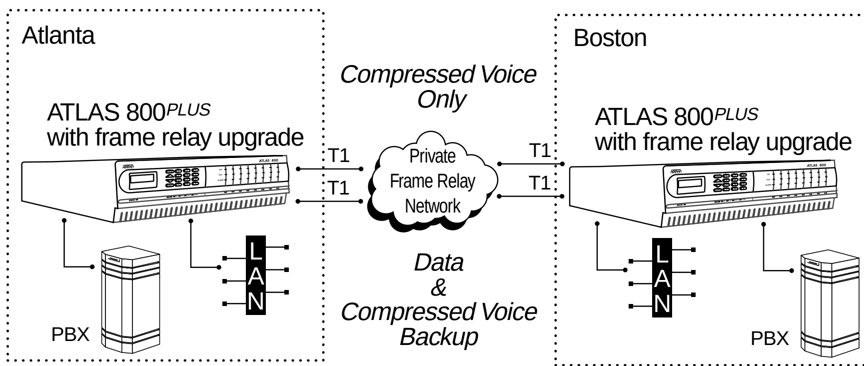


Figure 6-44. Private Frame Relay Network with Dedicated Backup

Step 1

Create the packet endpoints, two frame relay endpoints for the private frame relay links, and one TBOP link for carrying the signaling between the PBXs. Select the signaling role of **BOTH** for the link used for backup (see Figure 6-45).

```
ATLAS 800 Plus/Packet Manager/Packet Endpnts/Config[3]/Protocol
Status      |    Endpnt Name        Protocol    Config  Sublinks  Usage
Performance | 1 Atlanta-TBOP        Trans BOP                     -------
Config      | 2 Boston-Data         Frame Relay [+]     [+]       -------
Test        | 3 Boston-Voice        Frame Relay [+]     [+]       -------
```

Figure 6-45. Menu for Creating Packet Endpoints

Step 2

Configure the sublinks for the voice link.

All 23 voice channels can be carried by one sublink transported on five DS0 channels to Boston. One DS0 channel and one sublink are required for the TBOP channel carrying the signaling between the PBXs. To ensure that both the voice and the TBOP sublinks are allocated their necessary frame relay bandwidth, set the Quality-Of-Service (**QOS**) parameter with 64k allocated to the TBOP channel and 320k (5*64) allocated to the voice channels. The remaining bandwidth is reserved for backing up the data link (see Figure 6-46).

```
ATLAS 800 Plus--/Packet Manager/Packet Endpnts/Config[3]/Sublinks
Config   |        Name          DLCI      QOS      Burst    Config
Sublinks | 1 Voice               16       320        0       [+]
         | 2 Signaling           17        64        0       [+]
```

Figure 6-46. Menu for Configuring Sublinks

Step 3 Configure the sublinks for the data / backup link (see Figure 6-47).

```
ATLAS 800 Plus--/Packet Manager/Packet Endpnts/Config[2]/Sublinks[2]/QOS
Config   |        Name          DLCI      QOS      Burst    Config
Sublinks | 1 Voice_Bkup          16       320        0       [+]
         | 2 Signaling_Bkup      17        64        0       [+]
         | 3 Data                18        0         0       [+]
```

Figure 6-47. Menu for Configuring Sublinks

Step 4 Configure the backup sublinks for use as backup, and tie them to the primary sublinks (see Figures 6-48 and 6-49).

```
ATLAS 800 Plus--/Packet Manager/Packet Endpnts/Config[2]/Sublinks[1]/Config
Config| Fragmentation Threshold      0
      | DLCI State                   Auto
      | Diagnostic Mode              Pass-through Diagnostic Packets
      | In-band Sequence Numbering   No
      | Primary | Backup Selection   Backup
      | Primary Packet Endpt          Fr:Boston - Voice
      | Primary Sublink               Voice
      | Backup Mode                  Auto
      | Switch on Sublink Down       Yes
      | Switch on LMI Inactive       Yes
      | Switch on Backup Active      Yes
      | Backup Delay in Seconds      120
      | Restore Delay in Seconds     120
```

Figure 6-48. Menu for Configuring Backup Voice Sublink

```
ATLAS 800 Plus--/Packet Manager/Packet Endpnts/Config[2]/Sublinks[2]/Config
Config| Fragmentation Threshold      0
      | DLCI State                   Auto
      | Diagnostic Mode              Pass-through Diagnostic Packets
      | In-band Sequence Numbering   No
      | Primary | Backup Selection   Backup
      | Primary Packet Endpt          Fr:Boston - Voice
      | Primary Sublink               Signaling
      | Backup Mode                  Auto
      | Switch on Sublink Down       Yes
      | Switch on LMI Inactive       Yes
      | Switch on Backup Active      Yes
      | Backup Delay in Seconds      120
      | Restore Delay in Seconds     120
```

Figure 6-49. Menu for Configuring Backup Signaling Sublink

Step 5 Make the packet connections (see Figure 6-50).

```
ATLAS 800 Plus--/Packet Manager/Packet Cncts
Packet Endpnts|    FROM: PEP   Sublink    TO: PEP    Sublink   Protocol  Config
Packet Cncts  |  1  Fr:Boston  Data       Router     Not used  IP        N/A
Frame Relay IQ|  2  Fr:Boston  Signaling  Tb:Atlant  Not used  Transpa   [+]
```

Figure 6-50. Menu for Making the Packet Connections

Step 6 Connect the packet endpoints to the physical ports.

Each DS0 carrying voice from the PBX must be connected to the frame relay endpoint. Figure 6-51 shows the entries for channels 1-21. The **PRT/PEP** field is the **BOSTON_VOICE** packet endpoint.

```
ATLAS 800 Plus--/Dedicated Maps/Create/Edit Maps[1]/Connects[1]
Connects|  #  FROM Slt  Port     TO Slt/S  Prt/PEP  From Config  To Config  SIG
Enbl Day|  1  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=1]      [16.1]     Off
        |  2  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=2]      [16.2]     Off
        |  3  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=3]      [16.3]     Off
        |  4  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=4]      [16.4]     Off
        |  5  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=5]      [16.5]     Off
        |  6  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=6]      [16.6]     Off
        |  7  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=7]      [16.7]     Off
        |  8  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=8]      [16.8]     Off
        |  9  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=9]      [16.9]     Off
        | 10  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=10]     [16.10]    Off
        | 11  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=11]     [16.11]    Off
        | 12  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=12]     [16.12]    Off
        | 13  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=13]     [16.13]    Off
        | 14  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=14]     [16.14]    Off
        | 15  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=15]     [16.15]    Off
        | 16  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=16]     [16.16]    Off
        | 17  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=17]     [16.17]    Off
        | 18  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=18]     [16.18]    Off
        | 19  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=19]     [16.19]    Off
        | 20  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=20]     [16.20]    Off
```

Figure 6-51. Menu for Connecting Packet Endpoints to Physical Ports

Step 6-a The TBOP endpoint is mapped to DS0 24 of the PBX connection. All 24 DS0s of controller T1 port 2 are mapped to the private frame relay link to Boston. Only 6 DS0s are required for the voice and signaling channels. The remaining 18 channels are available for backing up the data link. The data link, Boston_Data, is mapped to a T1 port on a T1 / PRI module. Figure 6-52 shows the remaining dedicated map entries.

```
ATLAS 800 Plus--/Dedicated Maps/Create/Edit Maps[1]/Connects
Connects|  #  FROM Slt  Port     TO Slt/S  Prt/PEP  From Config  To Config  SIG
Enbl Day|  7  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=7]      [16.7]     Off
        |  8  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=8]      [16.8]     Off
        |  9  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=9]      [16.9]     Off
        | 10  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=10]     [16.10]    Off
        | 11  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=11]     [16.11]    Off
        | 12  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=12]     [16.12]    Off
        | 13  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=13]     [16.13]    Off
        | 14  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=14]     [16.14]    Off
        | 15  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=15]     [16.15]    Off
        | 16  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=16]     [16.16]    Off
        | 17  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=17]     [16.17]    Off
        | 18  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=18]     [16.18]    Off
        | 19  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=19]     [16.19]    Off
        | 20  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=20]     [16.20]    Off
        | 21  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=21]     [16.21]    Off
        | 22  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=22]     [16.22]    Off
        | 23  0)Sys C   1)T1/PR  PktVoice  Fr:Bost  [DS0=23]     [16.23]    Off
        | 24  0)Sys C   1)T1/PR  PktEndpt  Tb:Atla  [DS0=24]     [+]
        | 25  0)Sys C   2)T1/PR  PktEndpt  Fr:Bost  [DS0=1-24]   [+]
        | 26  7)T1/PR   2)T1/PR  PktEndpt  Fr:Bost  [DS0=1-24]   [+]
```

Figure 6-52. Menu for Connecting Packet Endpoints to Physical Ports

EXAMPLE 8: IP ROUTING USING PPP

Example 8 depicts a typical IP routing situation for a point-to-point link using PPP (see Figure 6-53). A TSU 100e with a Router Module is at the remote site. The ATLAS terminates up to a full T1 connection to the peer. To recreate this example, follow the process discussed below.

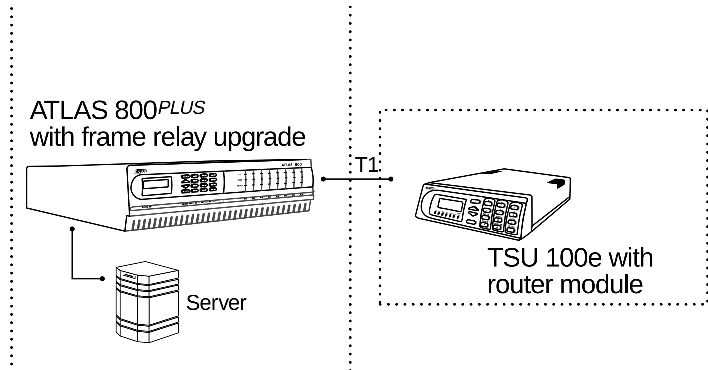


Figure 6-53. Private Frame Relay Network with Dedicated Backup

Step 1 From **PACKET MANAGER/PACKET ENDPOINTS/CONFIG**, create the packet endpoint (see Figure 6-54).

```
ATLAS 800 Plus--/Packet Manager/Packet Endpnts/Config
Status       |    Endpnt Name        Protocol     Config  Sublinks   Usage
Performance  |  1 TSU 100e           PPP          [+]                1-----u
Config       |
Test         |
```

Figure 6-54. Menu for Creating Packet Endpoints

Step 2 From **PACKET MANAGER/PACKET ENDPOINTS/CONFIG/CONFIG/AUTHENTICATION**, configure the authentication parameters for the peer (Rx) and the authentication parameters the peer is going to use to authenticate you (Tx) (see Figure 6-55).

```
ATLAS 800 Plus--/Packet Manager/Packet Endpnts/Config[1]/Config/Authentication
Authentication | RX Method          PAP, CHAP, or EAP
IP             | RX Authentication  Local
Debug Log      | RX Username
               | RX Password        *******
               | TX Method          PAP, CHAP, or EAP
               | TX Username
               | TX Password        *******
```

Figure 6-55. Menu for Configuring Sublinks

Step 3 From **PACKET MANAGER/PACKETCNCTS**, connect the packet endpoint to the Router using the IP protocol (see Figure 6-56).

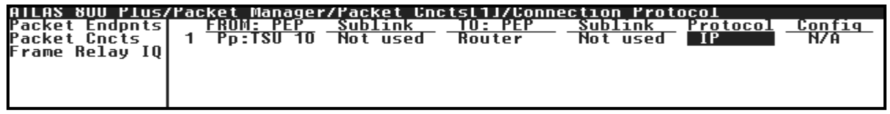


Figure 6-56. Menu for Configuring Sublinks

Step 4 From **ROUTER/IP/INTERFACES**, configure the IP addresses for the ATLAS and the peer. For unnumbered links, you should leave the Address field as 0.0.0.0 and the Far-End Address can be the peer's address (this is not needed since PPP will negotiate the peer's IP address) (see Figure 6-57).

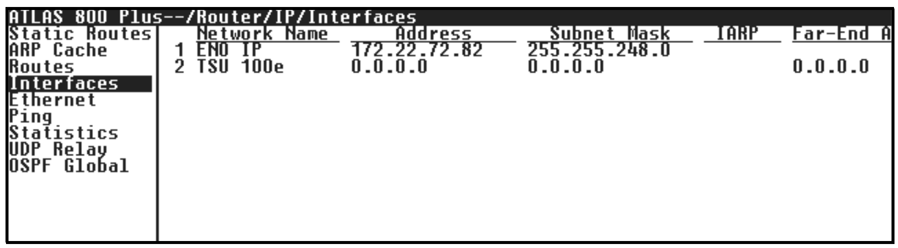


Figure 6-57. Menu for Configuring Backup Voice Sublink

Step 5 From **DEDICATED MAPS/CREATE/EDIT MAPS[1]/CONNECTS**, connect the packet endpoint to a physical port (see Figure 6-58).

Figure 6-58. Menu for Making the Packet Connections

Step 6 The state of the PPP link can be viewed from **PACKET MANAGER/PACKET ENDPOINTS/PERFORMANCE[1]/LINK STATS**. These stats indicate the state of the different layers of PPP.

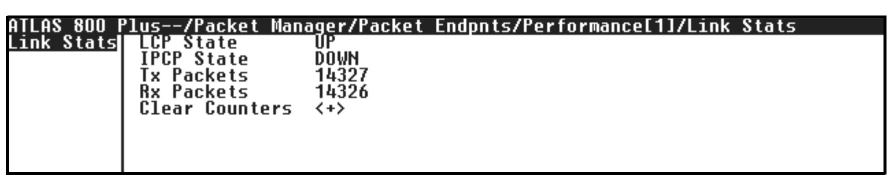


Figure 6-59. Menu for Connecting Packet Endpoints to Physical Ports

Chapter 7 Using Frame Relay IQ

FRAME RELAY IQ provides information about frame relay activity. Statistical information for ports and PVCs is collected in day and interval (5, 10, 15, 20, or 30 minutes) statistics tables. Users can adjust the number of days and number of intervals for which statistics are gathered; however, interval collections are limited to 5, 10, 15, 20, or 30 minutes.

FRAME RELAY IQ

Gathers and stores statistical information in the submenus **ENABLE IQ STATS**, **PORT ENABLES**, **CONFIG**, and **VIEW IQ STATISTICS** (see the menu tree in Figure 7-1)

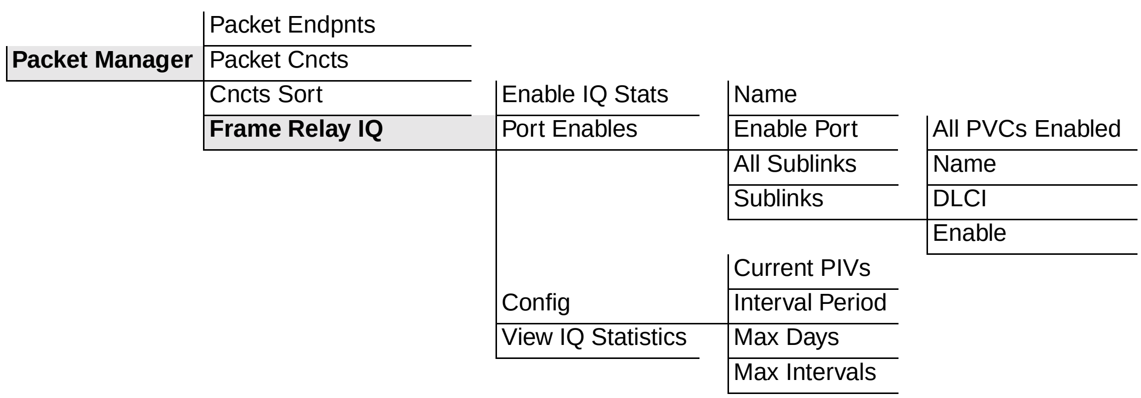


Figure 7-1. Frame Relay IQ Menus

ENABLE IQ STATS

Globally enables and disables IQ statistics gathering. IQ statistics are only gathered when this option is enabled. This field defaults to the original setting of **[15 MIN, 7 DAYS, 96 INTS]** when re-enabled.

PORT ENABLES

Enables and disables IQ statistics gathering for each port. Use the submenus **NAME**, **ENABLE**, **ALL SUBLINKS**, and **SUBLINKS** to configure the individual ports.

NAME

Displays the port number and name.

ENABLE PORT Enables and disables IQ statistics gathering for the port identified in **NAME**.

ALL SUBLINKS Provides an easy way to enable or disable IQ statistics gathering on all sublinks. When this activator reads **DISABLE**, pressing **Enter** disables IQ statististics gathering on all sublinks. When it reads **ENABLE**, pressing **Enter** enables IQ statistics gatering on all sublinks.

SUBLINKS Identifies the PVC to be polled.

ALL PVCS ENABLED
Indicates the number of sublinks that ATLAS will collect IQ data for within the given link.

NAME
Displays the user-designated name of the sublink (up to 15 characters).

DLCI
Displays the Data Link Connection Identifier (circuit number).

ENABLE
Indicates collection of IQ data for the target DLCI.

CONFIG

Sets the parameters for IQ statistics gathering.

CURRENT PIVS Identifies resources used by IQ statistics storage. A PIV is a port or PVC per interval. ATLAS can track up to 10,000 PIVs. Think of it as a resource meter. The PIV number is derived from the **MAX DAYS** and **MAX INTERVALS** selected by the user. Changing one affects the other.

INTERVAL PERIOD Sets the period for IQ statistics gathering. Options are 5, 10, 15, 20, and 30 minutes.

MAX DAYS Defines the number of history day intervals to keep. Maximum entry is dependent on the **MAX INTERVALS** setting.

MAX INTERVALS Defines the number of history intervals to keep. Maximum entry is dependent on the **MAX DAYS** setting.

VIEW IQ STATISTICS

Displays statistical information gathered for intervals and days on a port and for intervals and days on sublinks (PVCs or DLCIs). Figure 7-2 shows the menu tree for this option.

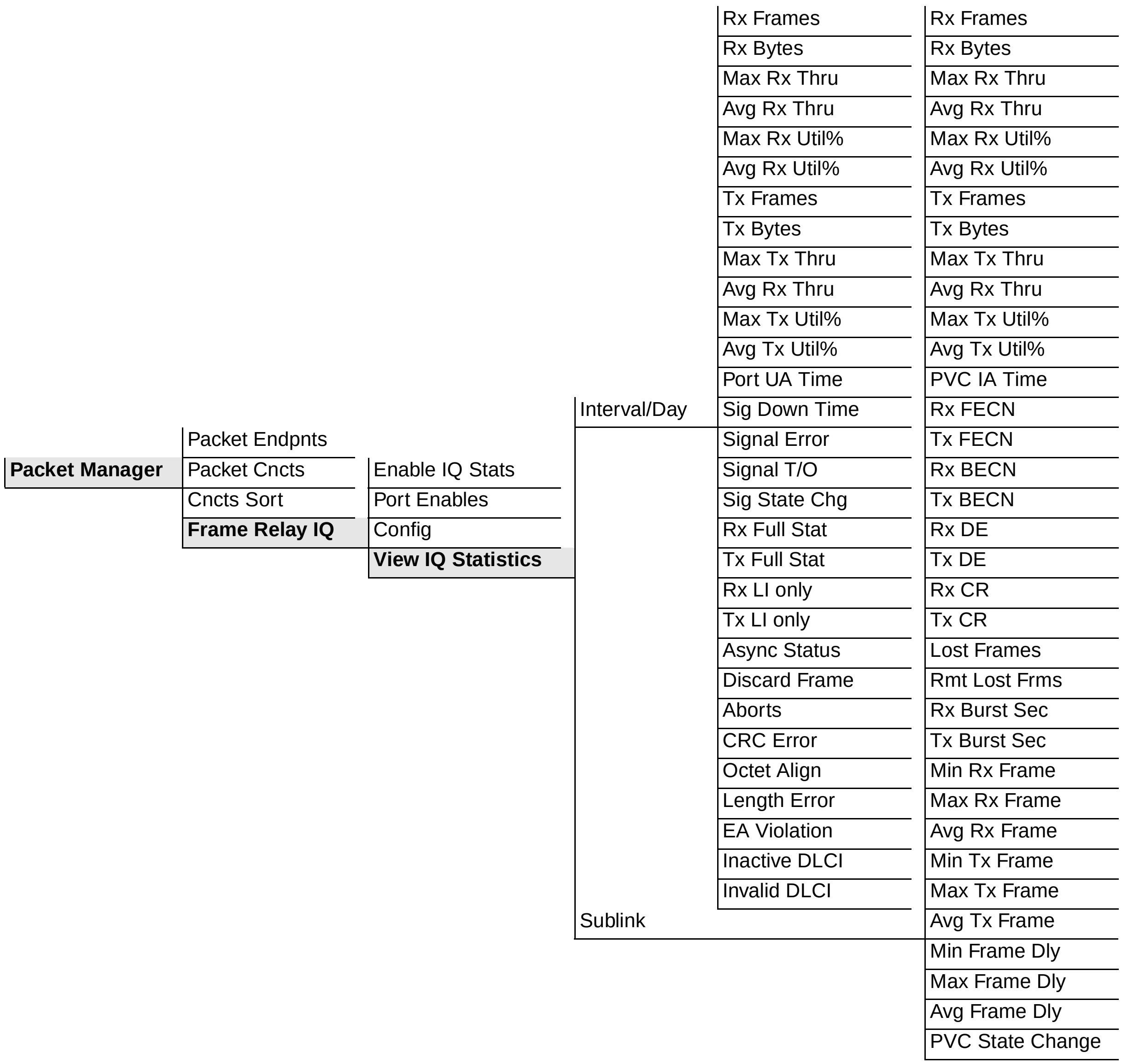


Figure 7-2. View IQ Statistics Menu Tree

INTERVAL / DAY (LINK)

Descriptions of the statistics available in the **INTERVAL** or **DAY** submenus follow:

RX FRAMES
The number of frames the port received for the interval or day.

RX BYTES
The number of bytes the port received for the interval or day.

MAX RX THRU
The maximum throughput the port received for the interval or day.

AVG RX THRU
The average throughput the port received for the interval or day.

MAX RX UTIL%
The maximum utilization the port received for the interval or day.

AVG RX UTIL%
The average utilization the port received for the interval or day.

TX FRAMES
The number of frames the port transmitted for the interval or day.

TX BYTES
The number of bytes the port transmitted for the interval or day.

MAX TX THRU
The maximum throughput the port transmitted for the interval or day.

AVG TX THRU
The average throughput the port transmitted for the interval or day.

MAX TX UTIL%
The maximum utilization the port transmitted for the interval or day.

AVG TX UTIL%
The average utilization the port transmitted for the interval or day.

PORT UA TIME
Time, in seconds, the port is unavailable due to physical or frame relay outage.

SIG DOWN TIME
Time, in seconds, the signaling state has been down.

SIGNAL ERROR
The number of PVC signaling frames received with protocol violations.

SIGNAL T/O
The number of PVC signal time-outs. Either T391 seconds elapsed without receiving a response to a poll or T392 seconds elapsed without receiving a poll.

SIG STATE CHG
The number of state changes for the PVC signaling protocol. This number includes transitions from down state to up state and vice-versa.

RX FULL STAT
The number of PVC-signaling, full-status frames received.

TX FULL STAT
The number of PVC-signaling, full-status frames transmitted.

RX LI ONLY
The number of PVC-signaling, link integrity only frames received.

TX LI ONLY
The number of PVC-signaling, link integrity only frames transmitted.

ASYNC STATUS
The number of single PVC status frames received.

DISCARD FRAME
The number of frames discarded by the IQ unit.

ABORTS
The number of frames received without proper flag termination.

CRC ERROR
The number of frames received with CRC errors.

OCTET ALIGN
The number of frames received with a bit count not divisible by eight.

LENGTH ERROR
The number of frames received that are less than 5 bytes or greater than 4500 bytes.

EA VIOLATION
The number of frames received with errors in the EA field of the frame relay header.

INACTIVE DLCI
The number of frames received while the PVC is in the inactive state.

INVALID DLCI
The number of frames received with a DLCI value less than 16 or greater than 1007, not including PVC signaling frames.

SUBLINK

Provides statistics for a particular DLCI or PVC by interval or day. Descriptions of the statistics available from the **INTERVAL** or **DAY** submenus of **SUBLINK** follow:

RX FRAMES
The number of frames the PVC received for the interval or day.

RX BYTES
The number of bytes the PVC received for the interval or day.

MAX RX THRU
The maximum throughput the PVC received for the interval or day.

AVG RX THRU
The average throughput the PVC received for the interval or day.

MAX RX UTIL%
The maximum utilization the PVC received for the interval or day.

AVG RX UTIL%
The average utilization the PVC received for the interval or day.

TX FRAMES
The number of frames the PVC transmitted for the interval or day.

TX BYTES
The number of bytes the PVC transmitted for the interval or day.

MAX TX THRU
The maximum throughput the PVC transmitted for the interval or day.

AVG TX THRU
The average throughput the PVC transmitted for the interval or day.

MAX TX UTIL%
The maximum utilization the PVC transmitted for the interval or day.

AVG TX UTIL%
The average utilization the PVC transmitted for the interval or day.

PVC IA TIME
Time, in seconds, the PVC has been in the inactive state for the interval or day.

RX FECN
The number of FECNs the PVC has received for the interval or day.

TX FECN
The number of FECNs the PVC has transmitted for the interval or day.

RX BECN
The number of BECNs the PVC has received for the interval or day.

TX BECN
The number of BECNs the PVC has transmitted for the interval or day.

RX DE
The number of DEs the PVC has received for the interval or day.

TX DE
The number of DEs the PVC has transmitted for the interval or day.

RX CR
The number of CRs the PVC has received for the interval or day.

TX CR
The number of CRs the PVC has transmitted for the interval or day.

LOST FRAMES
The number of lost frames on the PVC for the interval or day.

RMT LOST FRMS
The number of remote lost frames on the PVC for the interval. Applies only if **IN-BAND SEQUENCE NUMBER** is **ENABLED** (see page 4-15) on the PVC.

RX BURST SEC
The number of bursty seconds the PVC received for the interval or day.

TX BURST SEC
The number of bursty seconds the PVC transmitted for the interval or day.

MIN RX FRAME
The minimum frame size the PVC received for the interval or day.

MAX RX FRAME
The maximum frame size the PVC received for the interval or day.

AVG RX FRAME
The average frame size the PVC received for the interval or day.

MIN TX FRAME
The minimum frame size the PVC transmitted for the interval or day.

MAX TX FRAME
The maximum frame size the PVC transmitted for the interval or day.

AVG TX FRAME
The average frame size the PVC transmitted for the interval or day.

MIN FRAME DLY
The minimum **IN-BAND DELAY MEASUREMENT** is **ENABLED** (see page 4-17) for the PVC or if PVC diagnostics are being performed.

MAX FRAME DLY
The maximum delay in milliseconds on the PVC for the interval or day. Applies only if **IN-BAND DELAY MEASUREMENT** is **ENABLED** (see page 4-17) for the PVC or if PVC diagnostics are being performed.

AVG FRAME DLY
The average delay in milliseconds on the PVC for the interval or day. Applies only if **IN-BAND DELAY MEASUREMENT** is **ENABLED** (see page 4-17) for the PVC or if PVC diagnostics are being performed.

PVC STATE CHANGE
The number of state changes for this PVC for the interval or day.

Appendix A Troubleshooting

Frame relay link is down.

Potential Cause	Solution
Cabling problem	**T1** 1. Check the ports' alarm status. 2. If the T1 is experiencing LOS, ensure the cable is plugged in. 3. If the cable is plugged in, ensure the pinout is correct. Refer to the *ATLAS User Manual* for a correct pinout. **Nx** 1. Check DTE port signals and verify that DTR and RTS are active. 2. If signals are inactive, verify V.35 cable is connected to correct port. 3. If cable is connected, verify external DTE is powered on.
Packet endpoint not mapped	From **PACKET MANAGER/PACKET ENDPNTS/STATUS**, verify that the packet endpoint indicates that a physical port is mapped.
Signaling mismatch	From **PACKET MANAGER**, verify that the Signaling type matches that provided by the carrier and the external DTE.
Timers not configured	Verify that frame relay counters and timers are configured as specified by the frame relay provider. (Counters and timers do not normally need to be adjusted.)

Frame Relay Link is active, but data is not passing.

Potential Cause	Solution
DLCI is not active	Verify in the **PACKET MANAGER/PACKET ENDPNTS/PERFORMANCE** menu that the DLCI shows active. If the DLCI is listed inactive and the packet endpoint is configured as User side of UNI, the frame relay network has not activated this DLCI.
No data on DLCI	1. Verify in the **PACKET MANAGER/PACKET ENDPNTS/PERFORMANCE** menu that the DLCI shows receive packets. If there are no packets received, verify that external equipment is configured to transmit data on this DLCI. 2. Verify in the **PACKET MANAGER/PACKET CNCTS** menu that this DLCI is mapped.

Appendix B Glossary

A-Law

PCM coding method as defined by the ITU-T. It is a companding standard for converting between analog and digital in a PCM system. A-Law is mainly used in Europe; μ-Law is the North American equivalent.

ANSI T1.617-D (Annex D)

See Annex D.

Annex A

Standard for frame relay signaling as defined by the International Telecommunication Union Telecommunication Standardization Sector (ITU-T) in publication Q.933-A.

Annex D

Standard for frame relay signaling as defined by the American National Standards Institute (ANSI) in publication T1.617-D.

ARP

Address Resolution Protocol. A protocol that maps an IP address to an ethernet MAC address.

BECN

Backward Explicit Congestion Notification. Sent to the device generating excessive frame relay traffic as a means to slow down the flow of data to the network. Compare with FECN.

Bridge IP

This is a way to have a virtual ethernet port using Frame Relay or PPP. The IP packets destined for an interface running this protocol will be encapsulated with an ethernet header, using the MAC adress of the real ethernet port. This packet is encapsulated over the resulting WAN protocol, PPP or Frame Relay, to be sent to the peer.

Burst

A sporadic increase in a transmission.

Bursty traffic

Traffic that alternates between steady transmission and short bursts of high transmission.

CHAP

Challenge Handshake Protocol. This is an authentication protocol that uses a one-way hashing algorithm to encrypt the username and password. This hashing algorithm makes it virtually impossible to determine the password.

Companding

The process of compressing and expanding a signal.

CIR

Committed Information Rate. The guaranteed bandwidth available for customer data under normal circumstances.

DACS

Digital Access Cross-Connect System. An architecture that allows the cross-connecting of up to 34 T1 circuits; that is, any DS0 on any of 34 T1 circuits can be groomed to any other DS0 on any of the 34 T1 circuits in the system.

DHCP

Dynamic Host Configuration Protocol. Allows dynamic IP address allocation.

DID

Direct Inward Dial. Digits received or transmitted that allow the attached equipment to further route a call.

Discard Eligible (DE)

A flag that can be set to indicate to the network that if excess traffic is received this frame can be discarded if necessary.

DLCI

Data Link Connection Identifier. Identifies each virtual circuit within a shared physical channel.

EAP

Extensible Authentication Protocol. This is very much like CHAP but it has options about the encryption to be used.

FECN

Forward Explicit Congestion Notification. Sent to the device receiving data from the frame relay network to indicate that there is congestion in the receive direction. The receiving DTE device should take action to slow down traffic from the remote end. Compare with BECN.

FRAD

Frame Relay Access Device. Any equipment that provides a connection between a frame relay network and a LAN.

Frame Relay

A subset of the X.25 packet switching protocol that allows for efficient transmission of data by utilizing many virtual circuits on a single physical interface.

Full Status Poll

A poll that occurs each N391 polls and reports the status of each PVC. During this poll the frame relay switch can also notify the user side of the UNI of any creation or deletion of frame relay PVCs.

G.723.1

ITU-specified voice compression algorithm.

Groom

The assignment and redistribution of any DS0 on any T1 circuit to any other DS0 on any on the 34 T1 circuits in a DACS.

Group of Four

The Frame Relay Consortium, composed of Cisco Systems, DEC, Nortel, and StrataCom, which defined an interface for the UNI.

HDLC

High Level Data Link Control. A generic link-level communications protocol developed by the International Organization for Standardization (ISO). HDLC manages synchronous code-transparent, serial information transfers over a link connection.

IAD

Integrated Access Device. A network access device that provides many services from a single platform. ATLAS is an IAD.

IARP

Inverse Address Resolution Protocol. Used for resolving the protocol address when the hardware address is known.

ICMP

Internet Control Message Protocol. Specified in RFC-292 to provide diagnostic functions.

IP

Internet Protocol. A protocol which provides for transmitting blocks of data between hosts identified by fixed-length addresses.

IPCP

IP Control Protocol. This is a network control protocol used for negotiating IP options for PPP.

ITU-T Q.933-A (Annex A)

See Annex A.

IXC

IntereXchange Carrier. Phone companies that connect LECs.

LEC

Local Exchange Carrier. Provides local access to public data and phone networks.

Link Integrity Poll

A poll that occurs each T391 seconds to determine the state of the connection to the frame relay switch.

LLC2

Logical Link Control Type 2. Upper portion of the Data Link layer (layer 2) that handles flow control and error control.

LMI

Standard published by the Frame Relay Consortium in 1990 to create a defined interface on the UNI. The Consortium was composed of Cisco Systems, DEC, Nortel, and StrataCom, and is commonly referred to as the Group of Four. LMI has become a generic term to indicate the type of frame relay signaling used and could be used to mean Annex A or Annex D.

MAC Address

Data link address that is unique for every device that gets connected to a LAN. Devices on the LAN use these addresses to update routing tables.

μ-Law

A companding standard for converting between analog and digital in a PCM system. μ-Law is mainly used in North America. A-Law is the European equivalent.

NNI

Network-to-Network Interface. A standard interface between two frame relay switches.

N391

Defines how many link integrity polls occur before a full status poll. One out of the number defined in N391 is a full status poll.

N392

Defines how many bad polls can occur within an N393 window before the link is declared down.

N393

Defines the number of polls that make up the window used by N392 to determine if a link is operational.

OSI

Open System Interconnection. A standard defined by ISO and the ITU-T to allow interoperability between equipment of different vendors.

Packet

A transmission that contains both control information and data in a specified format.

Packet Endpoint

A virtual port within ATLAS that a specified physical port terminates its data into for further routing by the system.

Packet Switching

A method of routing packets that avoids congestion and minimizes delivery time.

PAP

Password Authentication Protocol. This is a clear-text authentication protocol, which means the username and password are sent over the link in a readable format.

PCM

Pulse Code Modulation. The most common method for encoding analog voice into a digital bit stream.

PIV

Port / PVC **I**nter**v**al. Think of this as a resource meter. ATLAS can track up to 10,000 PIVs. The PIV is derived from the Max Number of Days and Max Number of Intervals selected by the user. Changing one affects the other.

PPP
Point-to-point Protocol. An implementation of TCP/IP which is intended for transmission using telephone lines. PPP provides router-to-router and host-to-network connections over both synchronononous and asynchronous circuits.

PVC
Permanent Virtual Circuit. Virtual circuit within the frame relay network that has all bandwidth parameters permanently defined upon ordering the circuit.

QOS
Quality of Service. A means of guaranteeing available bandwidth under normal operating conditions.

RIP
Routing Information Protocol. A protocol used to exchange routing information among a set of computers connected by a LAN. RIP uses hop count as a routing metric.

Router
An interface which finds the best path between two networks. Routers forward packets from one network to another, based on network layer information.

Routing Metric
The method by which a routing algorithm determines that one route is better than another. This information is stored in routing tables. Such tables include reliability, delay, bandwidth, load, MTUs, communication costs, and hop count.

SNA
Systems Network Architecture. Network architecture developed by IBM in the 1970s.

SVC
Switched Virtual Circuit. Virtual circuit within the frame relay network that is created only when needed. Bandwidth parameters are defined each time the circuit is created.

T391
Defines the time in seconds between frame relay link integrity polls.

T392
Defines the time in seconds the frame relay switch will wait for a poll from the user before declaring the poll bad.

TBOP
Transparent Bit Oriented Protocol. ADTRAN proprietary method for transmitting HDLC traffic across a frame relay network.

Transparent BOP
See TBOP.

TCP
Transmission Control Protocol. Connection oriented protocol that provides error control of IP traffic.

TIA 464A
Telecommunication Industry Association’s standard for DTMF detection and generation.

UDP

User Datagram Protocol. Connectionless protocol defined by RFC 768 for transmission of data without acknowledgment or error control.

UNI

User to Network Interface. Defines the interface between the CPE and the frame relay providers' switch.

Voice Compression

A means of reducing the bandwidth required for transmission of voice traffic with minimal impact on the quality of the voice.

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Product Support Information

Pre-Sales Inquiries and Applications Support
Please contact your local distributor, ADTRAN Applications Engineering, or ADTRAN Sales:

Applications Engineering	(800) 615-1176
Sales	(800) 827-0807

Post-Sale Support
Please contact your local distributor first. If your local distributor cannot help, please contact ADTRAN Technical Support and have the unit serial number available.

Technical Support	(888) 4ADTRAN

Repair and Return
If ADTRAN Technical Support determines that a repair is needed, Technical Support will coordinate with the Custom and Product Service (CAPS) department to issue an RMA number. For information regarding equipment currently in house or possible fees associated with repair, contact CAPS directly at the following number:

CAPS Department	(256) 963-8722

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

ADTRAN Customer and Product Service
6767 Old Madison Pike
Building #6 Suite 690
Huntsville, Alabama 35807

RMA # ____________________