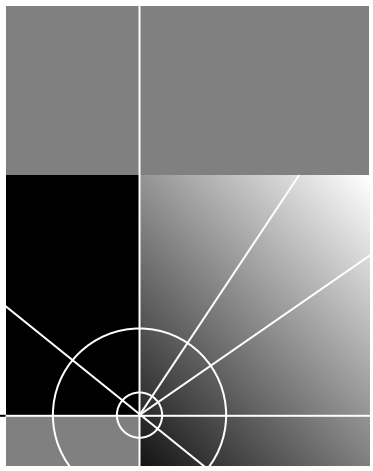
PathBuilder® S700

WAN Access Switch Reference Guide

Release 2.03



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Part No.3C64917
010-12197-0001
Published November 1998

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4 PATHBUILDER S700 MODULE AND APPLICATION OVERVIEW

5 CONFIGURING PATHBUILDER S700 MODULES, PORTS, AND APPLICATIONS

WARNING INFORMATION

This section contains warning information for AC powered systems.

Servicing

Service of this unit is to be performed by qualified service personnel only.

Service of certain components and subassemblies in this equipment is accomplished by the replacement of Field Replaceable Units (FRUs). However, safety agency approval requires that the servicing of other subassemblies within this product be referred to 3Com's service personnel.

The trim enclosure and other mechanically secured plates serve as protection barriers from potential hazardous internal areas. No attempt should be made to troubleshoot internal components with these protective barriers removed without first disconnecting the equipment from main power.

Rack Mounting

This equipment is for use only in complete equipment where the acceptability of the combination is determined by the applicable safety agency in the country in which it is installed. This includes UL in the U.S.A., CSA in Canada, and TUV in Europe.

Conditions of Acceptability: When installed in the end-use equipment, the following are among the considerations to be made.

1. The units shall be installed in compliance with enclosure, mounting, spacing, casualty, and segregation requirements of the ultimate application.
2. These units have been judged on the basis of the required spacings of UL 1950 D3 deviations edition, CSA 22.2 No. 950-M89, and EN 60950 1988 through TUV Rheinland, which would cover these components if submitted for unrestricted listing or certification.
3. Complete testing should be performed in the end-use product.
4. Rack configurations with certain combinations of 3Com equipment installed in racks with a height greater than 50" (127 cm) may require a counter-balance weight, a stabilizer bar, or anti-tip legs to ensure rack stability in accordance with safety agency regulations. See specific rack installation guidelines for 3Com recommendations.

Power and Power Cords

This equipment is not intended for use with IT power distribution systems whose line to line voltage exceeds 250 VAC RMS defined by EN 60950 as having no direct connection to earth. The PathBuilder S700 WAN Access Switch will autoconfigure for 115 VAC or 220-240 VAC.

NORTH AMERICAN APPLICATIONS: Use a UL Listed and CSA Certified Cord Set rated 12 amps, consisting of a minimum 10 AWG, Type SVT or SJT three conductor cord maximum of 15 feet in length, with a NEMA 5-15P plug.

INTERNATIONAL APPLICATIONS: The power supply cords used with this equipment should be harmonized with all local standards applicable in the country in which it is installed.

Safety agency compliance requires this unit to be connected to branch circuits with overcurrent protection ≤ 20A for North American applications and ≤ 10A for international applications.

The power supply cord must be disconnected when servicing all components or subsystems.

EMI

FCC - This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant with Part 15 of the FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be required to correct the interference. These tests were conducted with shielded communications cables with metal connector hoods; the use of unshielded cables may void this compliance.

Canada - This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Europe - This is a Class A product. In a domestic environment this product may cause radio interference, in which case, the user may be required to take adequate measures.

Safety Classification of Ports for Connection to Telecommunications Networks

The following port types in the product range are classified according to the Harmonized Europeans Standard EN41003, subclause 4.1.3, as follows:

E1/E3 - TNV normally operating within SELV limits (TNV-1)

[1]Telecommunications Network Voltage (EN60950, subclause 1.2.8.8)

[2]Safety Extra-Low Voltage (EN60950, subclause 1.2.8.5)

SUPPLEMENTARY REGULATORY INFORMATION

This section provides information about host chassis/module compatibility and creepage/clearance requirements. It also describes the compliance of the PathBuilder S700 WAN access switch (Pathbuilder S700) with FCC and CE regulations.

Host Chassis/Module Compatibility and Creepage/Clearance Requirements

The installer of the E1 CBR and E3 UNI Module must ensure that the host chassis and module are compatible and that the host chassis is capable of providing adequate power to the module and any other auxiliary host apparatus.

The E1 CBR Module has the following input power requirements:

+5 vdc @ 3.6 Amps

The E3 UNI Module has the following input power requirements:

+5 vdc @ 3.0 Amps

Please contact 3Com for an up-to-date list of compatible host chassis.

In order to maintain the independent approval of this card, it must be installed in such a way that with the exception of the connections to the host, when other option cards are introduced which use or generate a hazardous voltage, the minimum creepages and clearances specified in the table below are maintained. A hazardous voltage is one which exceeds 42.2V peak AC or 60V DC.

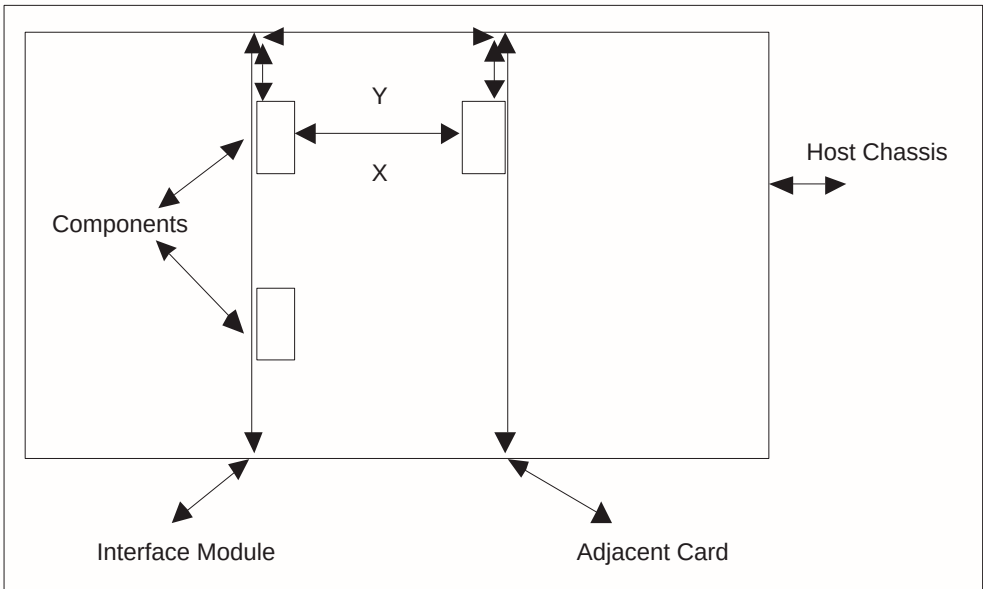
If you have any doubt, seek advice from a component engineer before installing other adapters into the test equipment.

Clearance (mm)	Creepage (mm)	Voltage Used or Generated by Host or Other Cards
2.0	2.4 (3.8)	Up to 59 V_{rms} or V_{dc}
2.6	3.0 (4.8)	Up to 125 V_{rms} or V_{dc}
4.0	5.0 (8.0)	Up to 250 V_{rms} or V_{dc}
4.0	6.4 (10.0)	Up to 300 V_{rms} or V_{dc}
For a host or other expansion card fitted in the host, using or generating voltages greater than 300V (rms or dc), advice from a competent telecommunications safety engineer must be obtained before installation of this card.		Above 300 V_{rms} or V_{dc}

The larger distance shown in parentheses in the table above applies where the local environment within the host is subject to conductive pollution or dry non-conductive pollution which could become conductive due to condensation. Failure to maintain these minimum distances would invalidate the approval.

Clearance (distance X in the figure below) is defined as the shortest distance between two conductive parts, or between the conductive part and the bonding surface of the equipment, measured through air.

Creepage (distance Y in the figure below) is defined as the shortest path between two conductive parts, or between the conductive part and the bonding surface of the equipment, measured along the surface of the insulation.



FCC Part 68 Statement

This equipment complies with Part 68 of the Federal Communications Commission (FCC) rules. On the product is a label that contains the FCC registration number for this device. If requested, you must provide this information to the telephone company.

This equipment is designed to be connected to the telephone network or premises wiring using a compatible modular jack which is Part 68 compliant. See installation instructions for details.

If this device causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. The telephone company may request that you disconnect the equipment until the problem is resolved.

The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of this equipment. If this happens, the telephone company will provide advance notice in order for you to make necessary modifications to maintain uninterrupted service.

If you experience trouble with this equipment or for repair or warranty information, please follow the applicable procedures explained in the Technical Support section of this manual (Appendix A).

CE Notice

Marking by the symbol CE indicates compliance of the equipment with the EMC, Telecom and Low Voltage directives of the European Community. Such marking is indicative that this equipment meets or exceeds the following technical standards.

EN55022—Limits and methods of measurement of radio interference characteristics of information technology equipment.

EN50082-1—Electromagnetic compatibility - generic immunity standard part 1: residential, commercial, and light industrial.

CTR 12—Connection of 2 Mbit/s Unstructured Leased Lines.

CTR13—Connection to 2 Mbit/s Structured Leased Lines.

EN 60950—Safety of Information Technology Equipment including Electrical Business Equipment.

EN 41003—Particular safety requirements for electrical equipment to be connected to Telecom networks.

WARNING*: This customer equipment is to be installed and maintained by service personnel as defined by AS/NZS 3260 clause 1.2.14.3. (Service Personnel). Incorrect connection of connected equipment to the General Purpose Outlet could result in a hazardous situation.*

WARNING: *Safety requirements are not fulfilled unless the equipment is connected to a wall socket outlet with protective earth contact.*

About this Guide

About This Guide provides an overview of this guide, describes guide conventions, tells you where to look for specific information and lists other publications that may be useful.

Introduction

This guide describes how to install and configure the PathBuilder S700 WAN access switch (PathBuilder S700). It also provides an overview of the unit's modules and supported applications.

Audience Description

This guide is intended for network administrators, system engineers, field engineers, and other personnel responsible for installing, configuring, and managing PathBuilder products.

If the information in the Release Notes shipped with your product differs from the information in this guide, follow the Release Notes.

How to Use This Guide

Table 1 shows where to find specific information in this guide.

Table 1 Where to Find Specific Information

If you are looking for...	Turn to...
Descriptions of the features and benefits of the PathBuilder S700	Chapter 1
System specifications	Chapter 1
Installation instructions	Chapter 2
Information about how to get started using the PathBuilder S700	Chapter 3
Instructions for using the PathBuilder S700 menus	Chapter 3
Information about the specific modules and applications you can use with the PathBuilder S700	Chapter 4
Instructions for configuring PathBuilder S700 modules, ports, and cards	Chapter 5
Instructions for configuring virtual interfaces	Chapter 5
Instructions for configuring shapers	Chapter 5
Instructions for configuring virtual circuits	Chapter 5
Instructions for configuring bridging applications	Chapter 5
Information about managing system alarms and lists of the alarms supported by the PathBuilder S700	Chapter 6
Information about setting up loopbacks and what loopbacks specific modules support	Chapter 6
Information about displaying statistics and lists of the types of statistics available for specific modules	Chapter 6
Technical support information	Appendix A

Conventions

Table 2 and Table 3 list conventions that are used throughout this guide.

Table 2 Notice Icons

Icon	Notice Type	Alerts you to...
	Information note	Important features or instructions
	Caution	Risk of personal injury, system damage, or loss of data
	Warning	Risk of severe personal injury

Table 3 Text Conventions

Convention	Description
`Syntax`	The word "syntax" means you must evaluate the syntax provided and supply the appropriate values. Placeholders for values you must supply appear in angle brackets. Example: Enable RIPIP by using the following syntax: `SETDefault !<port> -RIPIP CONTrol = Listen` In this example, you must supply a port number for <port>.
`Commands`	The word "command" means you must enter the command exactly as shown in text and press the Return or Enter key. Example: To remove the IP address, enter the following command: **`SETDefault !0 -IP NETaddr = 0.0.0.0`** *This guide always gives the full form of a command in uppercase and lowercase letters. However, you can abbreviate commands by entering only the uppercase letters and the appropriate value. Commands are not case-sensitive.*
`Screen displays`	This typeface represents information as it appears on the screen.
The words "enter" and "type"	When you see the word "enter" in this guide, you must type something, and then press the Return or Enter key. Do not press the Return or Enter key when an instruction simply says "type."
[Key] names	Key names appear in text in one of two ways: ■ Referred to by their labels, such as "the Return key" or "the Escape key" ■ Written with brackets, such as [Return] or [Esc]. If you must press two or more keys simultaneously, the key names are linked with a plus sign (+). Example: Press [Ctrl]+[Alt]+[Del].
Menu commands and *buttons*	Menu commands or button names appear in italics. Example: From the *Help* menu, select *Contents*.
Words in *italicized* type	Italics emphasize a point or denote new terms at the place where they are defined in the text.
Words in **bold-face** type	Bold text denotes key features.

Related Documentation

In addition to this guide, the following documentation may help you use the PathBuilder S700.

PathBuilder S700 Release Notes—Provides configuration help and information about new features and any known limitations and issues found in the release.

PathBuilder Switch Manager User Guide—Describes how to use PathBuilder Switch Manager to configure and manage PathBuilder WAN access switches. Using PathBuilder Switch Manager, you can configure shelf, device, and circuit information; use a loopback panel to diagnose port cards; view line and interface statistics; and perform administrative functions such as configuring trap destinations and setting SNMP community strings.

1 SYSTEM DESCRIPTION

This chapter describes the PathBuilder S700 WAN access switch (PathBuilder S700), and lists PathBuilder S700 system specifications. It includes the following sections:

- Introducing the PathBuilder S700
- Specifications
- Options and Parts List

Introducing the PathBuilder S700

The PathBuilder S700 is a next-generation multiservice platform that provides adaptation, concentration, and switching of a wide variety of traffic onto high-speed ATM links. Delivering sophisticated data, voice and video adaptation, and traffic management capabilities, the PathBuilder S700 WAN access switch is an ideal platform both for service providers (to provision low-speed multiservice services) and for enterprise users (to build converged networks).

PathBuilder S700 Features

The PathBuilder S700 provides the following key features:

- **Scalability**—18 slots, with 14 slots for application modules, supporting a maximum of 96 (rear access) or 112 (front access) T1 or E1 ports, 14 DS3 or E3 ports, or 14 OC3/STM-1 ports.
- **High ATM backplane capacity**—3.2 Gbps
- **Supports proven technology**—queuing, buffering, traffic shaping, traffic policing, early packet discard, and multicasting. See "Key Features of the STX Module" below for details.
- **Resiliency**—supports load-sharing power supplies, hot-swappable common components (MCPU and STX), and application modules; selected rear redundant application modules are available; common component and application module redundancy will be supported in subsequent releases.
- **Legacy module support**—use existing PathBuilder S600 application modules in the PathBuilder S700.
- **Rear cable access**—rear access modules designed specifically for the PathBuilder S700; available now for T1/E1 and DS3/E3 application modules.

Key Features of the STX Module

The STX module includes a switching fabric that provides sophisticated traffic management, priority queuing, and multicasting. Once an application module SARs its traffic into ATM cells, the STX receives the cells and performs address lookup for switching, queuing, traffic shaping, traffic policing, early packet discard, and multicasting.

The STX module provides the following features:

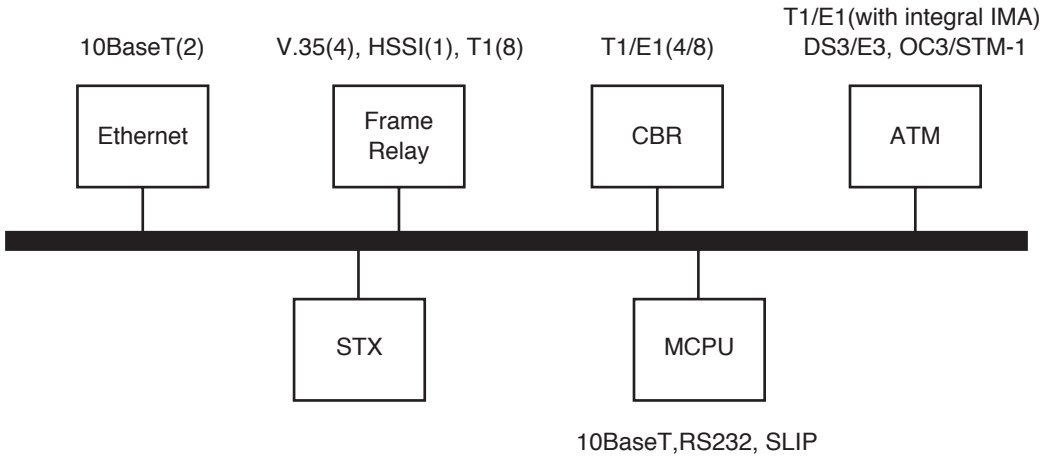
- Any-to-any port switching
- Virtual interfaces (VIs); logical UNI ports that provide traffic shaping profiles (127 total VIs allowed: 24 per triple-slot bus (7-9, 10-12, 13-15, 16-18), 15 per slot for slots 5 and 6, 1 for MCPU)
- Deep buffers for queuing (8,000 cells per VI for a total of over 1 million cells buffered per shelf)
- Priority queuing in which each VI can be assigned to specific VCs which can be allocated to one of 4 queues
- Per VC traffic policing
- Multicasting (up to 256 connections with 32 leaves)
- Bipolar Timing Source (BITS) timing clock
- Per VC statistics
- 4,000 connections per unit

PathBuilder S700 Architecture

The modular architecture of the PathBuilder S700 is designed to accommodate a wide range of interfaces and support a comprehensive set of applications. The core component of the unit is a 3.2 Gbps cell bus backplane where all traffic is carried in the form of ATM cells. The PathBuilder S700 accommodates up to six power supplies (AC 110/220 VAC and DC-48 VDC) in a load-sharing configuration.

The overall design philosophy of the PathBuilder S700 is to facilitate the transfer of cells on and off the bus backplane with enhanced traffic management and switching capabilities. Figure 1 illustrates the cell bus architecture. All packet-to-cell segmentation and reassembly (SAR) functions are performed on each of the application modules (Ethernet, Frame Relay, and CBR), thereby ensuring efficient cell transfer through the system. Additional SAR power is added each time a non-ATM interface module is added.

Figure 1 PathBuilder S700 Cell Bus Architecture



Because the STX module allows any-to-any port switching, there is no distinction between port and trunk modules for the PathBuilder S700. Thus, the slot assignments are as follows:

- Slot 1 contains the Management CPU (MCPU). This slot is permanently allocated. The MCPU manages the configuration database, network management (via Text User Interface and SNMP), and software download capabilities.
- Slot 3 contains the STX Module. This slot is permanently allocated.

Slots 2 and 4 are reserved for redundant MCPU and STX modules, which will be supported in subsequent releases.

- Slots 5-18 contain the application modules.

Each module incorporates an RISC-based processor for processing packets/cells, communication information, and statistics.

The S700 supports selected rear redundant application modules (T1/E1 and DS3/E3). You can use front connector modules (identical to those used in the PathBuilder S600) as well as the rear redundant modules, but only the rear connector types will support the redundant operation available in subsequent releases.

The S700 supports the following ATM and application modules:

- DS3 UNI module (front or rear connector)
- E3 UNI module (front or rear connector)
- OC3/STM-1 UNI module (front connector)
- DS1 UNI with Inverse Multiplexing for ATM (IMA) (front or rear connector)
- E1 UNI with Inverse Multiplexing for ATM (IMA) (front or rear connector)
- Dual Ethernet module (front connector)
- DSX-1 CBR (Constant Bit Rate) module (4 port or 8 port) (front or rear connector)
- E1 CBR (Constant Bit Rate) module (4 port or 8 port) (front or rear connector)
- QSIM (Quad Serial Interface Module) (QSIM) - V.35/RS422/EIA530/X.21 (front connector)
- HSIM (HSSI Serial Interface Module) (front connector)
- DS1 FAM (Frame Access Module) - (front connector)

Specifications

Table 4 lists complete specifications for the Pathbuilder S700. these specifications are subject to change without notice.

Table 4 PathBuilder S700 System Specifications

Platform	
Configuration	18 slots per shelf
Power Supplies	Up to 6 required depending on number of application modules installed (load sharing configuration)
Input Power Requirements	90-264 VAC, 50-60Hz standard grounded outlet -42 to -60 VDC, optional 10 AWG wire, Belden type 19364
Power Consumption	1250 Watts, maximum
Maximum Current	10.0 A @ 110 VAC 5.0 A @ 220 VAC 20.0 A @ -48 VDC
Environmental	
Operating Temperature	0 to 45ºC
Storage Temperature	-40 to 70ºC
Humidity	95% @ 40ºC (noncondensing)
Altitude	14,000 ft. or 4,300 meters
Regulatory Compliance	
FCC	FCC Part 15 rules for a Class A computing device FCC Part 68
Emissions	EN55022 EN50082-1 CTR 12 CTR 13 Austel TS-001 Austel AS 3260
Safety	UL listed (UL 1950 and 1459) VDE/TUV (EN 60950) EN41003 CSA 22.2 Austel AS/NZS35-48
Physical	
Shelf Dimensions	22.75" x 19" x 11.81" (H x W x D) (57.8 cm x 48.3 cm x 30 cm)
Rack Mount Width	19" (48.3 cm) or 23" (58.4 cm) optional
Rack Mount Spacing	13 RMU
Empty Weight (Base Unit)	62 lbs (28.1 kg)
Unit Weight (fully loaded)	95 lbs (43.1 kg)
Shipping Weight	100 lbs (45.4 kg)
Management	
Management Functions	In-band SNMP (See "Configuring In-band Management" in Chapter 3 for details.) Dual flash memory (image and configuration) TCP/IP stack (TFTP, ping, Telnet)

(continued)

Table 4 PathBuilder S700 System Specifications (continued)

SNMP Support	GET/SET/TRAP RFC 1213 (MIB II) RFC 1406 (DS1/E1) RFC 1407 (DS3/E3) RFC 1493 (Bridge MIB) RFC 1643 (Ethernet MIB) RFC 1595 (SONET MIB) ATM Forum CES MIB Enterprise Specific MIB
Statistics	Frames received, transmitted, and discarded (per port and per VC)
Standards Compliance	ATM Forum UNI 3.0, UNI 3.1 ATM Forum Circuit Emulation Service Interoperability Specification V 2.0 ATM FORUM Inverse Multiplexing for ATM (IMA) Specification Version 1.0 ANSI T1.107, 1988 ANSI T1.403 ANSI T1.403 ANSI T1.403 RFC 1483, 1490 RFC 826 RFC 1042 RFC 1577 IEEE 802.1 IEEE 802.3 AT&T PUB 54016 AT&T PUB 62411 ITU-T G.821 ITU-T G.703 ITU-T G.704 Frame Relay Forum Specifications 5 and 8
ATM User-to-Network Interface (UNI) Modules	
Interfaces	
DS3 UNI	Coax, BNC
E3 UNI	Coax, BNC
OC3 UNI	MMF/SMF, SC
STM-1 UNI	MMF/SMF, SC
ATM Framing	
DS3 UNI	HEC, PLCP
E3 UNI	HEC, PLCP
OC3 UNI	HEC
STM-1 UNI	HEC
LBO	
DS3 UNI	0-250, 250-450
E3 UNI	0-250, 250-450

(continued)

Table 4 PathBuilder S700 System Specifications (continued)

OC3 UNI	
Single-mode	300 Laser (SDX1155) wavelength: 1261 nm-1360nm TX (min) = -15 dBm TX (max) = -8 dBm RX (min = -30 dBm RX (max) = -8 dBm Reach: -15 km wavelength: 1261 nm-1360nm TX (min) = -15 dBm
Multi-mode	1300 LED (HFBR-5205) TX (min) = -19 dBm TX (max) = -14 dBm RX (min = -30 dBm RX (max) = -14 dBm Reach: -2 km
Line Coding	
DS3 UNI	B3ZS
E3 UNI	HDB3
OC3 UNI	CMI
STM-1 UNI	CMI
Line Framing	
DS3 UNI	M23 and C-BIT
E3 UNI	G.751-PLCP / G.804 / G.832 for HEC
OC3 UNI	T1.105
STM-1 UNI	G.709
Class of Service	CBR, VBR, VBR-nrt, UBR
Virtual Circuits	Up to 4000 total per PathBuilder S700
Traffic Shaping	Bulk shaping Per VC/VP shaping Per VC shaping (Ethernet, FAM, QSIM, HSIM)
Traffic Policing	Per VC
DS1/E1 UNI with Integrated Inverse Multiplexing for ATM (IMA) Modules	
Number of Interfaces	nx8,n = 1 to 8; software selectable for individual T1/E1 UNIs or as logical IMA group (>1 link)
Connector Type	RJ-48 connectors
Integrated CSU	Yes (for DS1)
Line Coding	B8ZS for T1 HDB3 for E1
Line Framing	ESF, SF (D4), or No Framing for T1 G. 703/704 for E1
ATM Framing	HEC (ITU-T G.804), I.432 Payload Scrambling for E1
DSX-1/E1 Interface CBR Module	
Interface	ATM Forum CES structured and unstructured (2.0)
Number of Interfaces	4 or 8
Connector Type	RJ-48, 120 ohms balanced or 75 ohms unbalanced
ATM Encapsulation	AAL1

(continued)

Table 4 PathBuilder S700 System Specifications (continued)

Timing	SRTS, adaptive, loop, internal
Cell Delay Variation Tolerance	24 msec (T1), 32 msec (E1)
Class of Service	CBR
VPI/VCI	Up to 192 per octal module Up to 96 per quad module
Front Panel LEDs	Power, in-service, fail, test, active Port in-service, port alarm
Ethernet LAN Interface Module	
Interfaces	2 Ethernet/IEEE 802.3
Packet Forwarding	14,800 pps simultaneously on each interface
Packet Protocols	Learning bridge, 802.1d spanning tree, RFC 1577 forwarding, RFC 1483
Filtering	MAC address, SAP, PID, user data field
Address Table Size	8192 entries (4096 per port)
ATM Protocols	AAL5, RFC 1483
Class of Service	VBR, UBR
VPI/VCI	Up to 512 per module
Traffic Shaping	Multiple levels with PCR, SCR, and MBS settings
Frame Data Modules	
Interface	Up to 8 T1 120 ohm (FAM) 4 V.35, RS-449, EIA530, X.21(QSIM) 1 HSSI (HSIM)
Speeds (line rate)	T1 56/64 Kbps to 1.5 Mbps V.35, RS-422/449 up to 8 Mbps each HSSI @ 20 Mbps
Packet Protocols	Frame Relay (service and network interworking), ATM DXI, HDLC/SDLC pass through
Clocking	DTE or DCE
DTE SDU	Up to 9232 octets
Class of Service	VBR, UBR (AAL5)
VPI/VCI	Up to 256 per module
Traffic Shaping	Multiple levels per VC, with PCR, SCR, MBS setting

Options and Parts List

Table 5 lists available PathBuilder S700 options including spare/redundant shelves, port modules, trunk modules, system modules, and interface cables Contact 3Com or your VAR with the appropriate part number for ordering and pricing information.

Table 5 Part Numbers and Descriptions

Part Number	Description
CHASSIS	
3C63400-3AC-C	PathBuilder S700 Base System (Includes: chassis, S700 MCPU, S700 STX, 3 AC power supplies, cover panels, rack mount, reference guide, RS-232 cable, and fan assembly)
3C63400-3DC-C	PathBuilder S700 Base System (Includes: chassis, S700 MCPU, S700 STX, 3 DC power supplies, cover panels, rack mount, reference guide, RS-232 cable, and -48V fan assembly)
ACCESS AND APPLICATION MODULES	
3C63101	Dual-Port Ethernet Modules (10BaseT) with bridging and RFC 1577
3C63103	Quad Serial Interface Module (4 Port V.35/RS449/RS530; DXI, Frame Relay, SDLC/HDLC)
3C63104	HSSI Serial Interface Module (Single HSSI; DXI, Frame Relay, SDLC/HDLC)
3C63105-4DSX	4-Port DSX-1 CBR Module
3C63405-4DSX	PathBuilder S700 Rear Redundant 4-Port DSX-1 CBR Module
3C63105-8DSX	8-Port DSX-1 CBR Module
3C63405-8DSX	PathBuilder S700 Rear Redundant 8-Port DSX-1 CBR Module
3C63105-4E1	4-Port E1 CBR Module
3C63405-4E1	PathBuilder S700 Rear Redundant 4-Port E1CBR Module
3C63105-8E1	8-Port E1 CBR Module
3C63405-8E1	PathBuilder S700 Rear Redundant 8-Port E1CBR Module)
3C63106A-DS3	DS3 UNI Single Port Module
3C63406-DS3	PathBuilder S700 Rear Redundant DS3 UNI Single Port Module
3C63106A-E3	E3 UNI Single Port Module
3C63406-E3	PathBuilder S700 Rear Redundant E3 UNI Single Port Module
3C63107A-MMF	OC3/STM-1 UNI Multi-Mode Module
3C63107A-SMF	OC3/STM-1 UNI Single-Mode Module
3C63114-8DS1	8-port T1 UNI with Integrated IMA Module
3C63414-8DS1	PAthBuilder S700 Rear Redundant 8-port T1 UNI with Integrated IMA Module
3C63114-8E1	8-port E1 UNI with Integrated IMA Module
3C63414-E1	PathBuilder S700 Rear Redundant 8-port E1 UNI with Integrated IMA Module
3C63115-8DS1	8-port FT1/T1 Frame Access Module (FAM)
3C63415-8DS1	PathBuilder S700 Rear Redundant 8-port FT1/T1 Frame Access Module (FAM)

(continued)

Table 5 Part Numbers and Descriptions (continued)

Part Number	Description
OPTIONAL AND SPARE ITEMS	
3C63111A-AC	Optional 110V/220V AC Power Supply
3C63111A-DC	Optional -48V DC Power Supply
3C63112	Spare Fan Assembly
3C63113-BPM	Blank Panel for Module Slots
3C63408	PathBuilder S700 MCPU System Controller Module
3C63416	PathBuilder S700 STX Switching Module
3C63410-3AC	PathBuilder S700 chassis (includes: chassis, fan assembly, and 3 AC power supplies)
3C63410-3DC	PathBuilder S700 chassis (includes: chassis, fan assembly, and 3 DC power supplies)
3C64917	Additional PathBuilder S700 User Documentation (Release 2.x)
CABLES	
3C63911	Coax Cable; BNC to BNC - 8M/25Ft
3C63912	HSSI Cable; 50-Pin Male, Straight, to Male 50-Pin - 8M/25Ft
3C63915	RS232 Cable; RS232 DB9 Male, Crossover, to RS232 DB9 Female - 2M/6Ft
3C63902	DS1/E1 Cable; RJ48, Shielded Straight, to RJ48 - 8M/25Ft
3C63903	DS1/E1 Cable; RJ48, Shielded Crossover, to RJ48 - 8M/25Ft
3C63904	E1 Balun Adapter; RJ48 120 ohm to Coax 75 ohm - 2M/6Ft
3C63905	Fiber Cable; SC, Multi-mode, to SC 8M/25Ft
3C63906	Fiber Cable; SC, Multi-mode, to FC 8M/25Ft
3C63907	Fiber Cable; SC, Multi-mode, to ST 8M/25Ft
3C63908	Fiber Cable; SC, Single-mode, to SC 8M/25Ft
3C63909	Fiber Cable; SC, Single-mode, to FC 8M/25Ft
3C63910	Fiber Cable; SC, Single-mode, to ST 8M/25Ft
3C63913	V.35 Cable; HD 60-Pin Male to V.35 34-Pin Male, 2M/6Ft (Crossover DTE)
3C63914	V.35 Cable; HD 60-Pin Male, Straight, to V.35 34-Pin Female, 2M/6Ft
3C63921	RS449 Cable; HD 60-Pin Male to RS449 Female (DCE), 2M/6Ft
3C63920	RS449 Cable; HD 60-Pin Male to RS449 Male (DTE), 2M/6Ft
3C63923	EIA530 Cable; HD 60-Pin Male to EIA530 Male (DTE), 2M/6Ft
3C63922	EIA530 Cable; HD 60-Pin Male to EIA530 Female (DCE), 2M/6Ft
3C63924	X.21 DTE Cable (HD 60-pin male straight to X.21 15-pin male)
3C63925	X.21 DCE Cable (HD 60-pin male straight to X.21 15-pin female)

2 INSTALLATION

This chapter tells you how to mechanically and electrically install the PathBuilder S700 WAN access switch (PathBuilder S700) in your network. It contains the following sections:

- Receiving and Inspecting the PathBuilder S700
- Installation Overview
- Step 1: Install the Shelf in the Rack
- Step 2: Connect AC or DC Power
- Step 3: (If needed) Install Additional Modules in the Shelf
- Step 4: Connect I/O Cabling and Wiring
- Step 5: Connect a Management Terminal

Before using the chapter for an actual installation, read through it at least once to familiarize yourself with the overall process.

Receiving and Inspecting the PathBuilder S700

When you receive the PathBuilder S700, unpack it and inspect the unit for any damage that might have occurred during shipment. Inventory the equipment against the shipping notice.

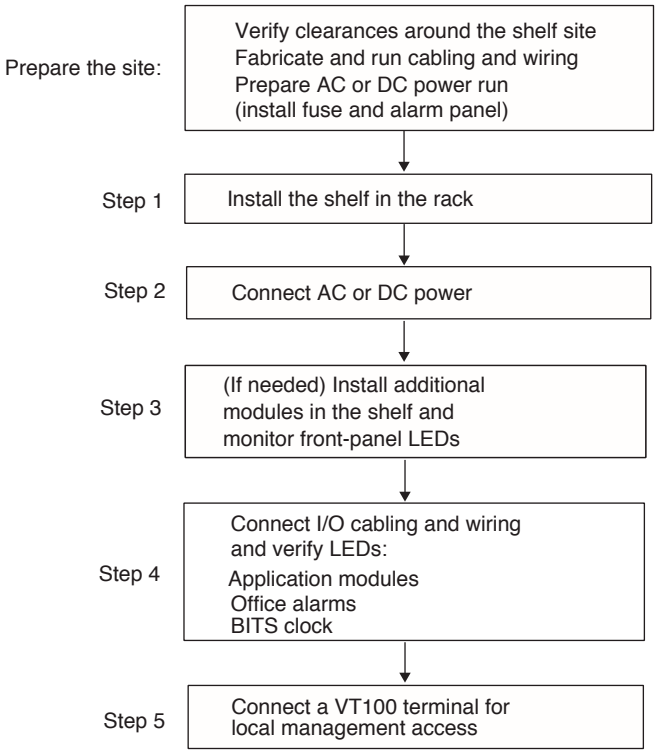
Save the boxes and packing materials in the event there is damage or anything needs to be reshipped at a future date. If anything is damaged or missing, contact the shipper and 3Com immediately.

CAUTION: *Many of the integrated circuits on the modules are sensitive to static electricity. Do not remove the plug-in modules from their shelves without wearing a properly grounded, antistatic, wrist strap.*

Installation Overview

Figure 2 summarizes the overall installation procedure for the PathBuilder S700. For details about each step in the overall procedure, see the following sections.

Figure 2 General Installation Procedure



Site Requirements

- Be within the maximum distances to the port and trunk connections, as well as the NMS terminal
- Have interconnect cabling and wiring ready and labeled
- Have a dedicated source of switched and fused AC power.
- Provide clearance for making all connections and performing maintenance.

Step 1: Install the Shelf in the Rack

In a normal rack mount configuration the PathBuilder S700 shelf is 22.75" x 19" x 11.81" including cables. If the PathBuilder S700 is mounted in an enclosure, plan on enough clearance at the front and back for cable and wiring service loops.

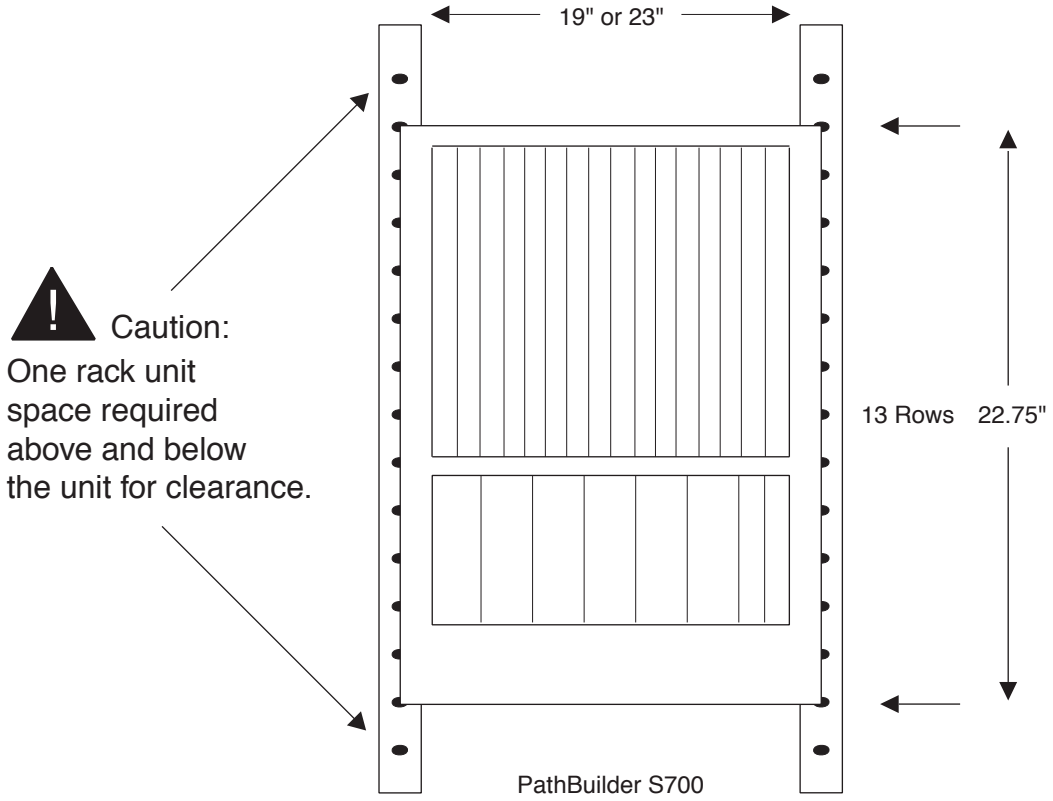
CAUTION: *The PathBuilder S700 chassis includes a fan tray, and a minimum gap of one RU (rack unit) is required between the chassis and any convection cooled equipment.*

CAUTION: *Many of the integrated circuits on the modules are sensitive to static electricity. Do not handle the plug-in modules without wearing a properly grounded, antistatic, wrist strap. When removing the modules from the shelf, place them printed-circuit side down on a nonconducting, static-free, flat surface.*

To install the unit in the rack using 19" or 23" mounting ears, follow these steps:

1 Adjust the mounting ears, if necessary, for 19" or 23" installation. Figure 3 illustrates the dimensions for a rack-mount installation.

Figure 3 Rack Mounting Ear Configurations



2 Support the shelf in its mounting place and attach the mounting hardware.

CAUTION: *Since a fully-loaded chassis weighs 95 pounds, we recommend that two people install the unit in the rack.*

Step 2: Connect AC or DC Power

AC/DC power connections are located at the rear of the PathBuilder S700 shelf. Table 6 lists the specifications for the AC/DC Source.

Table 6 AC/DC Source Specifications

Input Power Requirements	90-264 VAC, 50-60Hz, standard grounded outlet
	-42 to -60 VDC, Optional
	10 AWG wire, Belden type 19364
Power Consumption	1250 Watts, Max
Maximum Current	10.0 A @ 110VAC
	5.0 A @ 220VAC
	20.0 A @ -48VDC

3Com recommends that AC/DC power and office alarms be connected through a Fuse and Alarm Panel mounted above the PathBuilder S700.

The PathBuilder S700 supports six load-sharing power supplies and requires a minimum of three power supply modules for operation. Table 7 indicates how many I/Os (network or user interfaces) are supported based on the number of power supplies and the shelf configuration: non-redundant (1 MCPU module and 1 STX module) or redundant (2 MCPU modules and 2 STX modules),

The redundant configuration (2 MCPU modules and 2 STX modules is not supported in Release 2.03 but will be in subsequent releases.

Table 7 Power Supply Requirements

Total # of Power Supply Modules	Maximum # of I/Os (Non-Redundant System	Maximum # of I/Os (Redundant System)
3	5	4
4	8	7
5	11	11
6	14	14

To make AC/DC power connections, follow these steps:

1 Plug the power supply modules directly into the backplane of the shelf. Their low voltage DC outputs are bussed across the backplane to the other modules. Make sure that the power supply modules and the fan tray are in the shelf and that they are fully seated in their backplane connectors.

CAUTION: *Before servicing the unit and handling AC/DC power leads, disconnect all power supply cords. Always have a partner close by who is familiar with first aid for electrical shock.*

WARNING*: DC Units are to be installed only in Restricted Access Areas (dedicated equipment rooms, equipment closets, etc.) in accordance with Articles 110-16 or 110-17, and 110-18 of the National Electrical Code, ANSI/NFDA No.70.*

2 Turn off the AC/DC power source and connect the AC/DC leads to the front of the shelf. Dress the leads to the rack leaving a service loop.

3 Turn on the AC/DC power and verify that the POWER indicators on both Power Supply Modules are on and that the fans are running.

Figure 4 illustrates the location of the AC power plugs and switch on the rear of the unit.

Figure 4 PathBuilder S700 AC Power Input

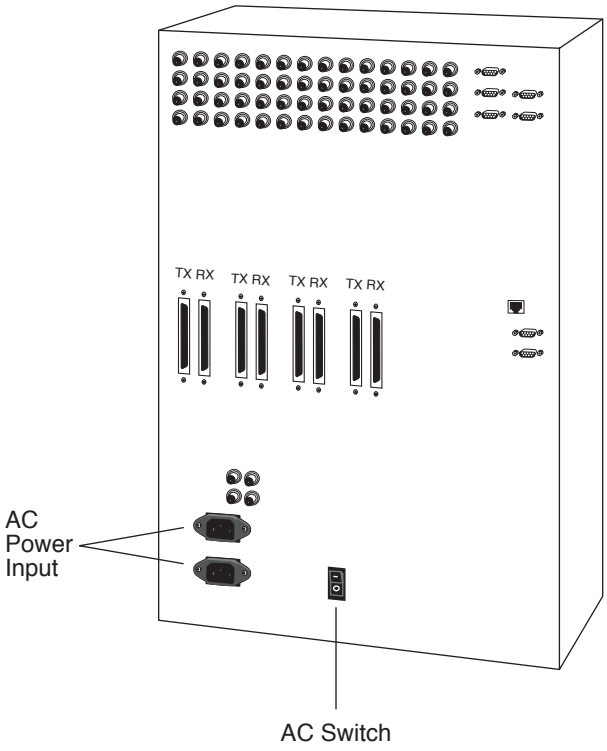
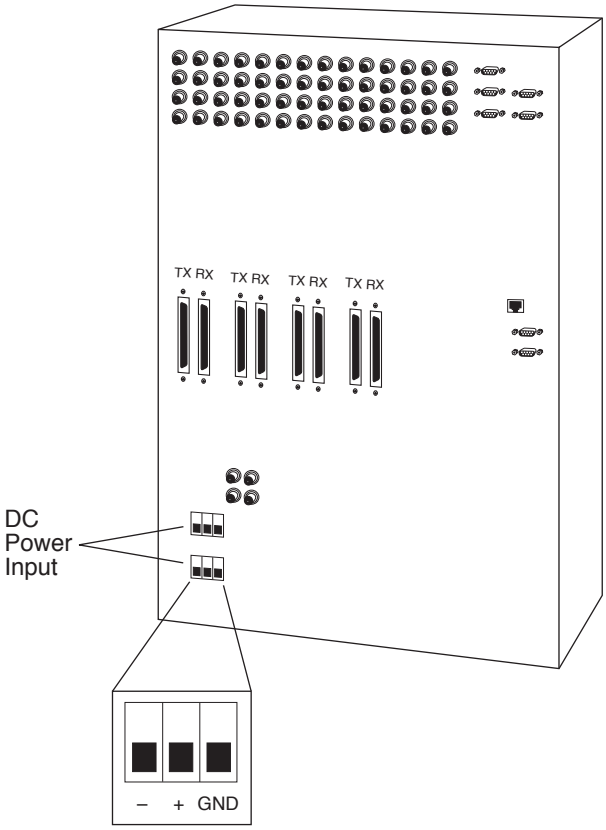


Figure 5 illustrates the location and pinouts for the DC connector block on the rear of the unit.

Figure 5 PathBuilder S700 DC Power Input



Step 3: (If needed) Install Additional Modules in the Shelf

The PathBuilder S700 ships with the factory-ordered modules installed. If you have ordered additional modules, install them as described in this section; otherwise, proceed to "Step 4: Connect I/O Cabling and Wiring" for instructions on how to connect the factory-installed modules and verify front panel indicators.

- Install the Management CPU module in slot 1. (Slot 2 is reserved for a redundant MCPU, which will be supported in subsequent releases.)
- Install the STX module in slot 3. (Slot 4 is reserved for a redundant STX module, which will be supported in subsequent releases.)
- Install any one of the following application modules in slot 5-18:
  - DS3 UNI
  - E3 UNI
  - OC3/STM-1 UNI
  - DS1 UNI with IMA
  - E1 UNI with IMA
  - Ethernet
  - DSX-1 CBR
  - E1 CBR
  - QSIM (Quad Serial Interface Module)
  - HSIM (HSSI Module)
  - FAM (Frame Access Module)

To minimize reconfiguration of modules to implement future redundancy capabilities, we recommend that you group similar modules in slots 7-11 or 12-16 and that you configure slots 17 and 18 last.

We recommend that you install OC3/STM-1 modules in slots 5 and 6 in order to utilize their full bandwidth. Slots 5 and 6 provide 155 Mbps bandwidth for each slot, while slots 7-18 share bandwidth (200 full-duplex Mbps for each group of three slots: 7-9, 10-12, 13-15, and 16-18).

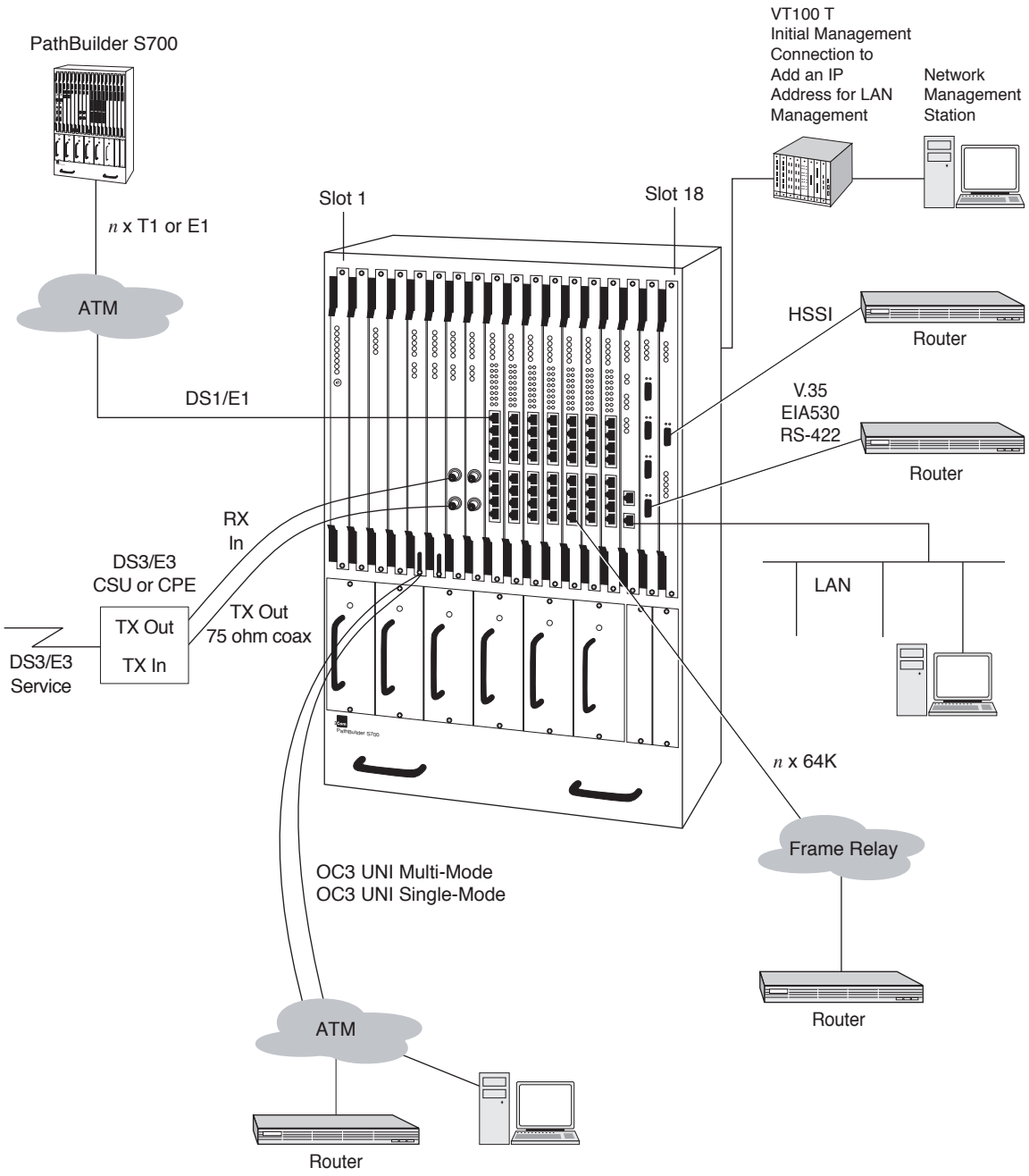
Slots 5 and 6 do not support rear redundant T1/E1 modules.

Step 4: Connect I/O Cabling and Wiring

This section tells you how to connect I/O cabling and wiring once the modules are installed in the shelf and describes the common and module-specific front panel LEDs.

Figure 6 shows an example of a PathBuilder S700 configuration with all of the associated cabling connected.

Figure 6 Sample Full System Configuration



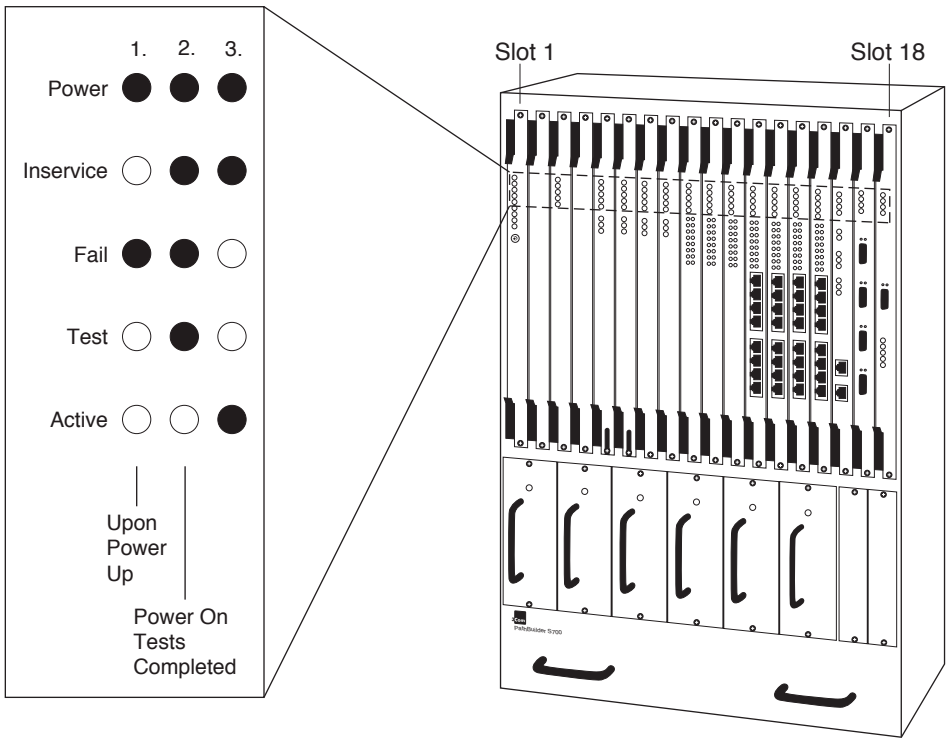
Normal Startup Sequence

All modules feature a set of common system LEDs on the top of the module. When you install and connect a module, the common LED sequence shown in Figure 7 occurs.

The Ethernet module, QSIM, and HSIM have only four common system LEDs. These modules do not include the Active *LED.*

For descriptions of the LEDs specific to each module, see the following sections.

Figure 7 Common LED Sequence



Power (PWR)—Indicates power from the power supply is good.

In Service (INS)—Indicates that the corresponding card is available for transmission.

Fail—Indicates a sub-system failure.

Test—Indicates that a diagnostic is active.

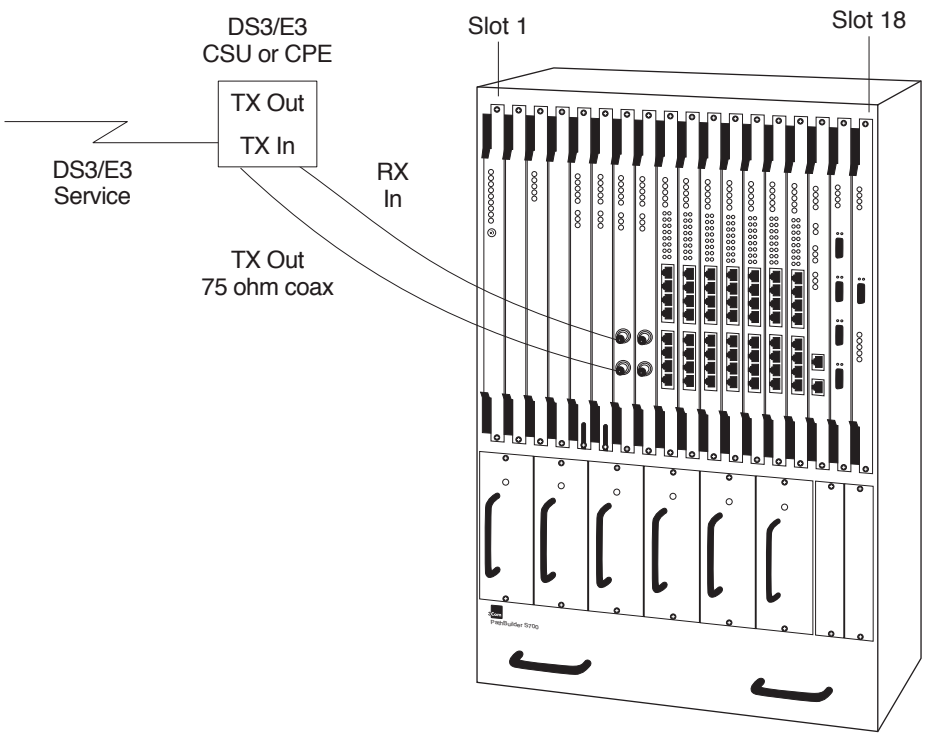
Active (ACTV)—Indicates that the card is in service and active.

Connecting a DS3 UNI or E3 UNI Module

Connect the DS3 UNI or E3 UNI module to a DS3 or E3 repeater using the female BNC connectors, as shown in Figure 8. The maximum coax run is 450 feet for DS3 and 1200 feet for E3. The transmitter in the DS3 UNI Module includes selectable LBO (Line Build-Out) to adjust the output signal to cable runs of 0-255 or 225-450 feet. Select the LBO during card configuration from the local terminal or NMS. See "Configuring DS3 UNI Modules" in Chapter 5, for details.

The PathBuilder S700 supports two models of DS3/E3 UNI modules: front-connecting modules, which you connect from the front of the unit, as described in this section, and rear redundant modules, which you connect from the rear of the unit. For details about how to connect rear redundant DS3/E3 UNI modules, see "Connecting Rear Redundant Modules" later in this chapter.

Figure 8 DS3/E3 UNI Module Connection



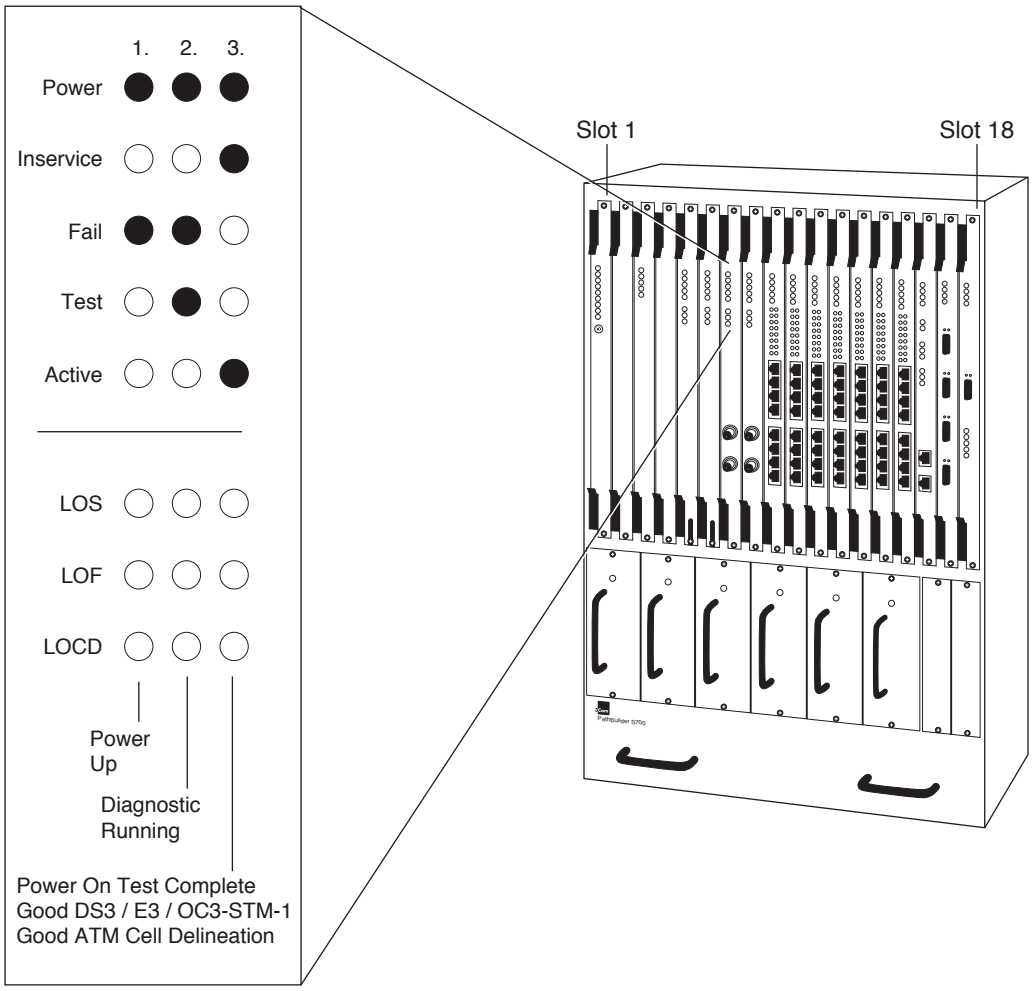
Once you have connected the module, verify the front-panel indicator sequence illustrated in Figure 9. The DS3 UNI and E3 UNI modules feature the following front panel indicators in addition to the common system LEDs:

LOS (RED)—Powers up in the "off" state and illuminates when a LOS (Loss of Signal) condition is detected on the incoming DS3/E3. The LOS LED is off if a signal is present. It reflects the LOS state of the DS3/E3 in real time (no integration of the state is needed).

LOF (RED)—Powers up in the "off" state and illuminates when a LOF (Loss of Frame) condition is detected on the incoming DS3/E3. The LOF LED is off when the signal is in frame. It reflects the LOF state of the DS3/E3 in real time (no integration of the state is needed).

LOCD (RED)—Powers up in the "off" state and illuminates when a LOCD (Loss of Cell Delineation) condition is detected on the incoming DS3/E3 under HEC (Header Error Control) framing. The LOCD LED is off when delineations are obtained. It reflects the LOCD state of the DS3/E3 in real time (no integration of the state is needed).

Figure 9 DS3/E3 UNI Module LEDs

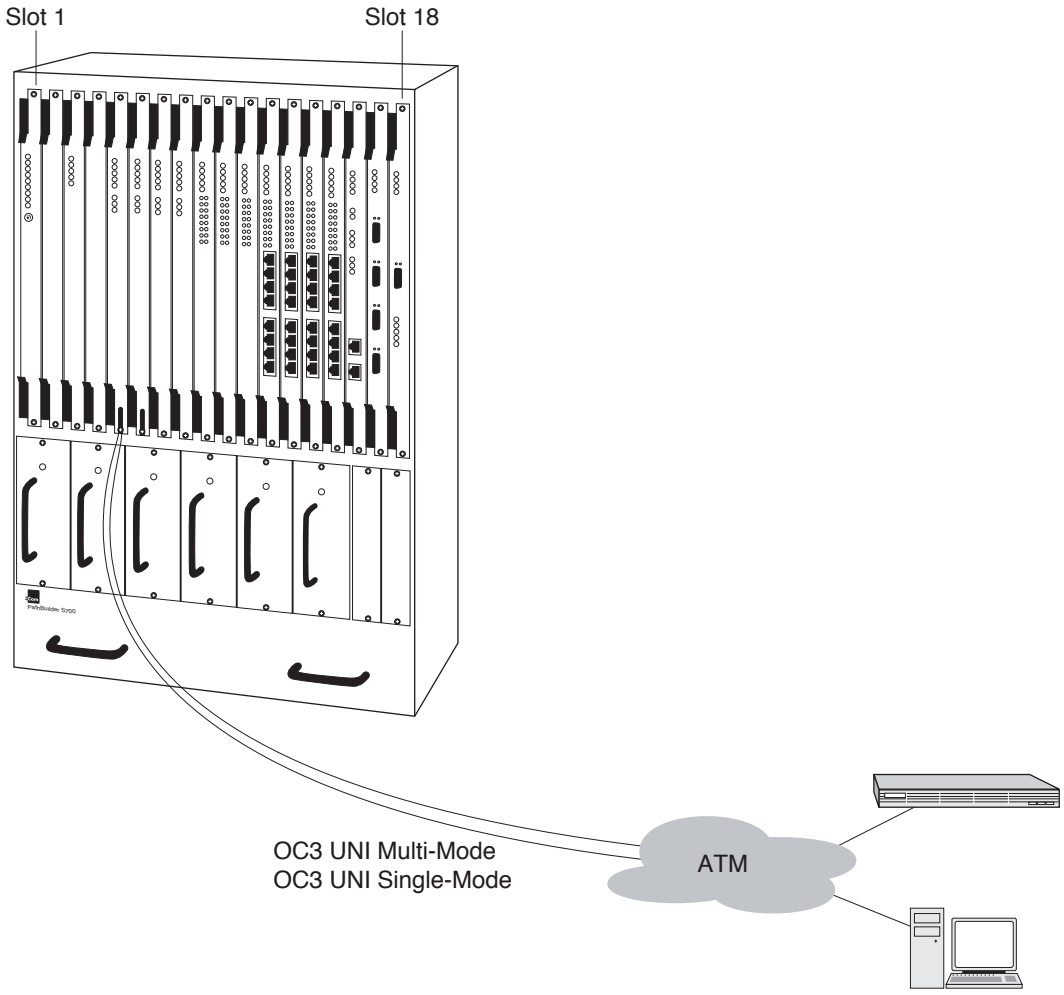


Connecting an OC3/STM-1 UNI Module

Connect the OC3/STM-1 UNI module using the Internal SC type connector. As shown in Figure 10, the OC3-STM-1 UNI module supports two types of fiber optic cable.

- Use multi-mode cable to generate UNI traffic over a port interface.
- Use single-mode cable to generate UNI traffic over a trunk interface.

Figure 10 OC3/STM-1 UNI Single-mode or Multi-mode Module Connection



Once you have connected the module, verify the front-panel indicator sequence. The startup LED sequence and module-specific LEDs for the OC3/STM-1 UNI module are the same as those for the D3 UNI and E3 UNI module. See "Connecting a DS3 UNI or E3 UNI Module" and Figure 9, earlier in this chapter, for details.

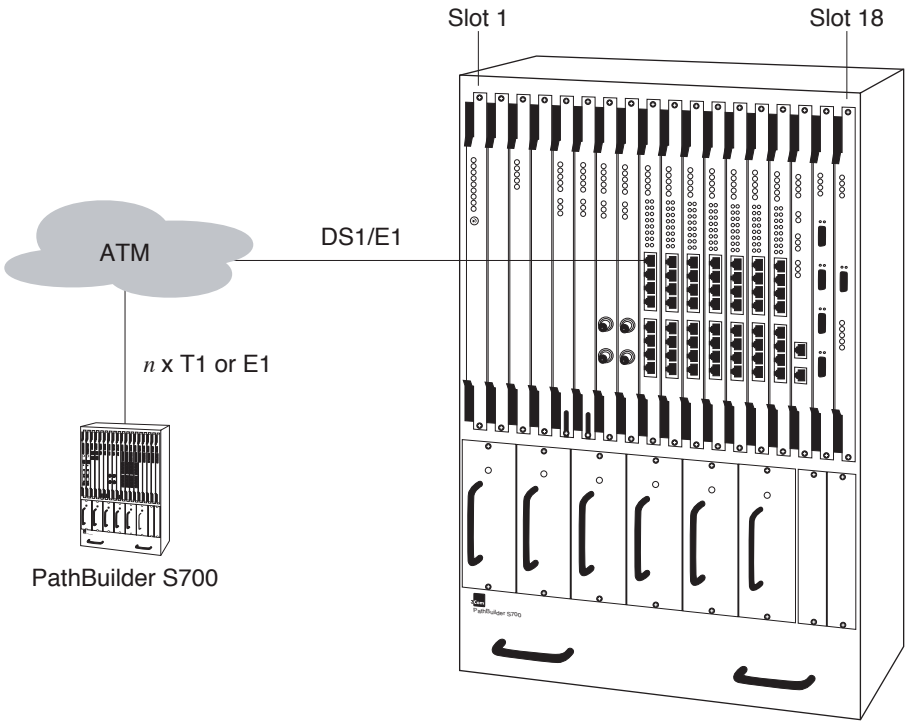
Connecting a DS1/E1 UNI with IMA Module

Connect the DS1 UNI with IMA module or the E1 UNI with IMA module using the RJ-48 connectors (with integrated CSU for the DS1 module, with no CSU for the E1 module), as shown in Figure 11.

The PathBuilder S700 supports two models of DS1/E1 UNI modules: front-connecting modules, which you connect from the front of the unit, as described in this section, and rear redundant modules, which you connect from the rear of the unit. For details about how to connect rear redundant DS1/E1 UNI modules, see "Connecting Rear Redundant Modules" later in this chapter.

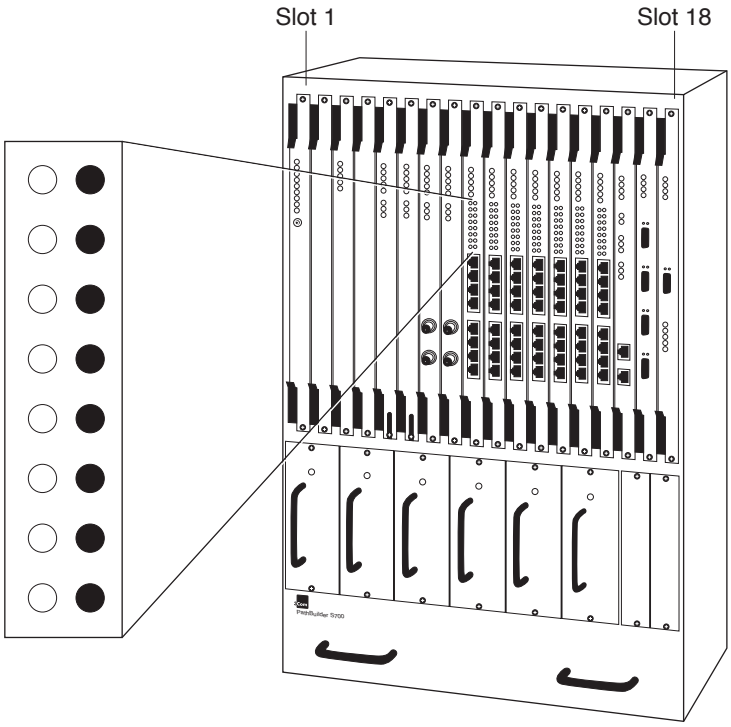
If you are using a G703 coax physical connection to connect the E1 line to the interface, you must use the E1 Balun Adapter (part number 3C63904) for proper impedance.

Figure 11 DS1/E1 UNI with IMA Module Connection



Once you have connected the module, verify the front-panel indicators. As shown in Figure 12, the DS1/E1 UNI with IMA module features eight pairs of port indicator LEDs in addition to the common system front panel indicators—each pair corresponds to one of the eight RJ48 interfaces on the DS1/E1 UNI module.

Figure 12 DS1/E1 UNI LEDs



- The green indicator light illuminates to show that the port is in service.
- The red indicator light illuminates to show that the port is not in service.

Connecting an Ethernet Module

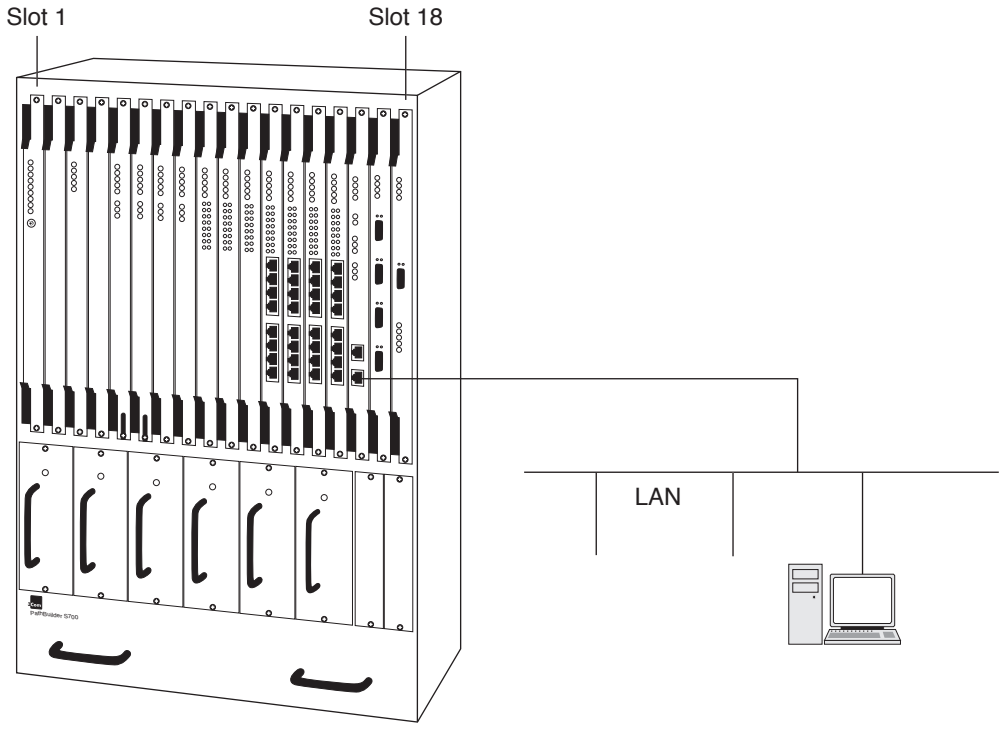
Connect an Ethernet module to the LAN directly or through a hub, as shown in Figure 13, Table 8 lists the RJ48 connector pinouts.

Table 8 Ethernet Module Connector Pinouts

PIN 1	TX+
PIN 2	TX-
PIN 3	RX+
PIN 4	
PIN 5	
PIN 6	RX-
PIN 7	
PIN 8	

The cable runs from the PathBuilder S700 Ethernet ports to the Ethernet LAN connections must be no longer than 100 meters in compliance with EIA/TIA standards for 10BaseT. The cable lengths should include service loops at the ends and the complete cable route distances.

Figure 13 Ethernet Module Connection



Once you have connected the module, verify the front panel indicator sequence. As shown in Figure 14, the Ethernet module has the following front panel indicators in addition to the common system LEDs.

TX Port 1 (GREEN)—This is a transmit (to the cable) activity indicator. For each frame sent to the cable, the LED is momentarily flashed.

RX Port 1 (GREEN)—This is a Receive (from the cable) activity indicator. For each frame received from the cable, the LED will momentarily flash.

Link Port1 (GREEN)—This LED will illuminate when properly connected to the Ethernet cable, otherwise it will be off.

TX Port 2 (GREEN)—This is a transmit (to the cable) activity indicator. For each frame sent to the cable, the LED is momentarily flashed.

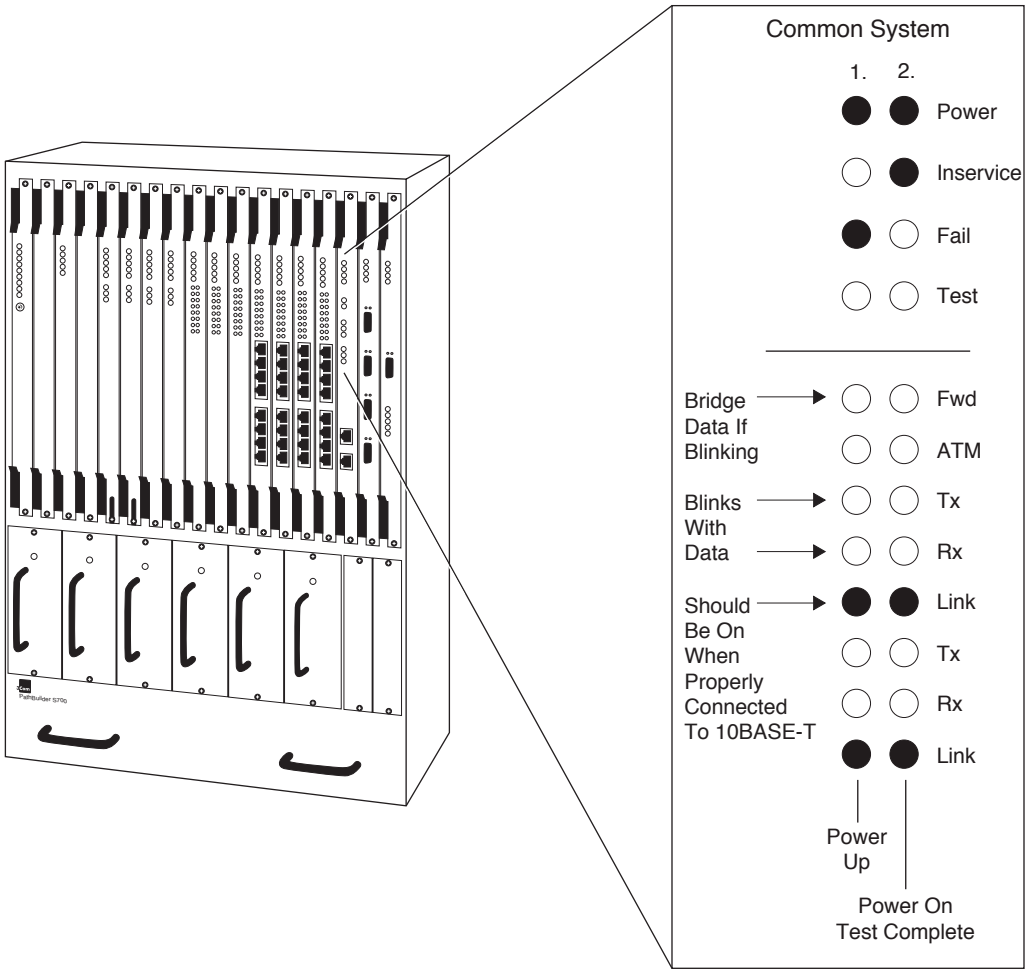
RX Port2 (GREEN)—This is a Receive (from the cable) activity indicator. For each frame received from the cable, the LED will momentarily flash.

Link Port 2 (GREEN)—This LED will illuminate when properly connected to the Ethernet cable, otherwise it will be off.

FWD (GREEN)—This is a bridging activity detector. For each frame bridged the LED will momentarily flash.

ATM (GREEN)—This is an ATM traffic indicator. It illuminates when an ATM cell is received or transmitted.

Figure 14 Ethernet Module LEDs



Connecting a DSX-1 CBR or E1 CBR Module

Connect a DSX-1 CBR or E1 CBR module using the RJ48 DSX-1 interface for T1/E1 traffic. Table 9 describes the DSX-1/E1 CBR connector pinouts.

Table 9 DSX-1/E1 CBR Connector Pinouts

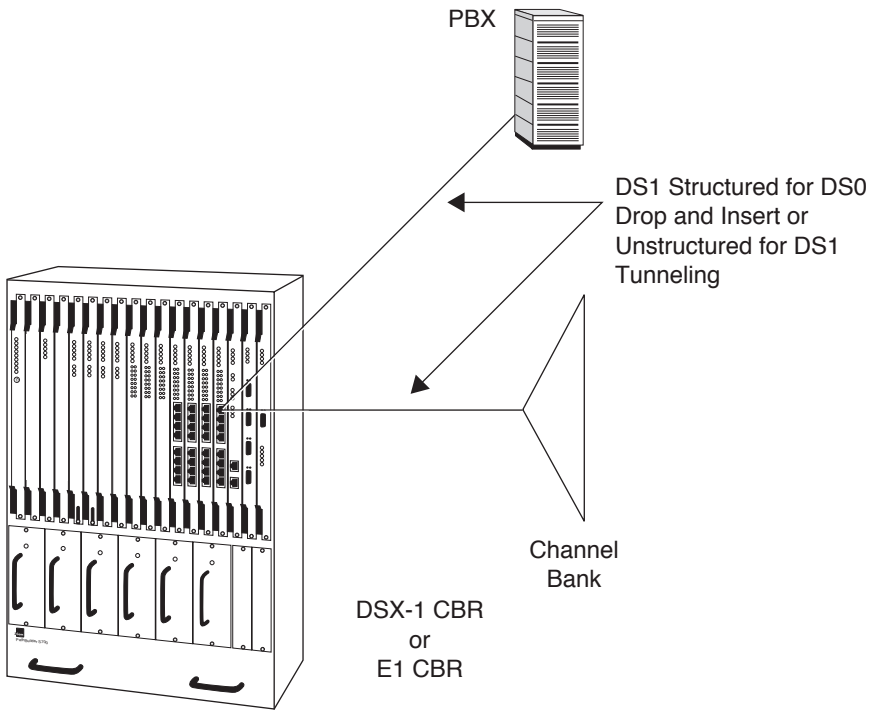
PIN 1	RX ring
PIN 2	RX tip
PIN 3	NC
PIN 4	TX ring
PIN 5	TX tip
PIN 6	NC
PIN 7	NC
PIN 8	NC

The PathBuilder S700 supports two models of DSX-1/E1 CBR modules: front-connecting modules, which you connect from the front of the unit, as described in this section, and rear redundant modules, which you connect from the rear of the unit. For details about how to connect rear redundant DSX-1/E1 CBR modules, see "Connecting Rear Redundant Modules" later in this chapter.

If you are using a G703 coax physical connection to connect the E1 CBR line to the interface, you must use the E1 Balun Adapter (part number 3C63904) for proper impedance.

The DSX-1 CBR module supports LBOs (LIne Build Outs) to CSU of up to 655 feet. You must configure the LBO via the local terminal or NMS. See "Configuring DSX-1 CBR or E1 CBR Modules" in Chapter 5, for details. You can typically make connections locally to DTE equipment without DSU/CSUs, as long as the equipment supports a direct T1 interface and can recover T1 signal. See Figure 15.

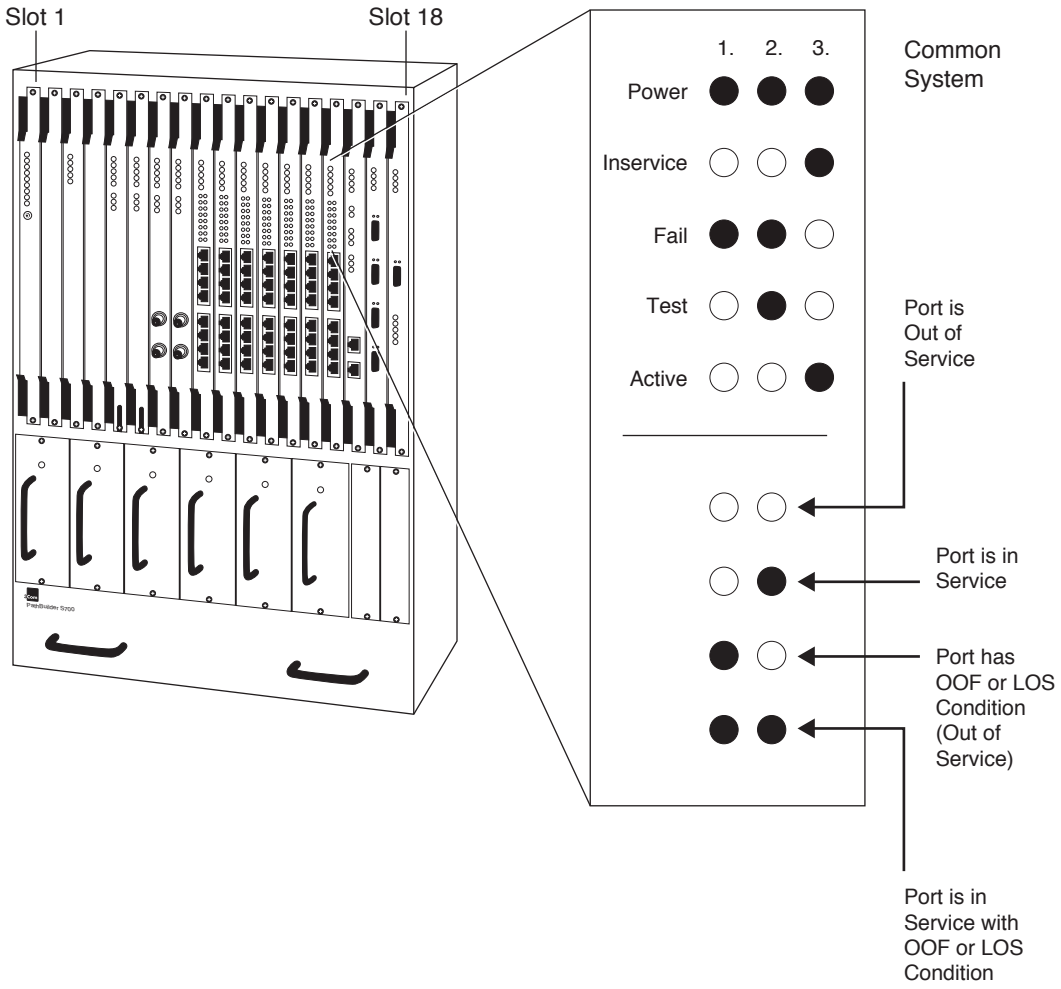
Figure 15 DSX-1/E1 CBR Module Connections



You can make connections from the E1 CBR module locally to DTE equipment as long as the equipment supports a direct E1 interface and can recover an E1 signal.

Once you have connected the DSX-1 CBR or E1 CBR module, verify the front panel common LED sequence illustrated in Figure 16.

Figure 16 DSX-1/E1 CBR Module LEDs



As shown above in Figure 16, the DSX-1/E1 CBR module features eight pairs of port indicator LEDs (four pairs for four-port CBR modules) in addition to the common system front panel indicators—each pair corresponds to one of the ports on the DSX-1/E1 CBR module.

- The green indicator light illuminates to show that the port has been placed in service.
- The red indicator light illuminates to show an OOF or LOS condition on the port.

Connecting a QSIM V.35/RS422/EIA530 Module

The QSIM (Quad Serial Interface Module) provides the following cabling options:

- DTE/DCE V.35
- DTE/DCE EIA530
- DTE/DCE RS-422
- DTE/DCE X.21

To connect the QSIM, attach the appropriate cable to one of the four ports using the 60-pin amphenol connector, as shown in Figure 17.

Figure 17 QSIM Connection

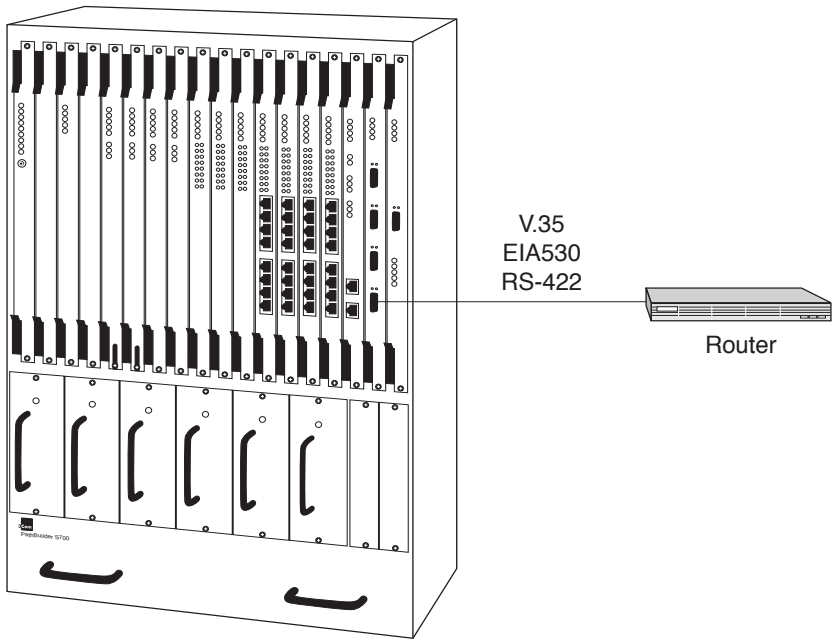


Table 10, Table 11, Table 12, Table 13, Table 14, Table 15, Table 16, Table 18, and Table 17 describe the connector pinouts

Table 10 V.35 DTE Cable (60-pin Male to 34-pin Male; Part # 3C63913)

Signal Name	Pin # on 60 Pin Conn	Pin # on V.35 Conn	Direction (For QSIM)
Frame GND	46	A	
Circuit GND	45	B	
RTS	42	C	Out
CTS	35	D	In
DSR	34	E	In
DCD	33	F	In
DTR	43	H	Out
LL (not used)	44	K	Out
SD+	18	P	Out
SD-	17	S	Out
RD+	28	R	In
RD-	27	T	In
SCTE+	20	U	Out
SCTE-	19	W	Out
SCR+	26	V	In
SCR-	25	X	In
SCT+	24	Y	In
SCT-	23	AA	In
Shorting GR 1	48, 49		
Shorting GR 2	50, 51, 52		
Shorting GR 3	53, 54, 55, 56		

Table 11 V.35 DCE Cable Pinouts (60-pin Make to 34-pin Female; Part # 3C63914)

Signal Name	Pin # on 60 Pin Conn	Pin # on V.35 Conn	Direction (For QSIM)
Frame GND	46	A	
Circuit GND	45	B	
RTS	35	C	In
CTS	42	D	Out
DSR	43	E	Out
DCD	44	F	Out
DTR	34	H	In
LL (not used)	33	K	In
SD+	28	P	In
SD-	27	S	In
RD+	18	R	Out
RD-	17	T	Out
SCTE+	26	U	In
SCTE-	25	W	In
SCR+	22	V	Out
SCR-	21	X	Out
SCT+	20	Y	Out
SCT-	19	AA	Out
Shorting GR 1	48, 49		
Shorting GR 2	50, 51,		
Shorting GR 3	53, 54, 55, 56		

Table 12 RS-422/449 DTE Cable Pinouts (60-pin Male to RS-449 male; Part # 3C63920)

Signal Name	Pin # on 60 Pin Conn	Pin # on V.35 Conn	Direction (For QSIM)
Frame GND	46	1	
Circuit GND	15, 16, 45	19, 20, 37	
RTS	9, 10	7, 25	Out
CTS	1, 2	9, 27	In
DSR	3, 4	11, 29	In
DCD (not used, see DCE cable)	5, 6	13, 31	In
DTR	7, 8	12, 30	Out
LL (not used)	44	10	Out
SD+	11	4	Out
SD-	12	22	Out
RD+	28	6	In
RD-	27	24	In
SCTE+	13	17	Out
SCTE-	14	35	Out
SCR+	26	8	In
SCR-	25	26	In
SCT+	24	5	In
SCT-	23	23	In
Shorting GR 1	48, 49		
Shorting GR 2	51, 52,		

Table 13 RS422/449 DCE Cable Pinouts (60-pin Make to RS-449 Female; Part # 3C63921)

Signal Name	Pin # on 60 Pin Conn	Pin # on V.35 Conn	Direction (For QSIM)
Frame GND	46	1	
Circuit GND	15, 16, 30	19, 20, 37	
RTS	1, 2	7, 25	In
CTS	9, 10	9, 27	Out
DSR	7, 8	11, 29	Out
DCD	5, 6	13, 31	Out
DTR	3, 4	12, 30	In
LL (not used)	29	10	In
SD+	28	4	In
SD-	27	22	In
RD+	11	6	Out
RD-	12	24	Out
SCTE+	26	17	In
SCTE-	25	35	In
SCR+	24	8	Out
SCR-	23	26	Out
SCT+	13	5	Out
SCT-	14	23	Out
Shorting GR 1	48, 49		

Table 14 EIA530 DTE Cable Pinouts (60-pin Male to EIA530 Male; Part # 3C63923)

Signal Name	Pin # on 60 Pin Conn	Pin # on V.35 Conn	Direction (For QSIM)
Frame GND	46	1	
Circuit GND	45	7	
RTS	9, 10	4, 19	Out
CTS	1, 2	5, 13	In
DSR	3, 4	6, 22	In
DCD (not used, see DCE cable)	5, 6	8, 10	In
DTR	7, 8	20, 23	Out
LL (not used)	44	18	Out
SD+	11	2	Out
SD-	12	14	Out
RD+	28	3	In
RD-	27	16	In
SCTE+	13	24	Out
SCTE-	14	11	Out
SCR+	26	17	In
SCR-	25	9	In
SCT+	24	15	In
SCT-	23	12	In
Shorting GR 1	47, 48, 49		
Shorting GR 2	51, 52,		

Table 15 EIA530 DCE Cable Pinouts (60-pin Male to EIA530 Female; Part # 3C63922)

Signal Name	Pin # on 60 Pin Conn	Pin # on V.35 Conn	Direction (For QSIM)
Frame GND	46	1	
Circuit GND	45	7	
RTS	1, 2	4, 19	In
CTS	9, 10	5, 13	Out
DSR	7, 8	6, 22	Out
DCD (not used, see DCE cable)	5, 6	8, 10	Out
DTR	3, 4	20, 23	In
LL (not used)	29	18	In
SD+	28	2	In
SD-	27	14	In
RD+	11	3	Out
RD-	12	16	Out
SCTE+	26	24	In
SCTE-	25	11	In
SCR+	24	17	Out
SCR-	23	9	Out
SCT+	13	15	Out
SCT-	14	12	Out
Shorting GR 1	47, 48, 49		

Table 16 HSSI straight DTE to DCE Cable (50-pin Male to 50-pin Male; Part # 3C63912)

Signal Name	Pin # on DCE	Pin # on DTE	Direction (For DTE)
Circuit GND	1, 7, 13, 19, 25, 26, 32, 38, 44, 50	1, 7, 13, 19, 25, 26, 32, 38, 44, 50	
TA	8, 33	8,33	Out
CA	3, 28	3, 28	In
LA	10, 35	10, 35	In
LB	12, 37	12, 37	In
LC	5, 30	5, 30	Out
SD	11, 36	11, 36	Out
RD	4, 29	4, 29	In
TT	9, 34	9, 34	Out
RT	2, 27	2, 27	In
ST	6, 31	6, 31	In
ST DTE	14, 39	14, 39	Out
Ancillary to DTE (not used)	20, 21, 22, 23, 24, 45, 46, 47, 48, 49	20, 21, 22, 23, 24, 45, 46, 47, 48, 49	In
Ancillary to DCE (not used)	15, 16, 17, 18, 40, 41, 42, 43	15, 16, 17, 18, 40, 41, 42, 43	Out

Table 17 X.21 DTE Cable (60 pin Male to 15-pin Male; Part # 3C63924)

Signal Name	Pin # on 60 PIN CONN	Pin # on DB15 CONN	Direction (For QSIM)
Frame GND	46	1	
Circuit GND	15	8	
RTS	1, 2	3, 10	In
CTS	9, 10	5, 12	Out
DSR			Out
DCD (in order to keep cable compatible with Cisco, DCD should be tristated when in DTE mode.			Out
DTR			In
LL (not used)			In
SD+	28	2	In
SD-	27	9	In
RD+	11	4	Out
RD-	12	11	Out
SCTE+			In
SCTE-1			In
SCR+ (in order to keep cable compatible with Cisco, SCR+ & - should be tristated when in DTE mode, double term, double buffer)	24	6	Out
SCR-	23	13	Out
SCT+			Out
SCT-			Out
Shorting GR 1	47, 48		

Table 18 X.21 DCE Cable Pinouts (60-pin Male to 15-pin Female; Part # 3C63925)

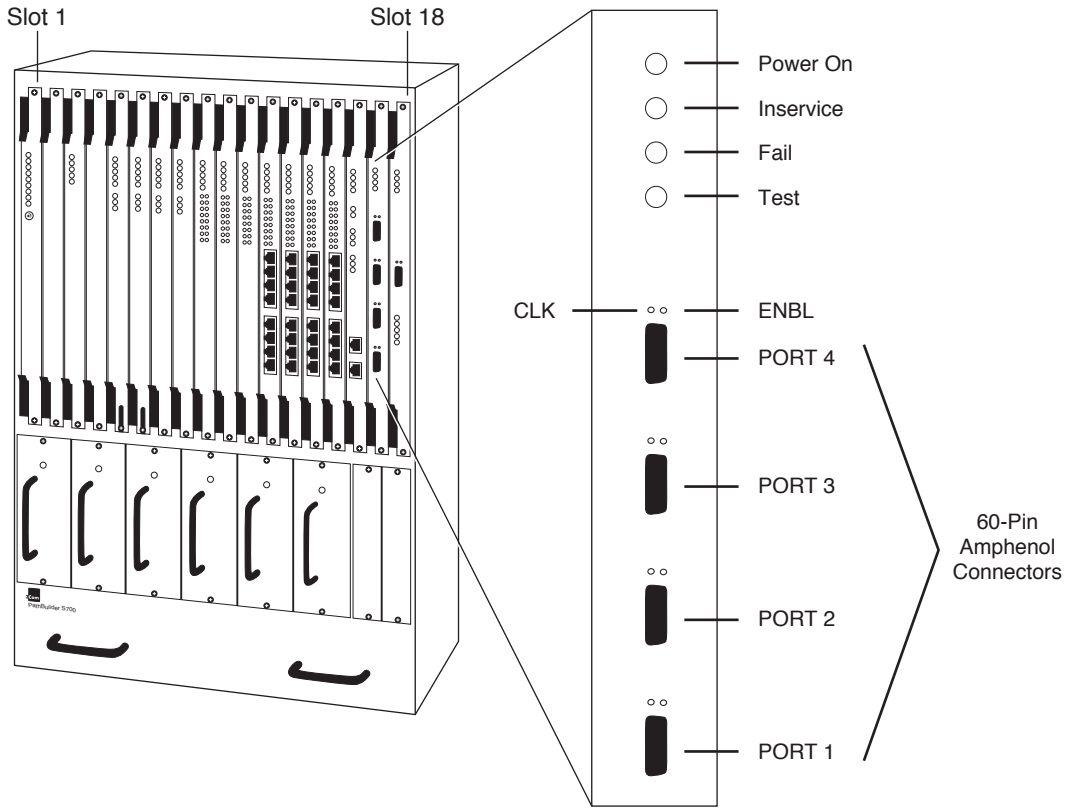
Signal Name	Pin # on 60 PIN CONN	Pin # on DB15 CONN	Direction (For QSIM)
Frame GND	46	1	
Circuit GND	15	8	
RTS	9, 10	3, 10	Out
CTS	1, 2	5, 12	In
DSR			In
DCD (not used, see DCE cable note)			In
DTR			Out
LL (not used)			Out
SD+	11	2	Out
SD-	12	9	Out
RD+	28	4	In
RD-	27	11	In
SCTE+			Out
SCTE-			Out
SCR+	26, 24	6	In
SCR-	25, 23	13	In
SCT+			In
SCT-			In
Shorting GR 1	47, 48		
Shorting GR 2	51, 52		

Once you have connected the QSIM, verify the front panel indicators. As shown in Figure 18, in addition to the common system front panel indicators, each port has a pair of LEDs to the left of the port.

ENBL—Illuminates when the port is in service.

CLK—Illuminates when clocking is in service.

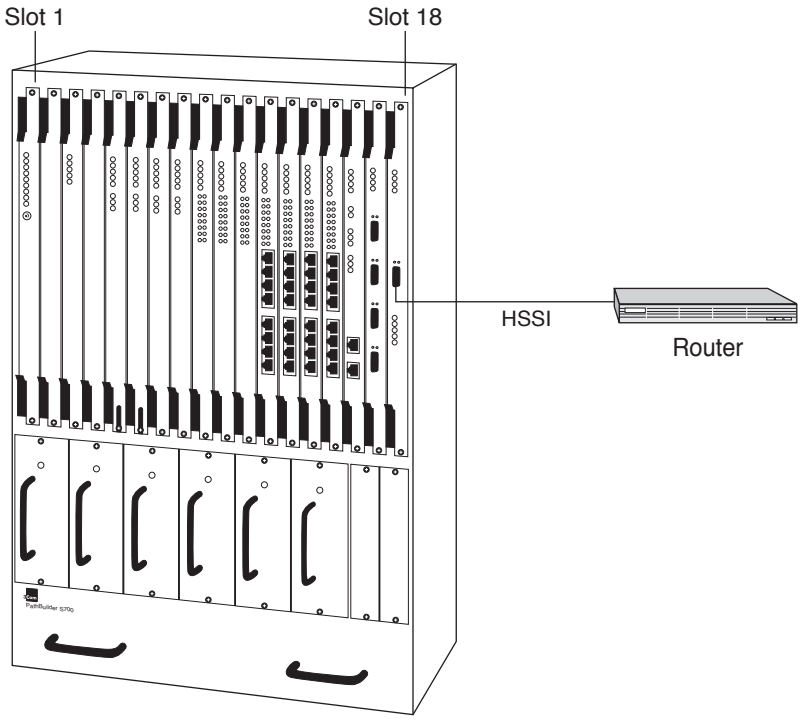
Figure 18 QSIM LEDs



Connecting a HSIM Module

Connect a HSIM module using a HSSI SCSI-II 50-pin cable, as shown in Figure 19.

Figure 19 HSIM Connection

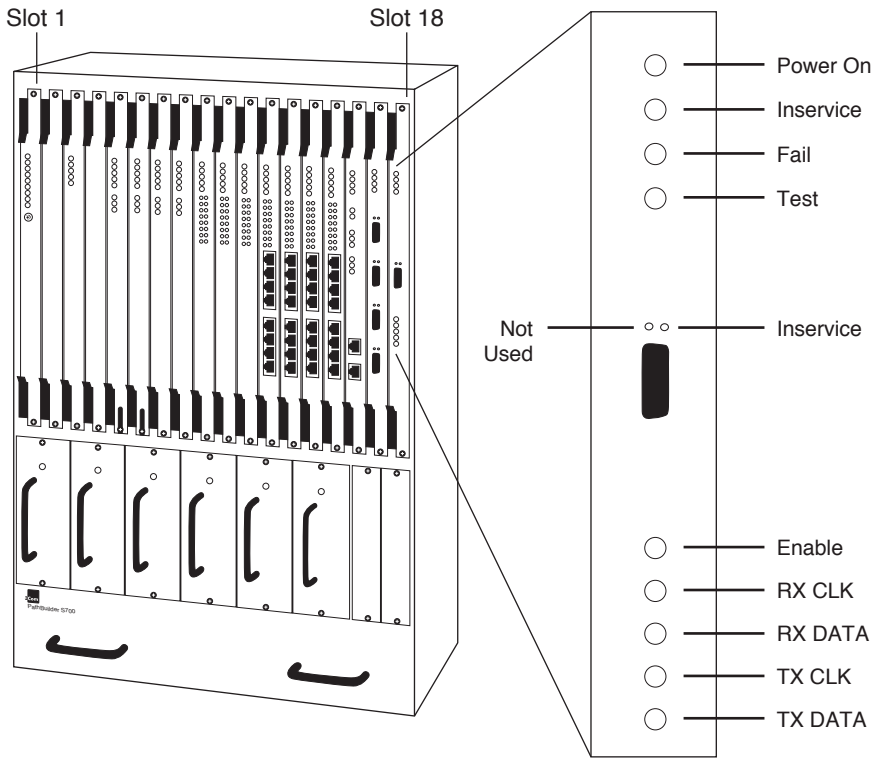


Once you have connected the HSIM module, verify the front panel indicators. As shown in Figure 19, the HSIM module has two front panel indicators in addition to the common system LEDs:

Inservice—Indicates that the HSIM card is active.

Not Used—Indicates that the HSIM card is not in use.

Figure 20 HSIM LEDs

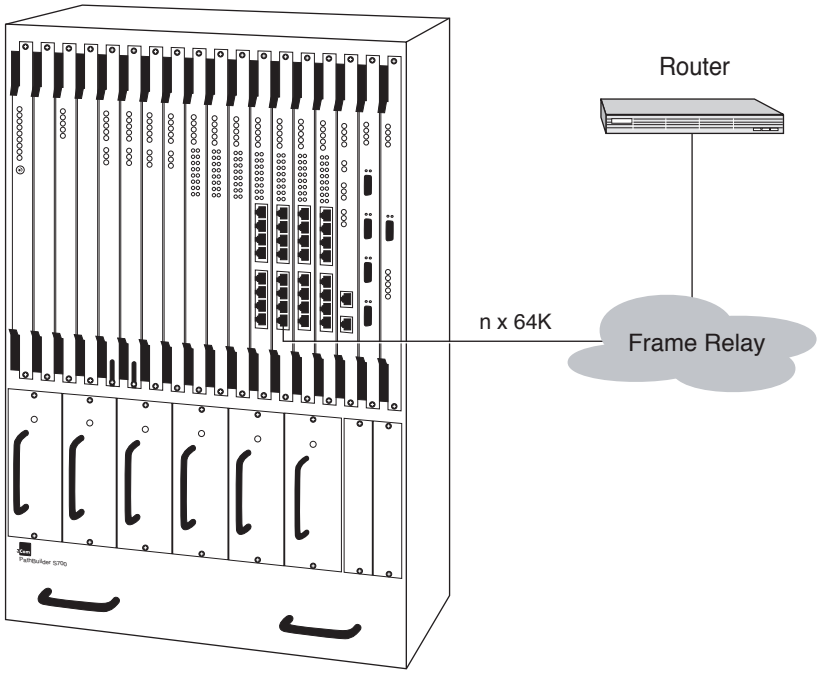


Connecting a DS1 Frame Access Module

Connect a DS1 Frame Access Module (FAM) using up to eight RJ48 interfaces for T1 traffic, as shown in Figure 21.

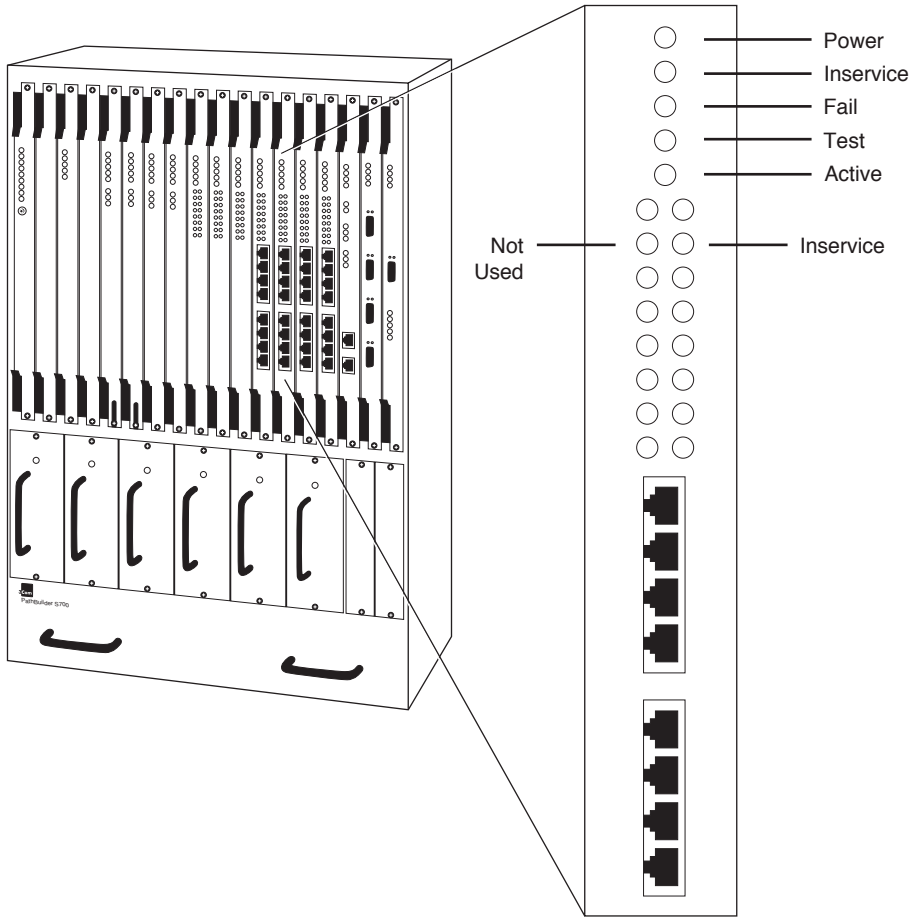
The PathBuilder S700 supports two models of DS1 FAM modules: front-connecting modules, which you connect from the front of the unit, as described in this section, and rear redundant modules, which you connect from the rear of the unit. For details about how to connect rear redundant DS1 FAM modules, see "Connecting Rear Redundant Modules" later in this chapter.

Figure 21 FAM Connection



Once you have connected the FAM, verify the front panel indicator sequence illustrated in Figure 22.

Figure 22 FAM LEDs



The FAM features eight pairs of port indicator LEDs in addition to the common system front panel indicators—each pair corresponds to one of the eight ports on the FAM.

Inservice—Indicates that the FAM card is active.

Not Used—Indicates that the FAM card is not in use.

Verifying CPU LEDs and Connecting the Office Alarm Connector

In addition to the common front panel indicators, the Management CPU module features the following LEDs:

Critical—Indicates a critical alarm.

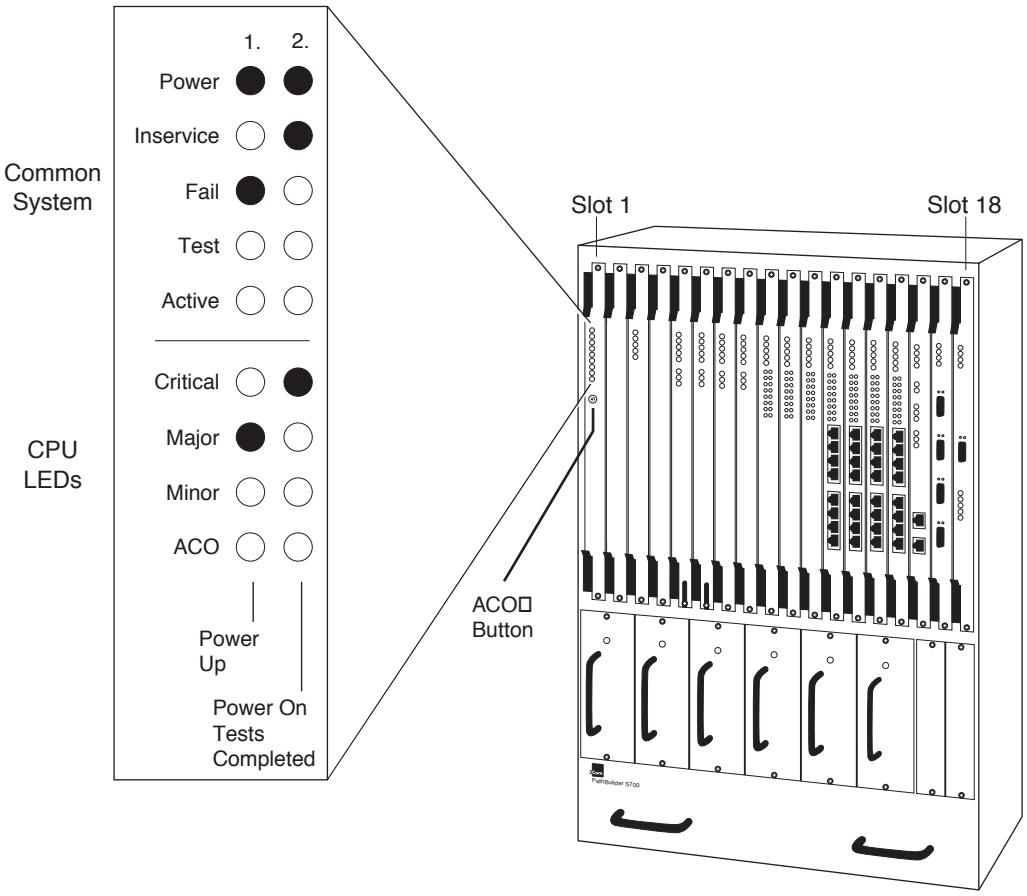
Major—Indicates a major alarm.

Minor—Indicates a minor alarm.

ACO—Alarm Cut off; illuminates when you push the ACO button. The ACO is used in conjunction with an external audible alarm. Pushing the ACO button cuts off the audible alarm and illuminates the ACO LED.

You must verify the front panel indicator sequence illustrated in Figure 23.

Figure 23 Management CPU LEDs and ACO Button



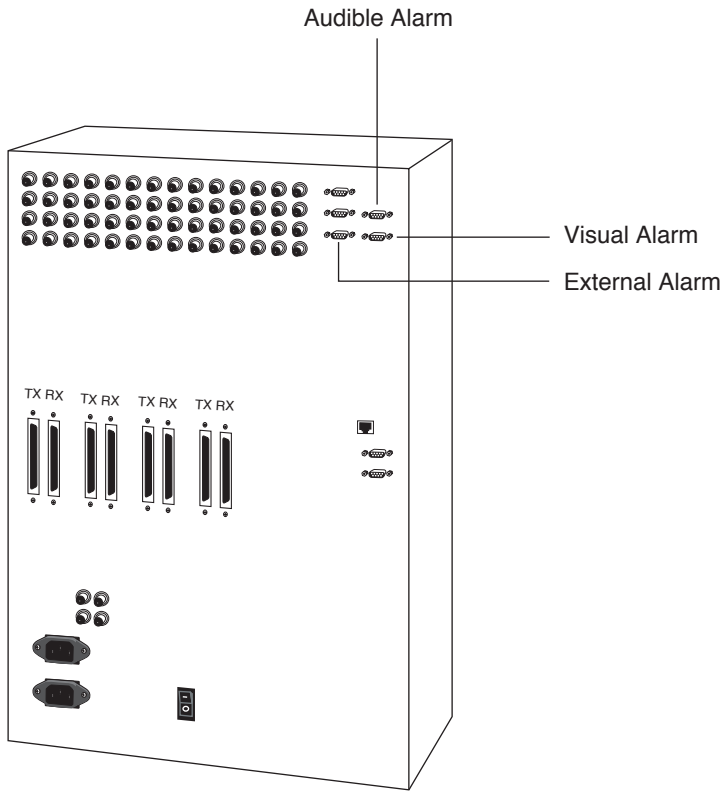
The PathBuilder S700 supports both an audible and a visual alarm, but the ACO extinguishes only the audible alarm.

Connecting the Office Alarms

As shown in Figure 24, the PathBuilder S700 features three alarm connectors on the rear of the unit:

- **External alarm**—Connect up to three external alarms from outside equipment.
- **Visual alarm**—Connect a visual alarm that will illuminate whenever a critical, major, or minor alarm occurs on the shelf. To extinguish the visual alarm, you must clear the alarm.
- **Audible alarm**—Connect an audible alarm that will ring whenever a critical, major, or minor alarm occurs on the shelf. To extinguish the audible alarm, clear the alarm or press the ACO button on the front of the MCPU module.

Figure 24 PathBuilder S700 Alarm Connectors



Connecting the External Alarm Table 19 lists the pinouts for the external alarm connector. You can connect up to three alarms from outside equipment using the specified pairs of pins (pins 5 and 9 for alarm #1, pins 8 and 3 for alarm #2, and pins 2 and 6 for alarm #3). Set the state of these alarms to *Normally Open* or *Normally Closed* from the Shelf Configuration menu. See "Setting External Alarm Status" in Chapter 5 for details.

Table 19 External Alarm Connector Pinouts

PIN 5	External Alarm #1
PIN 9	External Alarm #1 Return
PIN 8	External Alarm #2
PIN 3	External Alarm #2 Return
PIN 2	External Alarm #3
PIN 6	External Alarm #3 Return
PINS 1, 4, 7	No Connect

Connecting the Visual Alarm Table 20 lists the pinouts for the visual alarm connector. Connect your alarm equipment to the appropriate pins, as determined by the type of alarm equipment you are using. For example, if the alarm equipment you are using requires an Open state when there is no alarm, connect to pins 1 and 2 for the minor alarm, 7 and 8 for the major alarm, and 4 and 5 for the critical alarm. When the MCPU detects a minor, major, or critical alarm, the appropriate LED illuminates. To turn off the LED, you must clear the alarm.

Table 20 Visual Alarm Connector Pinouts

PIN 1	Minor Alarm Return (Common)
PIN 6	Minor Alarm Normally Closed (NC)
PIN 2	Minor Alarm Normally Open (NO)
PIN 7	Major Alarm Return (Common)
PIN 3	Major Alarm Normally Closed (NC)
PIN 8	Major Alarm Normally Open (NO)
PIN 4	Critical Alarm Return (Common)
PIN 9	Critical Alarm Normally Closed (NC)
PIN 5	Critical Alarm Normally Open (NO)

Connecting the Audible Alarm Table 21 lists the pinouts for the audible alarm connector. Connect your alarm equipment to the appropriate pins, as determined by the type of alarm equipment you are using. For example, if the alarm equipment you are using requires an Open state when there is no alarm, connect to pins 1 and 2 for the minor alarm, 7 and 8 for the major alarm, and 4 and 5 for the critical alarm. When the MCPU detects a minor, major, or critical alarm, the alarm rings. To turn off the alarm, press the ACO button on the front of the MCPU module.

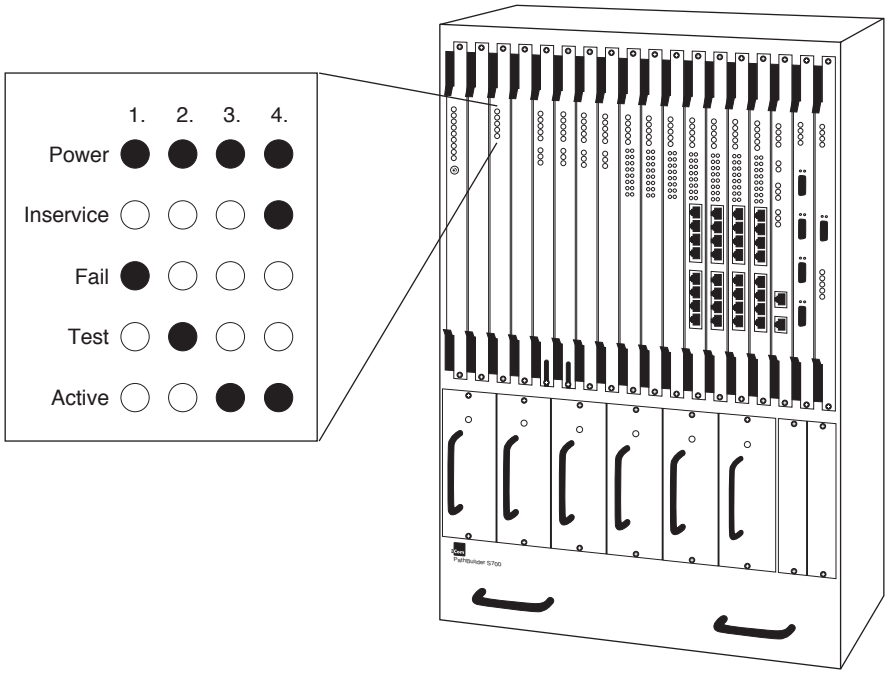
Table 21 Audible Alarm Connector Pinouts

PIN 1	Minor Alarm Return (Common)
PIN 6	Minor Alarm Normally Closed (NC)
PIN 2	Minor Alarm Normally Open (NO)
PIN 7	Major Alarm Return (Common)
PIN 3	Major Alarm Normally Closed (NC)
PIN 8	Major Alarm Normally Open (NO)
PIN 4	Critical Alarm Return (Common)
PIN 9	Critical Alarm Normally Closed (NC)
PIN 5	Critical Alarm Normally Open (NO)

Verifying STX LEDs and Connecting the Optional BITS Clock

The STX module requires no external connections, but you must verify the front panel indicator sequence illustrated in Figure 25.

Figure 25 STX Module LED Power-up Sequence



Connecting the Optional BITS Clock (STX)

The PathBuilder S700 can receive or transmit a Bipolar Timing Source (BITS) clock through the STX module. It offers the following options for the clock setting:

- T1 CSU
- DSX 0-133 feet
- DSX 133-266 feet
- DSX 266-399 feet
- DSX 399-533 feet
- DSX 533-655 feet

If desired, you can connect a BITS clock to the clock signal input or output port located on the rear of the PathBuilder S700 using a DB-9 connector, as shown in Figure 26.

This feature is currently available for North American, DSI, Standard carrier signals.

Figure 26 BITS Clock Connection (STX Module)

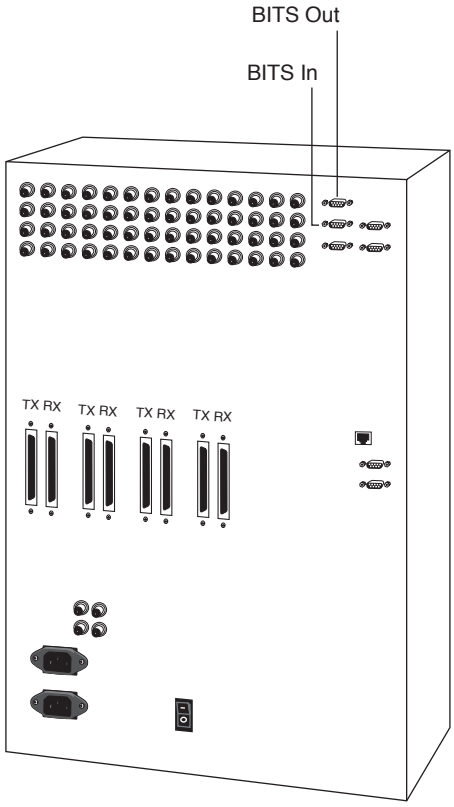


Table 22 and Table 23 list the connector pinouts for the input and output connectors.

Table 22 STX Module BITS Clock Input Connector Pinouts

PIN 1	Receive Tip
PIN 2	Receive Ring
PIN 3	NC
PIN 4	NC
PIN 5	NC
PIN 6	NC
PIN 7	NC
PIN 8	NC
PIN 9	NC

Table 23 STX Module BITS Clock Output Connector Pinouts

PIN 1	NC
PIN 2	NC
PIN 3	NC
PIN 4	Transmit Tip
PIN 5	Transmit Ring
PIN 6	NC
PIN 7	NC
PIN 8	NC
PIN 9	NC

To enable the BITS clock, you must make the following jumper settings on the STX module:

JP9 (1-5)

JP9 (2-6)

JP9 (3-9)

JP9 (4-10)

For information about how to select the BITS clock as the source for system timing, see "Managing the System Clock" in Chapter 5.

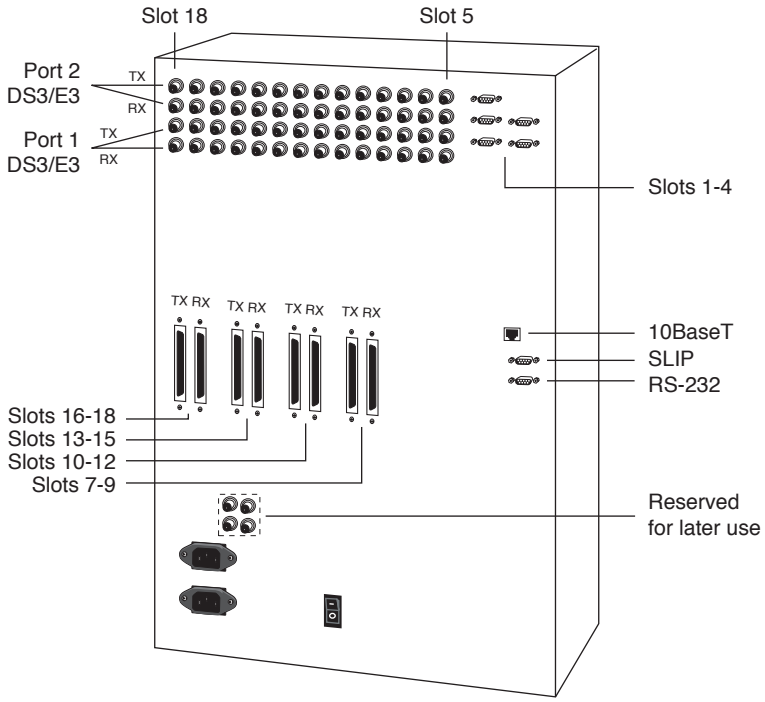
Connecting Rear Redundant Modules

The following PathBuilder S700 modules are available in either front-connecting or rear redundant models:

- DS3/E3 UNI
- DS1/E1 UNI with Inverse Multiplexing for ATM (IMA)
- DSX-1/E1 CBR

Figure 27 illustrates the locations of the connectors on the rear of the unit.

Figure 27 PathBuilder S700 Rear Connectors



When connecting rear redundant modules, follow these guidelines:

- Connect DS3 UNI or E3 UNI modules to DS3 or E3 repeaters using the pair of BNC connectors corresponding to the slot(s) in which you have the DS3/E3 UNI module(s) installed. For example, if you had a DS3 UNI module installed in slot 7, you would use the connectors in the third column from the right. For this release, use only the bottom two rows of connectors; the top two rows are reserved for future expansion.
- Connect DS1/E1 UNI or DSX-1/E1 CBR modules to the pair of Telco connectors corresponding to the slot(s) in which the module(s) are installed.

Table 24 lists the connector pinouts for the Telco connectors. Note the following as you use this table:

- The notations A, B, and C indicate the slot.
  - A corresponds to the slot with the lowest number
  - B corresponds to the slot with the middle number
  - C corresponds to the slot with the highest number

  For example, for the slot 7-9 connector, A corresponds to slot 7, B corresponds to slot 8, and C corresponds to slot 9.
- The pinouts are the same for both the Tx (out) and the Rx (in) connectors.

Table 24 Telco (T1/E1) Connector Pinouts

PIN 25	NC	PIN 50	NC
PIN 24	ATIP1	PIN 49	ARING1
PIN 23	ATIP2	PIN 48	ARING2
PIN 22	ATIP3	PIN 47	ARING3
PIN 21	ATIP4	PIN 46	ARING4
PIN 20	ATIP5	PIN 45	ARING5
PIN 19	ATIP6	PIN 44	ARING6
PIN 18	ATIP7	PIN 43	ARING7
PIN 17	ATIP8	PIN 42	ARING8
PIN 16	BTIP1	PIN 41	BRING1
PIN 15	BTIP2	PIN 40	BRING2
PIN 14	BTIP3	PIN 39	BRING3
PIN 13	BTIP4	PIN 38	BRING4
PIN 12	BTIP5	PIN 37	BRING5
PIN 11	BTIP6	PIN 36	BRING6
PIN 10	BTIP7	PIN 35	BRING7
PIN 9	BTIP8	PIN 34	BRING8
PIN 8	CTIP1	PIN 33	CRING1
PIN 7	CTIP2	PIN 32	CRING2
PIN 6	CTIP3	PIN 31	CRING3
PIN 5	CTIP4	PIN 30	CRING4
PIN 4	CTIP5	PIN 29	CRING5
PIN 3	CTIP6	PIN 28	CRING6
PIN 2	CTIP7	PIN 27	CRING7
PIN 1	CTIP8	PIN 26	CRING8

Step 5: Connect a Management Terminal

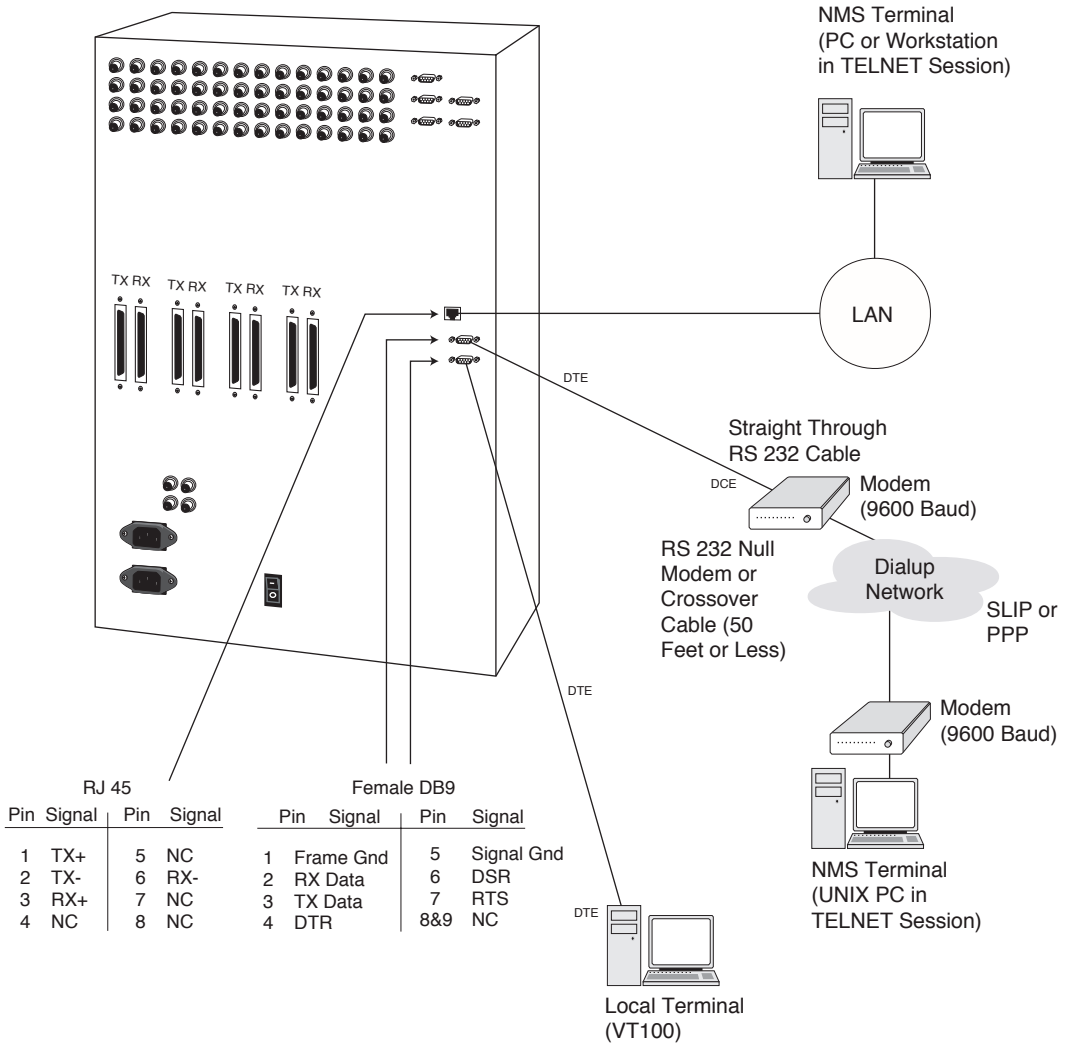
In order to configure application connections and an IP address for SNMP support, you must connect a management terminal to the PathBuilder S700. To do this, you use the 10Base T, RS-232, and SLIP ports on the rear of the PathBuilder S700.

To connect a network management terminal, follow these steps:

1. Connect a VT 100 terminal to the RS-232 (console) port.
2. Use the VT100 terminal to input an IP address for the PathBuilder S700. See "Setting up Communication Parameters" in Chapter 3, for details.
3. Establish communication between the PathBuilder S700 and any management terminal in one of these ways:
   - Direct RS-232 using the VT100 terminal or VT100 emulator, as described above
   - Direct 10BaseT using an IP Telnet session
   - SLIP or PPP over a dialup network using an IP Telnet session

   Figure 28 illustrates the network management station terminal connection options.

Figure 28 NMS Terminal Connection Options



After you have connected the network management terminal, perform initial configuration of the unit, as described in Chapter 3.

3 GETTING STARTED

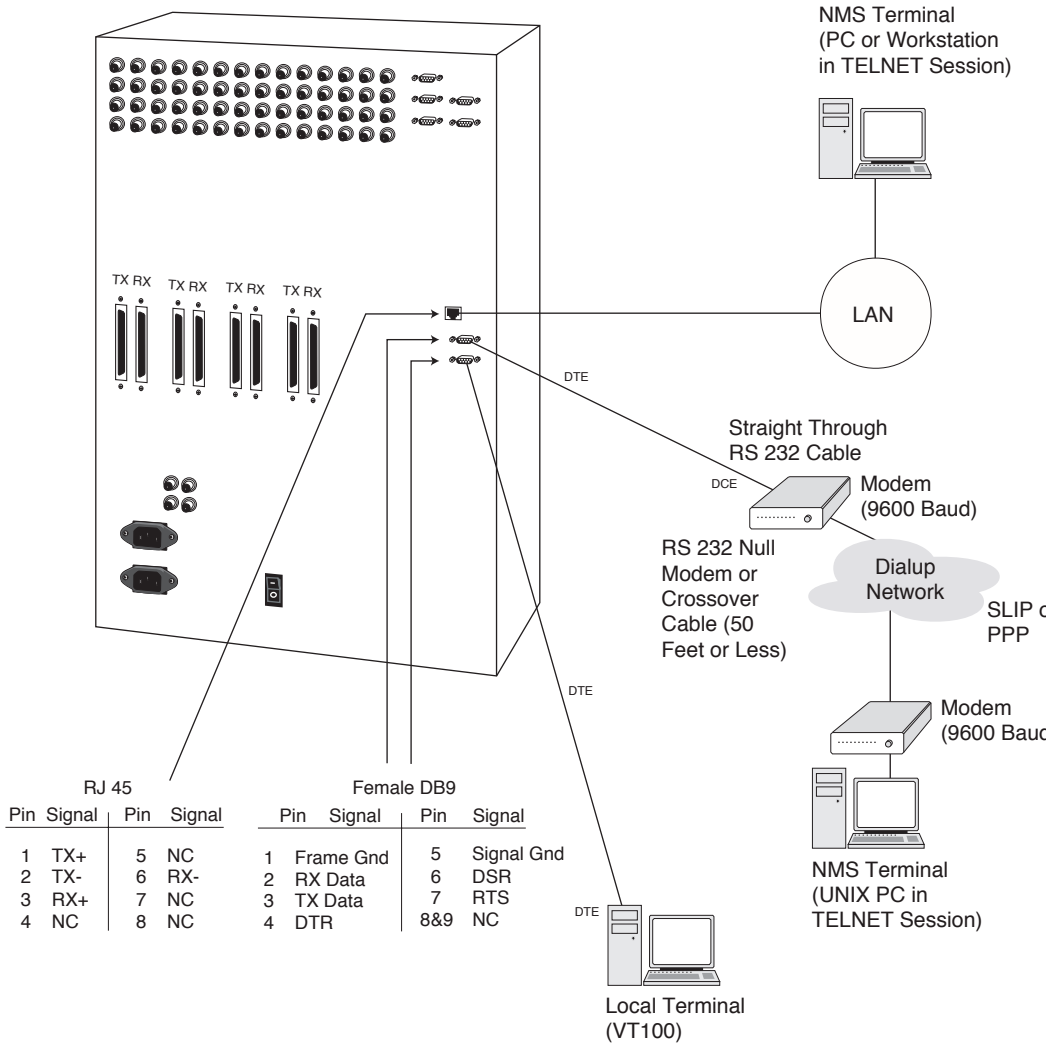
This chapter tells you how to log on to the PathBuilder S700 WAN access switch (PathBuilder S700), how to use the PathBuilder S700 menus, and how to perform initial configuration using the NMS menus. It contains the following sections:

- Logging On
- Using the Menus
- Performing Initial Configuration

Logging On

You enter initial configuration information via the local VT100 user interface. Figure 29 illustrates the terminal connection options.

Figure 29 NMS Terminal Connection Options

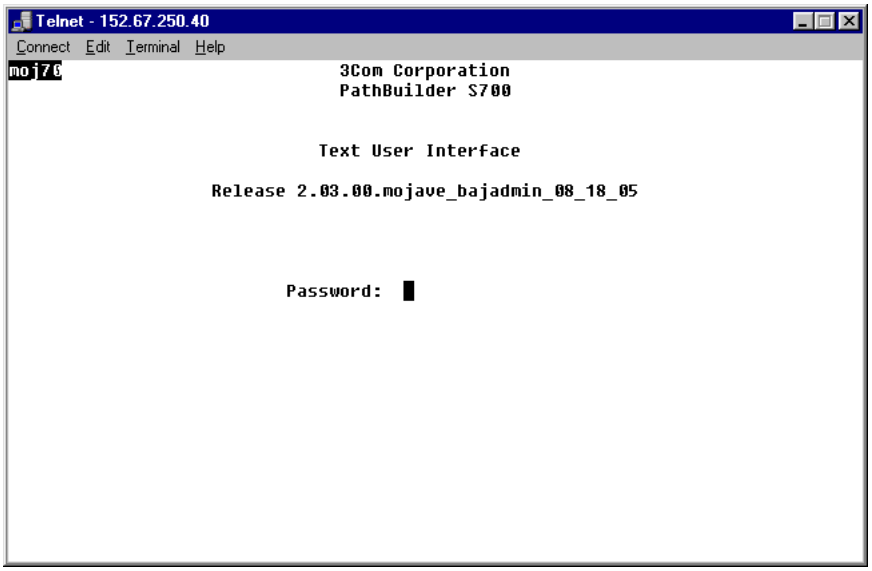


The user interface is preserved on a VT100 terminal connected to the RS-232 (console) port on the Management CPU in slot 1 of the PathBuilder S700. Set the terminal for the following:

- 9600 baud
- no parity
- 8 data bits
- 1 stop bit

When the PathBuilder S700 is powered up and operating, and your terminal is connected, operating, and properly configured, the Text User Interface (TUI) title screen shown in Figure 30 appears on your terminal.

Figure 30 PathBuilder S700 Text User Interface Title Screen



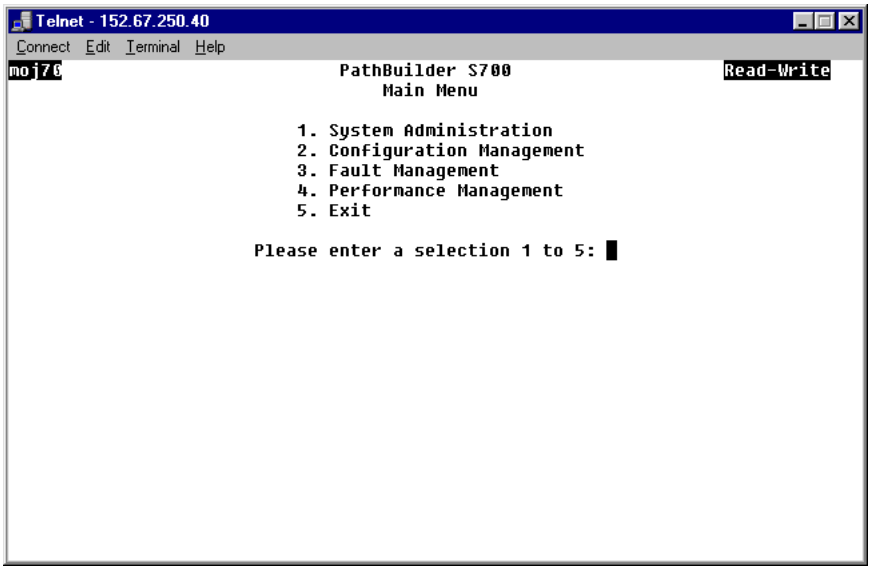
The TUI Title screen identifies the interface and its software release number and prompts you for a password. Enter the default password:

password

If the software does not accept your password entry, try again. If the password still not accepted, check with your system administrator to obtain the correct password.

The Main menu, shown in Figure 31, appears.

Figure 31 PathBuilder S700 Main Menu



Use the options on the Main menu as follows:

- Select *[1] System Administration* to access common parameters.
- Select *[2] Configuration Management* to view or set configuration parameters.
- Select *[3] Fault Management* to view or acknowledge alarms and set loopbacks.
- Select *[4] Performance Management* to view statistical data.
- Select *[5] Exit* to log out.

Using the Menus

The title of the menu or display appears at the top of the screen. Your access status appears in the upper righthand corner.

- *Read-Write* means that you have Read-Write control of the PathBuilder S700 and can make changes to the system.
- *Read Only* means that you can only monitor the menus and displays.

If you have superuser privileges, you can switch from a Read-Only to a Read-Write session without logging off. See later in this chapter for details.

Navigating through the Menus

You select a menu option by typing the selection number and pressing [Enter].

Displays that contain information and no selections include the prompt:

```
Press Esc for previous menu
```

Multi-page displays also prompt you to press "N" for the next page or "P" for the previous page.

Only the Main menu contains the Exit selection to log out. Selecting Exit returns you to the title screen with the password prompt. All other menus have a Previous Menu selection which returns you to the Main menu one screen at a time. You can also press [Esc] to move back one menu at a time.

The auto logout feature automatically logs you out and returns you to the title screen if you do not press a key for a specified time (1 - 99 minutes). To set the autolog timeout, select *[1] System Administration* from the Main menu, then select *[1] General System Information*, then select *[6] Set Auto Logout Time*.

Understanding the Menu Hierarchy

The PathBuilder S700 menu hierarchy includes several layers of menus. Each submenu has a name that is the same or similar to the name of the option that displays it. For example, selecting *[2] Configuration Management* on the Main Menu displays a submenu titled Configuration Management, and selecting *[4] Manage System Clock* from the System Administration menu displays a submenu titled System Clock Configuration.

You can then select options on the submenus to display additional submenus or prompts that allow you to set various parameters. The options that appear on some submenus vary, depending on what modules you have installed. For example, the System Clock Configuration menu includes a *Set CBR* option only if you have installed a CBR module, a *Set DS3* option only if you have installed a DS3 UNI module, a *Set IMA* option only if you have installed a DS1 UNI or E1 UNI module, and so on.

Using the Menus to Change Settings

Settings are displayed in prompts at the bottom of the menus. For example, if you select:

[2] Configuration Management

[1] Manage Card

[5] DS3 UNI (may be different choice number, depending upon your shelf configuration)

[1] Card Information

[5] Set ATM Payload Scramble

The following prompt appears at the bottom of the DS3 UNI Configuration menu:

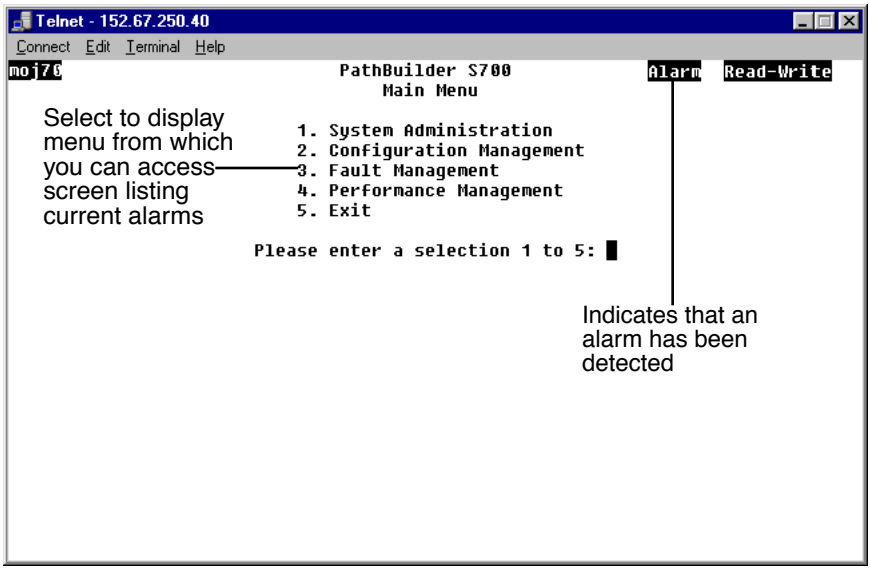
```
Enter ATM Payload Scramble (1=No,2=Yes):
```

When you type a selection number and press [Enter], payload scrambling is disabled or enabled, and the prompt is cleared.

Alarm Indicator

If the PathBuilder S700 detects an alarm condition, an alarm indicator (the highlighted word "Alarm") appears to the left of the access status on every menu and display, as shown in Figure 32.

Figure 32 Alarm Indicator



After you acknowledge the alarm, the alarm indicator is no longer highlighted, but the word "Alarm" remains in the upper right corner of the screen to indicate that an alarm has been acknowledged.

When the alarm is acknowledged and the condition that caused the alarm is cleared, the indicator disappears entirely. If a menu indicates that an alarm has been acknowledged and a new alarm occurs, the Alarm indicator is highlighted again.

See "Managing System Alarms" in Chapter 6 for instructions on acknowledging alarms.

Performing Initial Configuration

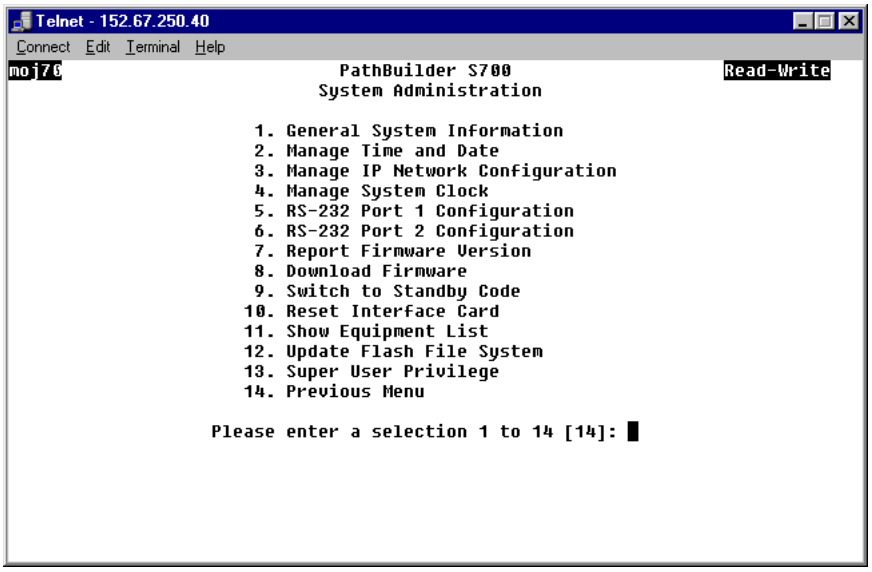
After you install the PathBuilder S700 hardware, you must complete the following three steps in order to complete the initial configuration:

1. Set up communication parameters
2. Configure In-band Management (optional)
3. Set up passwords
4. Set the time and date

You access the menus used to perform these steps from the System Administration menu, shown in Figure 33. To display the System Administration menu:

From the Main menu, select *[1] System Administration*.

Figure 33 System Administration Menu

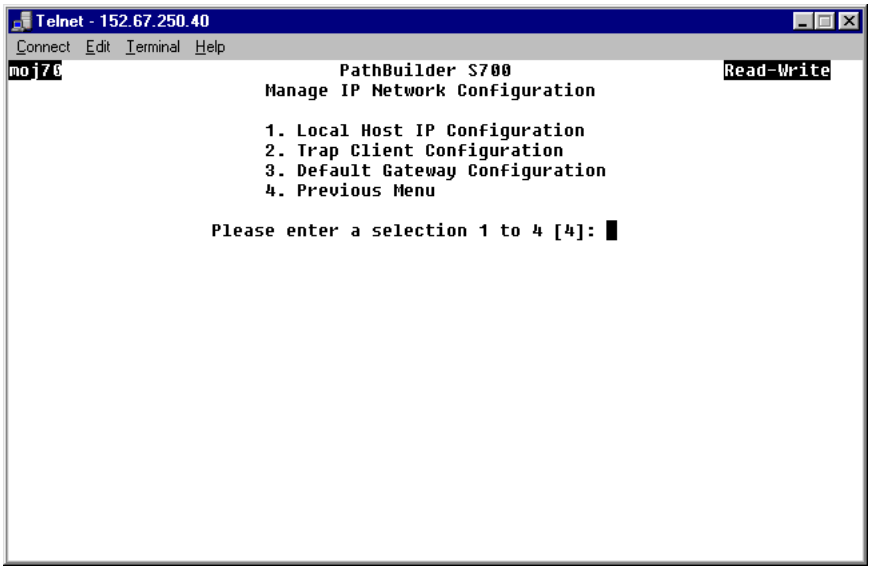


The following subsections provide instructions for performing the three initial configuration steps. See Chapter 5 for instructions on configuring specific PathBuilder S700 modules.

Setting up Communication Parameters

In order for the PathBuilder S700 to communicate to the Ethernet network, you must set the correct communication parameters. To do this, select *[3] Manage IP Network Configuration* from the System Administration menu to display the Manage IP Network Configuration menu, shown in Figure 34.

Figure 34 Manage IP Network Configuration Menu



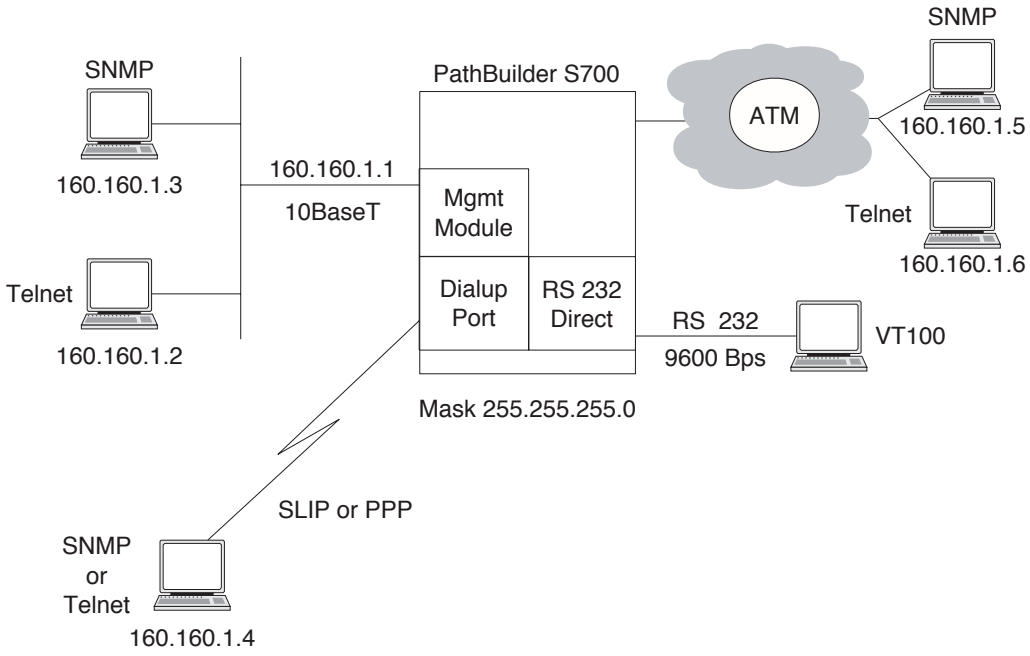
From the Manage IP Network Configuration menu, you configure the following:

- Local host IP address
- Trap client
- Default gateway

The subsections following the figure describe how to set these parameters.

Once you have entered the IP address and SNMP information for the PathBuilder S700 on the VT100 terminal, you can continue configuring the device on the local console, or you can configure the PathBuilder S700 through either the 10BaseT or the SLIP/PPP dialup port on the Management CPU module using either a Telnet session or an SNMP manager such as PathBuilder Switch Manager. See Figure 35.

Figure 35 PathBuilder S700 Terminal Access Methods



Configuring the Local Host IP Address

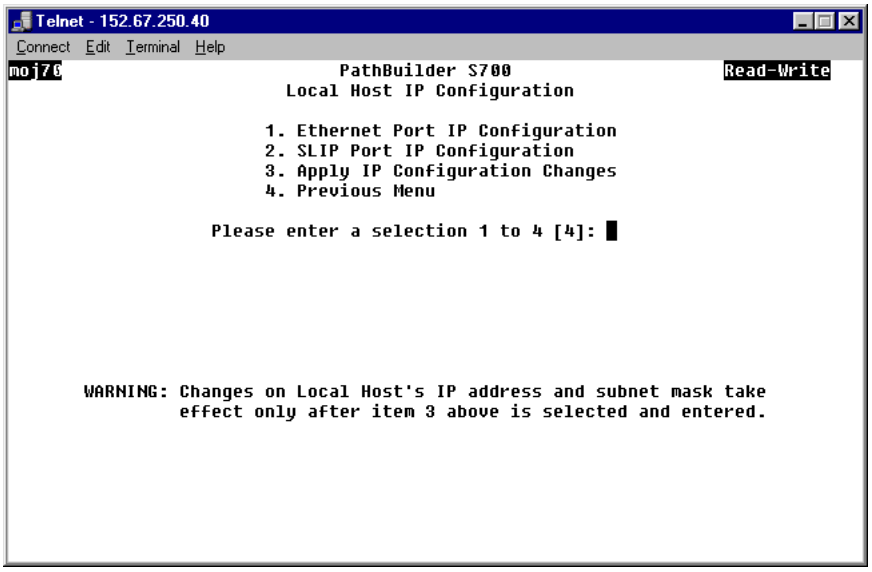
The Local Host IP Address Configuration menu allows you to set parameters for the management port (Ethernet or SLIP) or the PathBuilder S700.

To enter configure the Ethernet management port, follow these steps:

1 From the Manage IP Network Configuration menu, select *[1] Local Host IP Configuration* to display the Local Host IP Configuration menu, shown in Figure 36.

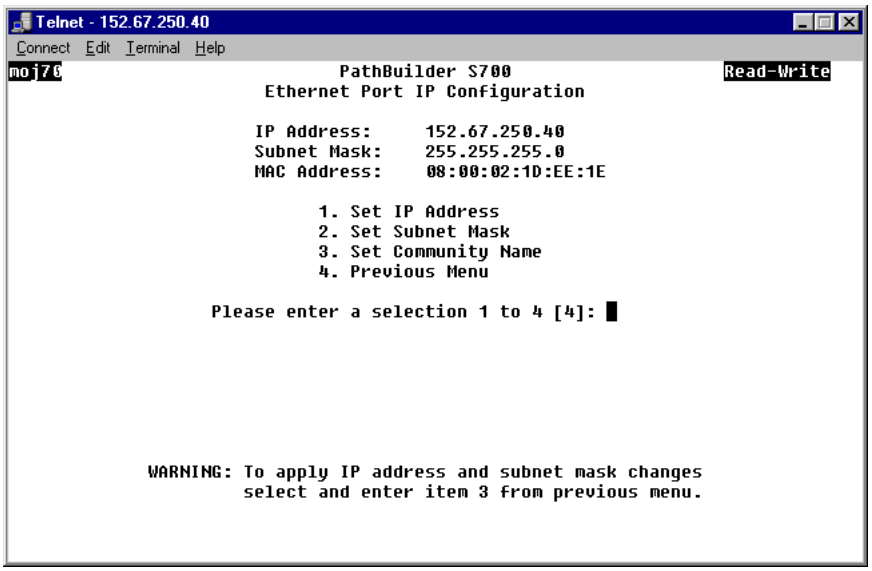
When you apply a change to the Local Host IP Configuration menu, you might get logged out if you are using a Telnet session. The default configuration is Baud rate: 9600, Parity; none, Data Bits:8, StopBits:1.

Figure 36 Local Host IP Configuration Menu



2 Select *[1] Ethernet Port IP Configuration* to display the Ethernet Port IP Configuration menu, shown in Figure 37.

Figure 37 Ethernet Port IP Configuration Menu



3 Enter the following information (by selecting the appropriate options and responding to the prompts that appear at the bottom of the screen) to enable IP Ethernet connections:

IP Address—Provided by the network administrator. This is the IP address of the PathBuilder S700 Management CPU.

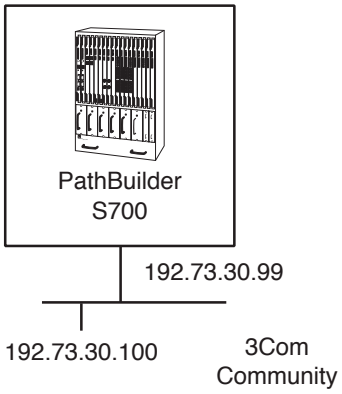
You should consult the network administrator to obtain an IP address for the PathBuilder S700 which will allow its 10BaseT Management port to co-exist with hosts on its local LAN.

Subnet Mask—Provided by the network administrator. The subnet mask identifies the subnetwork containing the PathBuilder S700 Ethernet management port.

Community Name—Enter "*3Com*" (The community name applies to Ethernet port IP configuration only.)

Figure 38 shows a sample PathBuilder S700 IP host setup.

Figure 38 Sample PathBuilder S700 IP Host Setup



4 Select *[4] Previous Menu* to return to the Local Host IP Configuration menu.

5 Select *[3] Apply IP Configuration Changes* to activate the IP address. The following prompt appears:

```
This action will terminate all running TELNET/SNMP sessions.
Are you sure you want to apply IP configuration changes (Y/N)[N]?
```

6 Enter **y** to apply your changes.

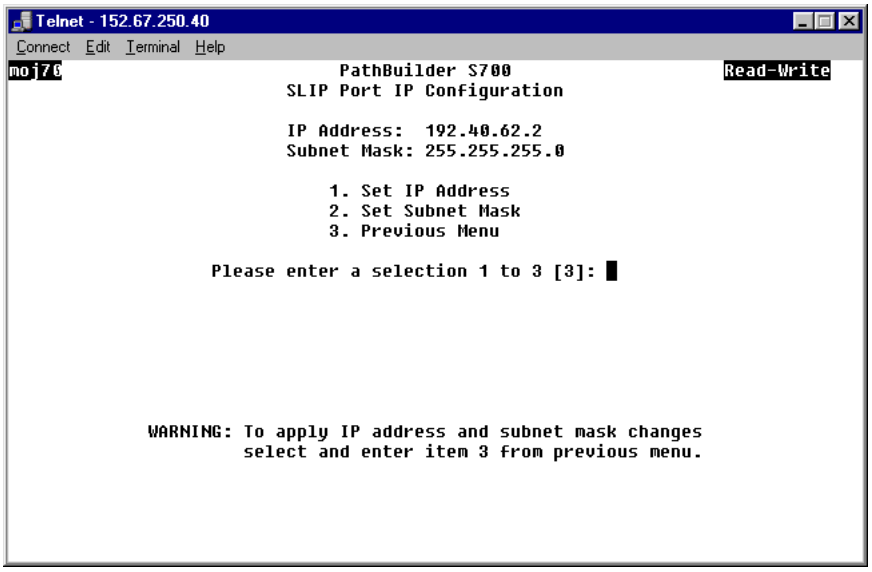
To enter configure the SLIP management port, follow these steps:

1 From the Manage IP Network Configuration menu, select *[1] Local Host IP Configuration* to display the Local Host IP Configuration menu, shown earlier in Figure 36.

When you apply a change to this menu, you might get logged out if you are using a Telnet session. The default configuration is: Baud Rate, 9600; Parity, none; Data Bits, 8, and Stop Bits, 1.

2 Select *[2] SLIP Port IP Configuration* to display the SLIP Port IP Configuration menu, shown in Figure 39.

Figure 39 SLIP Port IP Configuration Menu



3 Enter the following information (by selecting the appropriate options and responding to the prompts that appear at the bottom of the screen) to enable IP Ethernet connectors:

IP Address—Provided by the network administrator. This is the IP address of the PathBuilder S700 Management CPU.

You should consult the network administrator to obtain an IP address for the PathBuilder S700 which will allow its 10BaseT Management port to co-exist with hosts on its local LAN.

Subnet Mask—Provided by the network administrator. The subnet mask identifies the subnetwork containing the PathBuilder S700 SLIP management port.

4 Select *[3] Previous Menu* to return to the Local Host IP Configuration menu.

5 Select *[3] Apply IP Configuration Changes* to activate the IP address. The following prompt appears:

```
This action will terminate all running TELNET/SNMP sessions.
Are you sure you want to apply IP configuration changes (Y/N)[N]?
```

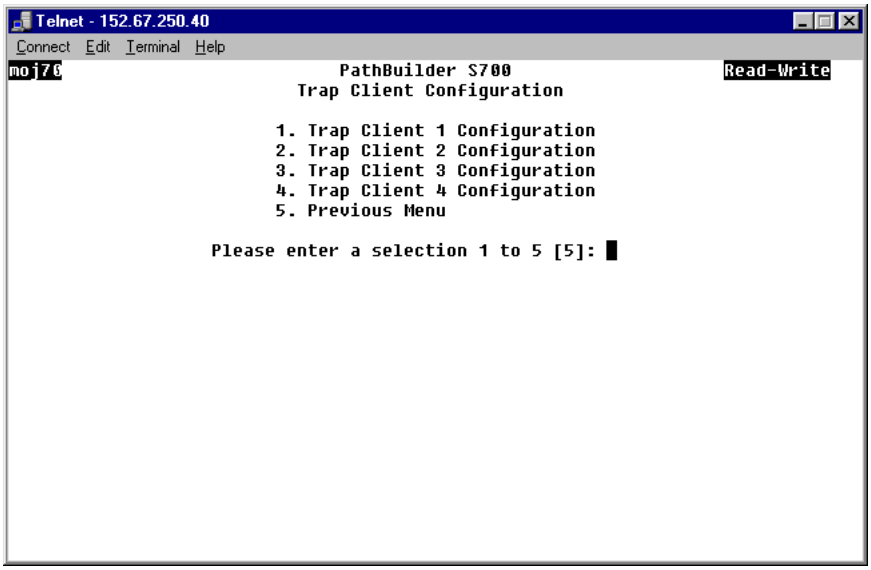
6 Enter **`y`** to apply your changes.

Configuring Trap Clients

The PathBuilder S700 can report SNMP trap alarms to a remote management system. Trap clients are the network management stations to which you want the PathBuilder S700 to send traps. You can specify up to four trap clients. To configure trap clients, follow these steps:

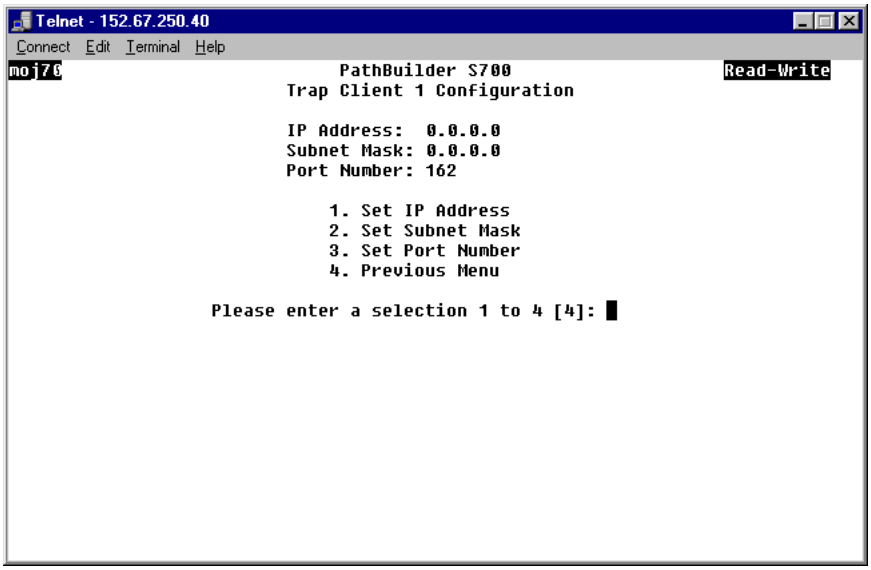
1 From the Manage IP Network Configuration menu, select *[2] Trap Client Configuration* to display the Trap Client Configuration menu, shown in Figure 40.

Figure 40 Trap Client Configuration Menu



2 Select the number corresponding to the trap client you want to configure. Figure 41 shows the menu for configuring trap client 1.

Figure 41 Trap Client 1 Configuration Menu



3 Enter the following information (by selecting the appropriate options and responding to the prompts that appear at the bottom of the screen) to configure the trap client:

IP Address—The IP address of the network management station to which you want the PathBuilder S700 to send traps.

Subnet Mask—The subnet mask for the network management station to which you want the PathBuilder S700 to send traps.

Port Number—The system-defined port number. You should not modify this number.

4 Select *[4] Previous Menu* to return to the Trap Client Configuration menu.

5 Select *[5] Previous Menu* to return to the Manage IP Network Configuration menu.

Configuring the Default Gateway

The default gateway routes IP data to non-local networks (Telnet sessions from different subnetworks). To configure the default gateway, follow these steps:

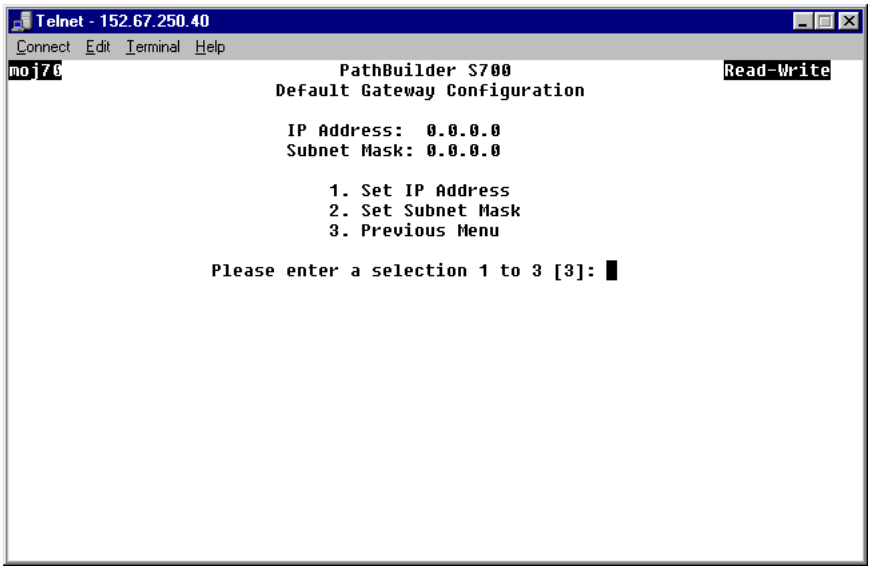
1 From the Manage IP Network Configuration menu, select *[3] Default Gateway Configuration* to display the Default Gateway Configuration menu, shown in Figure 42.

2 Enter the following information (by selecting the appropriate options and responding to the prompts that appear at the bottom of the screen) to configure the default gateway:

IP Address—The IP address of the router which you want to configure as the default gateway.

Subnet Mask—The subnet mask for the router which you want to configure as the default gateway.

Figure 42 Default Gateway Configuration Menu



3 Select *[3] Previous Menu* to return to the Manage IP Network Configuration menu.

4 Select *[4] Previous Menu* to return to the System Administration menu.

Configuring In-band Management

In addition to managing the PathBuilder S700 out-of-band, you can also manage the unit in-band in one of the following ways:

- via the 10Base-T port on the near-end MCPU card (up to ten VCs maximum)
- via the near-end Dual Ethernet module

For detailed instructions on configuring PVCs, see "Configuring Virtual Circuits" in Chapter 5.

In-band Management via the 10Base-T Port on the Near-end MCPU Card

You can use in-band management to manage any remote PathBuilder unit: S310, S330, S600, or S700.

To configure in-band management via the 10Base-T port on the near-end MCPU card, follow these steps:

If you use this method, you must use a new subnet with each PathBuilder S700 and a new static route for each new subnet on the management station or router. You are also limited to managing up to ten remote units from the central management unit.

1 Build a PVC on the near-end PathBuilder S700 from the MCPU to the OC3 UNI, setting the following parameters on the Add Virtual Circuit screen:

traffic shaper—Choose any of the available values (for example, 10Mbps).

IP address—This address must be different than the local host IP address.

subnet mask—Specify any acceptable address (for example, 255.255.255.0).

VPI/VCI—Enter any values in the accepted range (for example, 10/100).

2 Build a PVC on the far-end PathBuilder unit (S310, S330, S600, or S700) from the MCPU to the OC3 UNI, setting the following parameters on the Add Virtual Circuit screen:

traffic shaper—Choose any of the available values (for example 17M).

IP address—You must use a different subnet than the one you used for the near-end PathBuilder S700.

subnet mask—Specify any acceptable address (for example, 255.255.255.0).

VPI/VCI—You must use the same values as you did for the near-end PathBuilder S700.

3 From the System Administration menu, set the default gateway for the far-end PathBuilder unit (S310, S330, S600, or S700) and the management station.

a Set the default gateway on the far-end PathBuilder unit to the PVC IP address you set for the near-end PathBuilder S700 in step 1.

b Set the default gateway on the management station to the local host IP address of the near-end PathBuilder S700.

For details about setting the default gateway, see "Configuring the Default Gateway" earlier in this chapter.

4 Apply your IP configuration changes.

a From the main menu, select *[1] System Administration*.

b From the System Administration menu, select *[3] Manage IP Network Configuration*.

c From the Manage IP Network Configuration menu, select *[1] Local Host IP Configuration*.

d From the Local Host IP Configuration menu, select *[3] Apply IP Configuration Changes*.

In-band Management via the Near-end Dual Ethernet Module

To configure in-band management via the near-end PathBuilder S700 Dual Ethernet module, follow these steps:

If you use this method, you can manage one PathBuilder S700 in a point-to-point configuration or as many as 256 remote PathBuilder units (S310s, S330s, S600s, or S700s) if all the units are connected to an ATM network service provided by a local or large Telco organization.

1. Build a PVC on the near-end PathBuilder S700 from the Dual Ethernet Module to the OC3 UNI, setting the following parameters on the Add Virtual Circuit screen:

   traffic shaper—Choose any of the available values (for example 17M)

   VPI/VCI—Enter any values in the accepted range (for example, 10/101).

2. Attach a hub or Ethernet NIC directly to the Dual Ethernet Module port.

3. Build a PVC on the far-end PathBuilder unit (S310, S330, S600, or S700) from the MCPU to the OC3 UNI, setting the following parameters on the Add Virtual Circuit screen:

   traffic shaper—Choose any of the available values (for example 17M)

   IP address—Specify any acceptable address (for example, 192.198.65.3).

   subnet mask—Specify any acceptable address (for example, 255.255.255.0).

   VPI/VCI—You must use the same values as you did for the near-end PathBuilder S700.

4. Apply your IP configuration changes.

   a From the main menu, select *[1] System Administration*.

   b From the System Administration menu, select *[3] Manage IP Network Configuration*.

   c From the Manage IP Network Configuration menu, select *[1] Local Host IP Configuration*.

   d From the Local Host IP Configuration menu, select *[3] Apply IP Configuration Changes*.

Performing Super User Functions

The PathBuilder S700 supports a total of up to 10 logins at the following three access levels:

Read-Only User—Can view information and configuration settings in the PathBuilder S700 interface, but cannot set parameters or make any changes.

Read-Write User—Can view and set/change configuration information.

Super User—Can view and set/change configuration information and can perform the following super user functions:

- Set passwords
- Take over a read-write session
- Erase the system database

The following subsections provide step-by-step instructions for performing these super user functions.

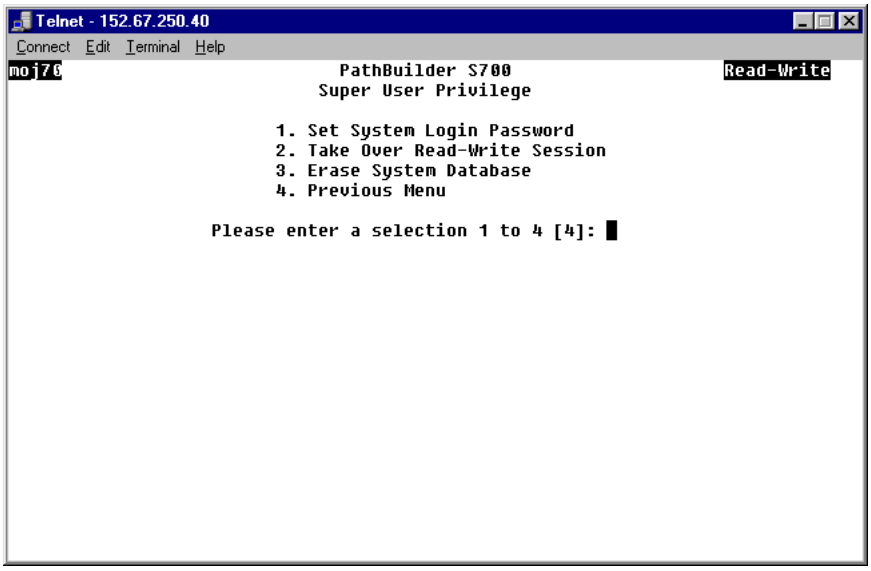
Setting Passwords

The default password for all three access levels is **password**. This password logs you on initially as a super user. For security reasons, you should change the Super User, Read-Write, and Read-Only passwords as soon as possible.

To set the Super User, Read-Write, or Read-Only password, follow these steps:

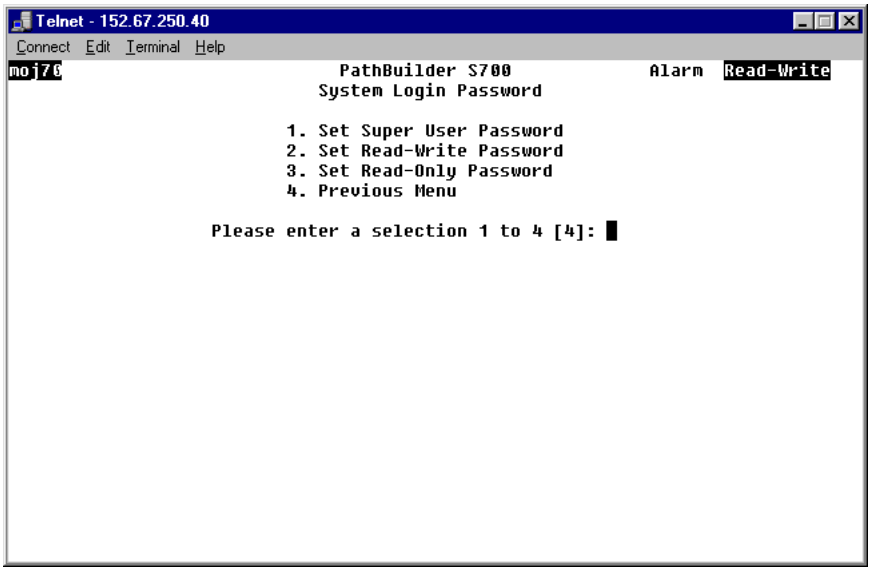
1 From the System Administration menu, select *[13] Super User Privilege* to open the Super User Privilege menu, shown in Figure 43.

Figure 43 Super User Privilege Menu



2 Select *[1] Set System Login Password* to open the System Login Password menu, shown in Figure 44.

Figure 44 System Login Password Menu



3 Select *[1] Set Super User Password*, *[2] Set Read-Write Password*, or *[3] Set Read-Only Password* to set the desired password.

The following prompt appears at the bottom of the screen:

```
Enter New Password:
```

4 Enter the new password. The password appears as asterisks on the screen as you enter it.

CAUTION: *Be sure to record your new password and keep the record in a safe place. If you forget your password and have no record of it, you can contact 3Com for assistance, but we may need to delete your database in order to solve the problem.*

The following prompt appears:

```
Re-enter New Password:
```

5 Re-enter the password you entered in step 4.

A message appears, indicating that the password has been saved.

6 Select *[4] Previous Menu* to return to the Super User Privilege menu.

Taking over a Read-Write Session

The PathBuilder S700 allows only one read-write session at a time. If you have super user privileges, however, you can take over a read-write session without logging off. When you take over a read-write session, the previous read-write session is forced to a read-only session.

To take over a read-write session, follow these steps:

1 From the Super User Privilege menu, shown earlier in Figure 43 select *[2] Take Over Read-Write Session*.

The following prompt appears:

```
Do you want to take over read-write session (Y/N) [N]?
```

2 Enter **`y`** to take over the read-write session.

The following message appears:

```
The current session has been changed to Read-Write!
Press any key to return.
```

3 Press any key to resume your session in read-write mode.

Erasing the System Database

In certain situations—if anomalous behavior on the part of the S700 makes you suspect that the database has been corrupted, or if you have moved a unit from a different location, for example—you may want to consider erasing the system database and starting from scratch. You must have super user privileges in order to erase the system database.

To erase the system database, follow these steps:

CAUTION: *Before you erase the system database, make a record of all configuration settings; these settings will be lost when you erase the database. Also keep in mind that erasing the database is an action that cannot be undone. Perform the following procedure only if you are sure that erasing the database is your best course of action.*

1 From the Super User Privilege menu, shown earlier in Figure 43, select *[3] Erase System Database* to open the Erase System Database menu. This menu displays the following warning and prompt:

```
This action will cause a SOFT RESET of the system.
Do you want to erase the system database (Y/N) [N]?
```

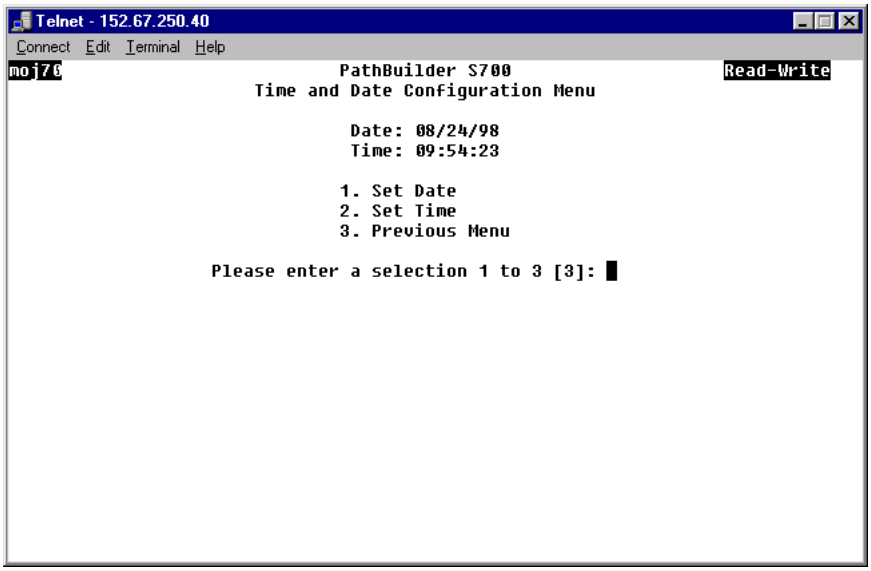
2 Enter **y** to erase the system database.

Setting the Time and Date

By setting the correct time and date, you ensure accurate alarm reporting by the NMS software. To set the time and date, follow these steps:

1 From the System Administration menu, select *[2] Manage Time and Date* to display the Time and Date Configuration menu, shown in Figure 45.

Figure 45 Time and Date Configuration Menu



The current date and time are displayed above the menu options.

2 Select *[1] Set Date*. The following prompt appears at the bottom of the screen:

```
Enter Date (mm/dd/yy)
```

3 Enter the date.

4 Select *[2] Set Time*. The following prompt appears at the bottom of the screen:

```
Enter Time (hh:mm:ss):
```

5 Enter the time.

Type a time a few seconds in advance of the current time, then press [Enter] when the current time matches the time you typed.

6 Select *[3] Previous Menu* to return to the System Administration menu.

7 Select *[12] Previous Menu* to return to the Main menu.

4 PathBuilder S700 Module and Application Overview

This chapter provides a brief overview of ATM (Asynchronous Transfer Mode) technology, describes the features and operation of each of the PathBuilder S700 WAN access switch (PathBuilder S700) modules, and discusses applications supported by the PathBuilder S700. It contains the following sections:

- ATM Overview
- System Module Overview
- ATM Module Overview
- Application Module Overview
- Supported Applications

For specifications for the PathBuilder S700 modules, see "Specifications" in Chapter 1.

ATM Overview

ATM provides the means of simultaneously transferring a wide variety of services with different protocols and bandwidth requirements such as voice, packet data, and video between end users or user networks. It does so by segmenting the input data streams into 53-byte cells, assigning the cells to virtual circuits set up in the ATM network, multiplexing the cells for transmission according to the bandwidth requirements of the individual data streams, and reassembling the cells into the original data streams at the receiving end.

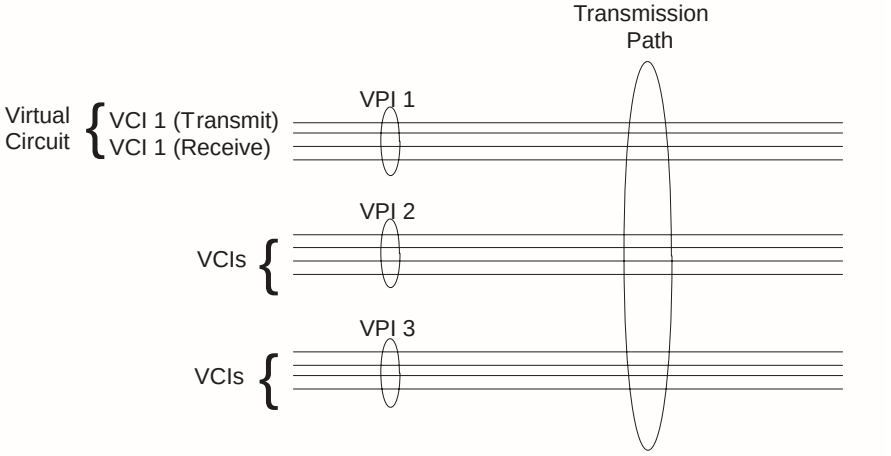
For more detail about how to apply the PathBuilder S700 to provide ATM WAN access, see "Supported Applications" in Chapter 4.

Virtual Circuits

ATM networks are organized into virtual circuits or logical duplex paths between two ATM unit ports.

Each transmission direction in a virtual circuit is referred to as a virtual channel. Virtual channels are then grouped into virtual paths between two ports. The channels and paths are assigned numbers: VPIs (Virtual Path Indicators) and VCIs (Virtual Channel Indicators). Figure 46 illustrates this scheme.

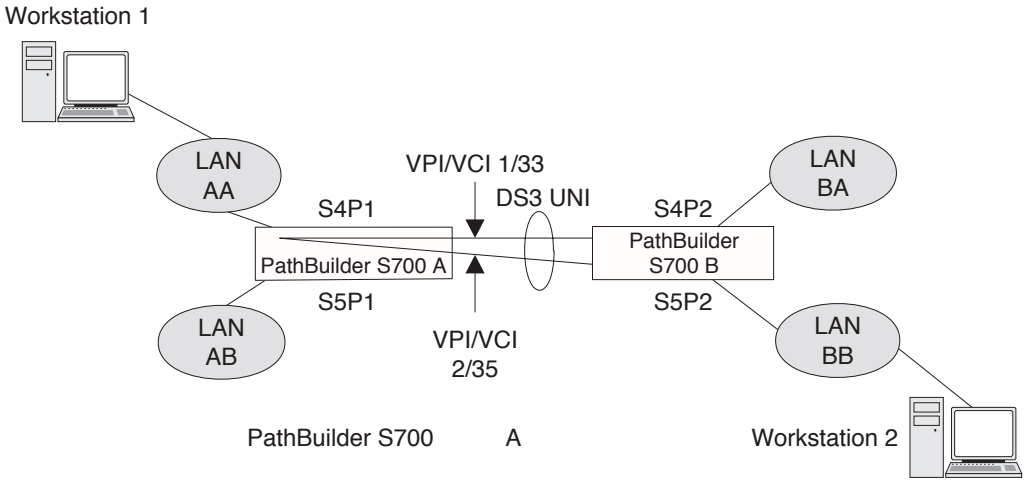
Figure 46 Virtual Circuit Scheme



Each ATM cell (a fixed-length unit of data over ATM) is assigned to a virtual circuit by including the circuit's VPI/VCI in the cell's header. This is then used to steer the cell through an ATM unit and the ATM network.

Figure 47 illustrates virtual circuits on a simple network using PathBuilder S700s.

Figure 47 Virtual Circuits in a Simple Network



Suppose workstation 1 on LAN AA wants to send data to workstation 2 on LAN BB. It transmits Ethernet packets which include its MAC address and that of workstation 2. PathBuilder S700 A groups the packets into cells and, since it does not know where workstation 2 is, broadcasts the cells on all VPI/VCIs.

PathBuilder S700 B learns that workstation 1 transmits to its slot 4 port 2 over VPI/VCI 1/33 and to slot 5 port 2 over VPI/VCI 2/35. This information is then stored in forwarding tables in PathBuilder S700 B.

When workstation 2 responds, it includes its MAC address and that of workstation 1 in the packets. PathBuilder S700 B looks in the appropriate forwarding table and finds that it can reach workstation 1 on VPI/VCI 2/35. When the first response cell on 2/35 is formatted back into packets at PathBuilder S700 A, PathBuilder S700 B learns how to reach workstation 2 without broadcasting.

System Module Overview

The PathBuilder S700 includes the following two system modules:

- Management Central Processing Unit (MCPU) module
- STX Module

Management CPU Module

The MCPU module, located in slot 1 of the PathBuilder S700 shelf, performs all configuration, monitoring and user interface functions. It features the following:

- Management processor
- Two RS-232 interfaces (one for terminal interface and one for SLIP/PPP interface)
- Ethernet port (for management of the PathBuilder S700 via the network)
- CPU memory consisting of a real time clock, dynamic RAM, and dual FLASH. The dual FLASH is used so that the code can be upgraded and two copies of the code can be stored at one time. The CPU can run either copy of the code under user control and the CPU code can be upgraded on-line.
- Two sets of three relay contacts for critical, major, and minor visual and audible alarms, located on the rear of the unit. The alarm relays are normally open. They trigger the audible and visual alarms whenever the CPU determines there is a critical, major, or minor alarm. You can cut off the audible alarm (open the relay) by pressing the ACO button.
- Relay contacts for up to three external alarms from outside equipment for which the alarm indication is activated when the input pins are shorted. You can set these alarms to be either normally open or normally closed. For details about setting the state of the external alarms, see "Configuring the Shelf" in Chapter 5.
- A SAR interfacing an ATM bus. The SAR is used for communication and signaling. It can send and receive packets from the ATM network under CPU control. The user interface allows you to enter management VCs in the same way any other VC is entered. Management VCs terminate on the CPU SAR.
- User interface software that allows you to interface to the system in multiple ways:
  - Through an RS-232 port for direct VT100 Connection. The CPU contains the VT100 drivers to control the management and user interface screens.
  - Through a second RS-232 port to run SLIP/PPP. This port can connect via a modem to the user management network. You can then run a Telnet session to access the NMS screens.
  - Through the direct Ethernet connection. You can then run a Telnet session to access the NMS screens.
- SNMP support via the RS232 SLIP/PPP and the Ethernet connection. The PathBuilder S700 supports multiple standard MIBs for the bridge, Ethernet, DS1, DS3, and ATM Forum compliant IMA functions. It also supports an Enterprise MIB that allows you to configure and monitor the unit using an SNMP-based Enterprise management system such as 3Com's Transcend.

The CPU stores all the code that runs on the system and runs diagnostics at bootup to check the integrity of the system.

SNMP MIB Standards Support

Table 25 lists the standards that are supported for the MIBs.

Table 25 Supported MIBs

Document Name	Description
RFC 1213	MIB II
RFC 1406	DS1/E1 MIB
RFC 1407	DS3/E3 MIB
RFC 1493	Bridge MIB (previously RFC 1286)
RFC 1595	SONET MIB
RFC 1643	Ethernet MIB
AF-PHY-0086.000.mib	ATM Forum Compliant IMA MIB

STX Module

The STX module provides a switching matrix that supports sophisticated traffic management, priority queuing, and multicasting. It performs all functions necessary for concentrating and switching ATM cells according to the set priority given to its Class of Service traffic types:

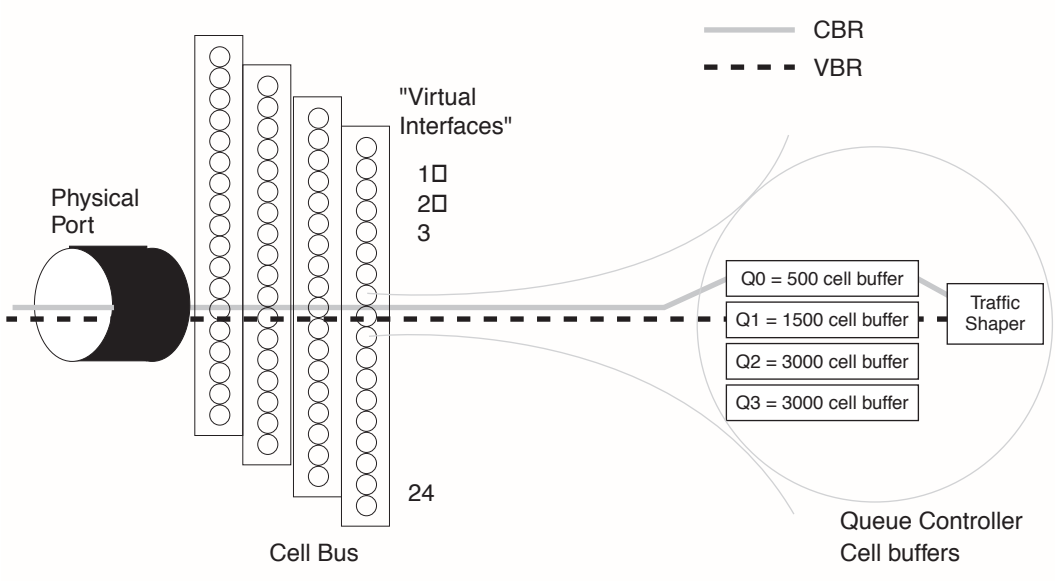
- Provides any-to-any switching based on VC address
- Supports virtual interfaces (VIs)—logical UNI ports
  - Slots 5 and 6 support up to 15 VIs each.
  - For slots 7-18, each bus supports three slots (7-9, 10-12, 13-15, and 16-18), and the PathBuilder S700 supports up to 24 VIs for each bus. As the VIs are assigned, the software automatically allocates them among the slots. In other words, all 24 VIs on a particular bus could be allocated to a single slot.
- Supports Deep buffers (8,000 cells per VI) for queuing to support 4 Classes of Services per VI
- Provides priority queuing in which each VC can be assigned to a specific VI which then can be allocated to one of 4 queues for CBR, VBR-rt, VBR-nrt, and UBR classes of service.
- Supports per VC traffic policing
- Supports multicasting (up to 256 connections with 32 leaves)
- Supports per VC statistics
- Allows a total of 4,000 two-way connections maximum per PathBuilder S700
- Generates the backplane timing 8KHZ clock and generates ATM bus timing
- Accepts an 8kHZ signal from all modules together with a 1.544MHz external BITS Clock
- Performs all address translation functions

Priority Queuing

The PathBuilder S700 with STX provides separate cell buffer queues per virtual interface. You can assign multiple VCs to each virtual interface and map them to the desired queue. The STX services the queues in order: queue 0, then queue 1, then queue 2 and queue 3. Figure 48 illustrates this priority queuing.

In Figure 48, all 24 VIs on a triple-slot bus have been allocated to a single slot. You can also distribute VIs among the slots supported by a bus. For details, see "Configuring Virtual Interfaces" in Chapter 5.

Figure 48 PathBuilder S700 with STX Priority Queuing



If the STX finds data in a higher queue while it is servicing another queue, it services the higher queue, thereby maintaining the priority. For example, if the STX finds data in queue 0 while it is servicing queue 2, the STX services queue 0. By queuing the VCs in this way, the STX ensures that the Class of Service is maintained.

The ensuing traffic from the queues is then shaped according to the traffic shaping parameter that you set (64Kbps to 155 Mbps) in cells per second. In addition, each circuit can be policed before reaching its queue. Tagged cells may be dropped if a queue is found to be congested based on the threshold you have set. Therefore the combined cell rate of all circuits mapped to a VI can be greater than the shaper rate of the VI.

ATM Module Overview

The PathBuilder S700 supports the following application modules with ATM interfaces:

- DS3 UNI
- E3 UNI
- OC3/STM-1 UNI
- DS1 UNI with IMA
- E1 UNI with IMA

DS3 UNI Module Overview

The DS3 module is compatible with AT&T Publication 54014 specifications, uses the unchannelized format, and is compliant to M23 or the C-bit parity ANSI-107a, 1991 specifications. It performs the following key functions:

- Provides line interface functions and terminates the FEAC and MDL for the C-bit format
- Performs ATM to physical layer mapping and adds PLCP according to UNI 3.0
- Performs peak traffic shaping on the transmit (14 bulk shapers)

E3 UNI Module Overview

The E3 UNI module is typically used for terminating/accessing public or private WAN services. However, depending on your local applications, you can also use this module in the port slot for taking local traffic across the WAN.

The E3 UNI module performs the following key functions:

- Performs ATM to physical layer mapping and adds PLCP according to UNI 3.0
- Performs peak traffic shaping on the transmit (14 bulk shapers)

OC3/STM-1 UNI Module Overview

There are two versions of the OC3/STM-1 module: multi-mode fiber and single-mode fiber. The multi-mode fiber module is typically used for connecting ATM LAN equipment such as 3Com CoreBuilder 7000. The single-mode fiber module is typically used for WAN ATM services, providing a longer reach in terms of distance. Both version support the European SDH framed optical networks (STM-1).

The OC3/STM-1 UNI module provides an ATM connection at up to 155 Mpbs and, like other UNI modules, it supports multiple traffic shaper values.

DS1/E1 UNI with IMA Module Overview

The DS1/E1 UNI module provides Inverse Multiplexing of ATM cell streams over multiple T1/E1 physical links, based on the industry standard ATM Forum Specification. It provides the following key benefits:

- Uses a cell-based multiplexing technique to convert a single ATM stream into multiple lower speed ATM streams to be sent over independent links and retrieve the initial ATM cell stream from the links at the far end
- Preserves cell order from end-to-end in the ATM layer
- Supports up to 8 DS1/E1 ports (n = 1 to 8)
- Supports multiple IMA groups
- Supports differential delay tolerance up to 70ms for DS1 and 56ms for E1
- Handles link addition/deletion, failure/recovery with minimal disruption
- Provides ATM Forum specified performance statistics

Application Module Overview

The PathBuilder S700 supports the following application modules:

- Ethernet (Dual Ethernet Module)
- CBR (DSX-1 CBR, E1 CBR)
- Frame Relay (QSIM, HSIM, FAM)

Ethernet Module Overview

The Ethernet module (Dual Ethernet) is a port or application module that takes legacy LAN traffic across a WAN ATM network using the PathBuilder S700. This module is used to connect LAN segments and bridge or IP forward traffic across the ATM network to a LAN/IP service.

The Ethernet module supports two 10BaseT Ethernet connections. It provides a bridge function together with a SAR conversion to ATM cells. The Ethernet module performs the following key functions:

- Provides line interface for two 10BaseT Ethernet connections.
- Performs bridge function and encapsulation according to RFC1483 with multicast support.
- Performs segmentation and assembly to ATM, with 14 programmable traffic shapers on the transmit (PCR, SCR, MBS settings available).
- Provides a wire speed forwarding rate of 14700 packets per port.
- Supports Spanning Tree

Ethernet Module Standards Support

Table 26 lists the standards currently supported by the Ethernet module.

Table 26 Supported Ethernet RFC Standards

RFC Number	Description
RFC 826	ARP
RFC 1042	Standard for the Transmission of IP Datagrams over IEEE.802 Networks
RFC 1483	Multiprotocol Encapsulation Over ATM Adaptation Layer
RFC 1577	Operation for ATM ARP and In ARP LLC/SNAP Encapsulation of IP, etc.

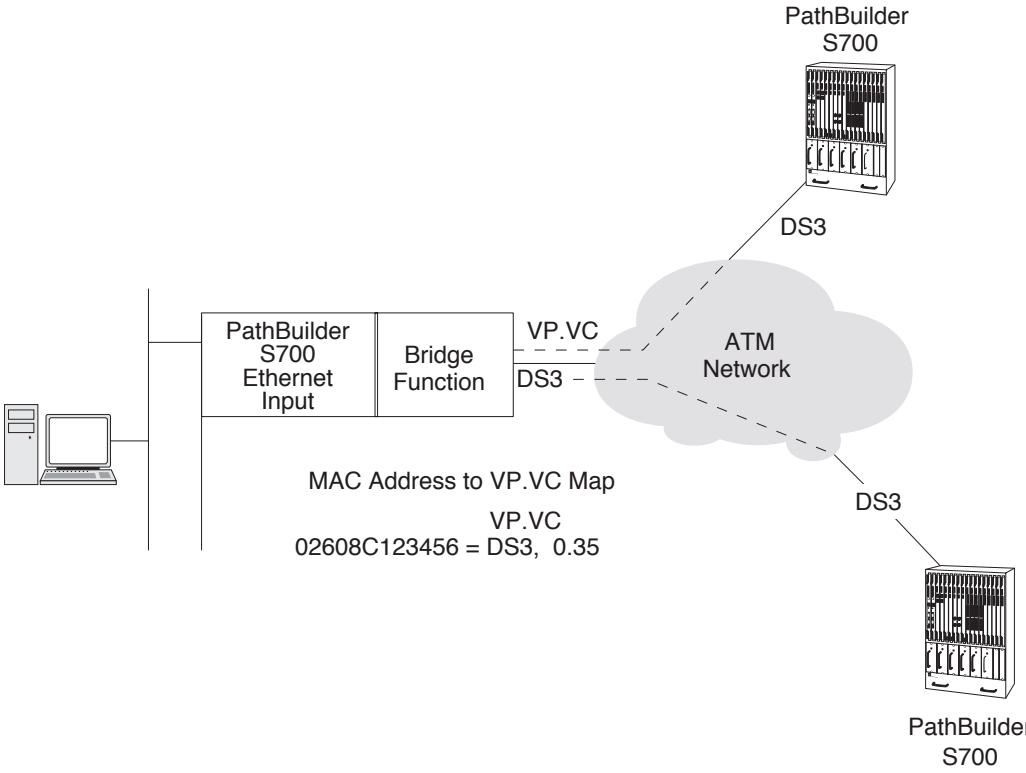
Ethernet Module Operation

The Ethernet module contains a high-performance CPU that performs all the bridging and packet switching functions. The Ethernet CPU communicates to the management CPU. Specific module information (serial number, type, MAC address etc.) is stored and accessed through the management CPU. After bootup, the local CPU requests actual run code from the management CPU. Figure 49 shows a functional block diagram for the Ethernet module.

The data flow in the Ethernet module is as follows:

- Packets appearing on the 10BaseT ports from the LAN are checked for packet integrity and stored in the shared memory area. Up to a Megabyte of memory is reserved for data.
- The CPU examines the packet's header in memory and a bridge operation is performed to determine if the packet goes on the WAN. See "Bridging", later in this chapter, for details about the bridge operation.
- If the packet is to go on the WAN, the bridge determines the VCC connection for the packet destination.
- The packet is then encapsulated according to RFC 1483 and the descriptor is handed off to the SAR together with the associated ATM header descriptor.
- The SAR append the AAL5 convergence sublayer to the packets and queues the packets according the shaper you specify for that connection in the user interface.

Figure 49 PathBuilder S700 Ethernet Block Diagram



The data is not moved or copied in memory from the time it is received till the time it is segmented. This guarantees maximum performance of the system.

- On the opposite side, cells are received from the DS3 UNI, or other ATM module, side through the STX module.
- The SAR then assembles the cells belonging to the connections specified for it and the CPU is given confirmation for the cells that are assembled.
- The bridge function of the CPU examines the packet header, removes the encapsulations, and forwards the packet to the proper destination after learning the address and updating the bridge table. For further information on bridging, see "Bridging" later in this chapter.

DSX-1/E1 CBR Module Overview

The PathBuilder S700 supports two CBR modules: DSX-1 CBR and E1 CBR. These modules are port or application modules for connecting devices such as PBXs (Private Branch eXchanges), video codecs, DSU/CSUs, T1 multiplexers, and channel banks for connection over an ATM WAN service.

DSX-1 CBR Module

The CBR service module provides four or eight DSX-1 ports for transit over an ATM network. The DSX-1 inputs can be either ESF or SF using B8ZS or AMI. The received frame can be tunneled through the ATM network using DS1 unstructured mode or broken up into its DS0 and ABCD signaling components using DS1 structured mode. The structured mode allows DS0 mid span drop and insert or grooming.

Structured and unstructured modes comply with ATM Forum AF-SAA-0032.000. This service maps the DS1 service through AAL1 adaptation layer over a CBR

virtual channel connection (VCC). The VCC is established as a permanent virtual circuit (PVC) and mapped from the PathBuilder S700s ATM port to either another PathBuilder WAN access switch or an ATM Forum circuit emulation compliant device.

The emulated circuit connection from the DSX-1 CBR port to a remote DSX-1 CBR port is accomplished by mapping DS1 circuits to Permanent Virtual Circuits. These circuits will then be transmitted through the ATM network to the destination port. For details on configuring the PVC, see "Configuring Virtual Circuits"" in Chapter 5.

Cell Delay Variation is compensated for by the PathBuilder S700 through an adaptive receive buffer. This buffer can provide consistent synchronous delivery of DS1 service by building in delay in excess of ATM cell delay and outputting from a receive buffer. You can configure the adaptive delay.

Dynamic Bandwidth Allocation Through dynamic bandwidth allocation, the DSX-1 CBR module can de-activate the CBR PVC and free up network access bandwidth for other uses. See "DS0 Signaling and Dynamic Bandwidth Allocation", later in this chapter, for details.

DSX-1 CBR Module Standards Support Table 27 lists the ATM standards supported by the DSX-1 CBR module.

Table 27 DSX-1 CBR Module ATM Forum/ANSI/ITU-T Supported Standards

Standard	Description
AF-SAA-0032.000	ATM Forum Circuit Emulation Service (CES)
ANSI T1.630/ITU-T I.363	AAL1 Unstructured Data Transfer Mode

E1 CBR Module

The E1 CBR module features four or eight E1 ports for transit over an ATM network. It provides a circuit emulator service mapped to ATM cells. The E1 inputs can be either single or multi-frame using HDB3 line coding. The received frame can be tunneled through the ATM network using E1 unstructured mode or broken up into its DS0 and ABCD signaling components using E1 structured mode. The structured mode allows DS0 mid span drop and insert or grooming.

The structured and unstructured mode comply with ATM Forum AF-SAA-0032.000. This service maps the E1 service through AAL1 adaptation layer over a CBR virtual channel connection (VCC). The VCC is established as a permanent virtual circuit (PVC) and mapped from the PathBuilder S700s ATM port to either another PathBuilder S700 or an ATM Forum circuit emulation compliant device.

Network Cell Delay Variation is compensated for by the PathBuilder S700 through an adaptive receive buffer. This buffer can provide consistent synchronous delivery of E1 service by building in delay in excess of ATM cell delay and outputting from a receive buffer. The adaptive delay is configurable.

E1 CBR Module Standards Support Table 28 lists the standards supported by the E1 CBR module.

Table 28 E1 CBR Module ATM Forum/ANSI/ITU-T Supported Standards

Standard	Description
AF-SAA-0032.000	ATM Forum Circuit Emulation Service (CES)
ANSI T1.630/ITU 1.36	AAL1 Unstructured Data Transfer Mode

QSIM/HSIM/FAM Module Overview

The PathBuilder S700 supports three Frame Relay modules: QSIM, HSIM, and FAM. These modules are port, or application, modules for connecting non-ATM devices to ATM services. Typical device applications include FRADs (Frame Relay Assembler and Disassembler or Frame Relay Access Devices), channel extenders, FEPs (Front-End Processors), and routers.

The HSIM module is used to interconnect terminals to DCE devices that must operate between 3 and 20Mbps.

Table 29 summarizes the basic features of the three Frame Relay modules.

Table 29 PathBuilder S700 Frame Relay Modules

Module	Acronym	# of ports	Type of ports
Quad Serial Interface Module	QSIM	4	V.35, RS449, EIA 530, X.21 (64K to 8 Mbps)
HSSI Module	HSIM	1	HSSI (20 Mbps)
Frame Access Module	FAM	8	T1 (64K to 1.5 Mbps)

Each of the Frame Relay modules provides a number of serial interfaces and an ATM SAR and is able to perform cell-to-frame as well as frame-to-cell conversion. Frames received from the HDLC serial interfaces are segmented in to cells by SAR and passed to the ATM backplane. In the other direction, cells received from ATM backplane will be reassembled into frames and passed to the HDLC serial interfaces.

A RISC processor on the Frame Relay module performs these functions:

- management CPU (MCPU) communication
- hardware device configuration
- frame/cell conversion
- permanent virtual circuit management
- alarm generation
- statistical data collection.

The SAR contains 15 traffic shapers, each of which can be programmed for sustained cell rate of transmission, peak cell rate, and maximum burst size.

The traffic shapers work as follows:

- The packet is segmented using a dual leaky buffer algorithm, whereby the cells are transmitted from each connection in the shaper at an average rate until the bucket of tokens fills up (a token is given to the connection at an average rate if it has no cells to transmit at that moment).
- The shaper then turns the burst mode on and transmits at the peak rate for a burst length. Note that the shaper serves every connection independently.
- PCR, SCR, and MBS settings are available.

Supported Applications

This section describes the following applications supported by the PathBuilder S700:

- Virtual circuits
- Bridging
- Spanning Tree
- CBR application
- Ethernet and voice application
- Frame application

See the following subsections for details about how the PathBuilder S700 implements these applications.

Bridging

The bridge function is an integral part of the Ethernet module. The PathBuilder S700 supports ATM permanent virtual circuits (PVCs) for access to the ATM network. These PVCs connect an PathBuilder S700 Ethernet port through the ATM network to another PathBuilder S700 Ethernet port. All the PVCs configured for a port will form a virtual Bridged Ethernet network to all other ports at the other end of the PVC.

The bridge operation is equivalent to a multiport bridge. The two Ethernet ports on the module are treated separately unless they are connected through the ATM network via PVCs. The ATM Layer operates transparently under the datalink layer to allow higher level protocols to run without changes.

The CPU examines each packet's headers while they are in memory and performs the bridging operations. A bridge is configured and maintained for each slot and port in the PathBuilder S700. The bridge maintains the following:

- A forwarding table in its memory that lists the source and destination addresses contained in each packet that passes through the PathBuilder S700
- An aging timer that removes addresses from the forwarding table if an address is not used for a configured time
- A configured list of protocols, source addresses, and destination addresses that will be rejected by the bridge. For information on configuring bridging filters, see "Configuring the Bridge"" in Chapter 5.

The bridge learns and builds forwarding tables for every PVC that is tied to that port. When a packet is received on the port or any PVC tied to that port, the Source MAC address is learned and kept in the forwarding table until the aging

timer expires. You can also use the user interface to add static forwarding addresses that the bridge will not delete after the aging timer expires.

When the packet arrives, the bridge looks up the destination MAC address to determine the destination of the packet from the forwarding tables. If the destination is found, the bridge forwards the packet to the correct destination. If the destination is not found, the bridge broadcasts or floods the packet on all PVCs that are tied to the particular port. If you have assigned a multicast PVC for that particular port, the bridge will forward the packet to the port multicast VC instead of broadcasting it.

The PathBuilder S700 performs LLC-based multiplexing per RFC 1483, and Ethernet frames are bridged.

Filtering

The first bridging operation determines if the packet is to be processed and transmitted across the bridge or filtered out based on the list of protocols and addresses input as part of the PathBuilder S700 configuration. Filtering gives you control over who communicates with whom in the network. The CPU reads the header of each packet to determine the protocol, source address, and destination address and then looks in the list to see if the packet should be passed through the bridge. If it is to be filtered out, it is cleared from memory.

Addressing

The next bridging operation determines if a packet is addressed to another unit on the LAN (in which case it can be rejected) or if it is addressed to a unit across the bridge.

As mentioned above, each Ethernet packet includes a source address and a destination address in its header. These are MAC addresses which are unique physical addresses assigned to every Ethernet interface on every Ethernet LAN. Packet transmission from one unit to another on the same LAN is accomplished easily. However, packet transmission between units on different LANs requires a higher-level addressing scheme.

Learning Bridge

The aggregate of VPIs/VCIs assigned to a slot and port (Ethernet connection) of the PathBuilder S700 is referred to as a bridge. Since the PathBuilder S700 reads and stores MAC addresses and associated VPIs/VCIs as described above, the bridge is called a learning bridge. Each learning bridge of the PathBuilder S700 has a separate forwarding table containing the MAC addresses to VPI/VCI associations.

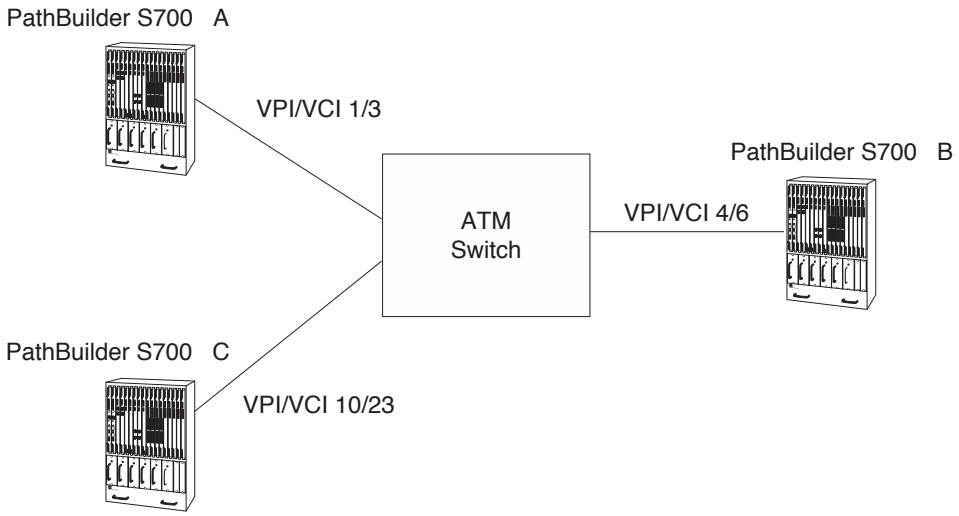
When a learned entry is stored in a forwarding table, it is time tagged. An aging timer in the PathBuilder S700, which you can set, purges entries from the forwarding tables after the specified time. The bridges must then relearn purged addresses. This controls the size of the forwarding tables, particularly in large networks.

In the PathBuilder S700, each bridge also has a static table associated with it. You can enter MAC addresses and corresponding PVCs into the static table that you do not want to be affected by the aging timer. These entries might be for LAN units that are permanent and are accessed through the ATM network frequently, such as servers.

The example in Figure 47 shows only one transmission path: the DS3 UNI between the two PathBuilder S700s. As a result, cells leaving PathBuilder S700 A on VPI/VCI 1/33 arrive at PathBuilder S700 B on VPI/VCI 1/33. If the DS3 trunk were switched through a standard telephone switching system to interconnect many PathBuilder S700s, each PathBuilder S700 would have to have the same VPI/VCI designations assigned. The ATM switch removes this restriction.

Figure 50 shows several PathBuilder S700s in an ATM-switched network. The switch maps one VPI/VCI into another based on the destination of the packets in the cell, in the process learning the complete topology of the network. Each PathBuilder S700 connected to the switch can be configured independently.

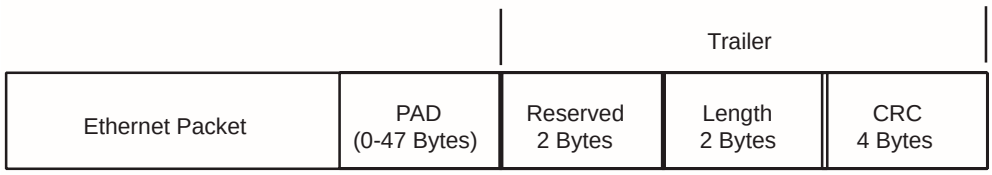
Figure 50 Virtual Circuits in a Switched Network



Segmentation

Once the CPU determines that a packet should go across the bridge, it encapsulates the packet per RFC 1483 and adds a pad and trailer conforming to AAL5 (ATM Adaption Layer 5) at the end of the packet (see Figure 51). The trailer is fixed at eight bytes and contains information such as the new length of the packet and cyclic redundancy check bytes (CRC facilitates error checking at the receive end). The pad is set to 0 to 47 bytes to make the full packet length including the trailer divisible by 48 bytes. The packet with the RFC 1483 encapsulation is then segmented into 48-byte (384-bit) cells by the SAR function.

Figure 51 AAL5 Pad and Trailer



The cells are assigned to a virtual circuit defined between the incoming and outgoing ports based on the destination address of the original packet. A 5-byte header containing the virtual circuit assignment along with other information is added to each cell. The cells are queued in the output FIFO (First In First Out) memory of the Ethernet Module based on the bandwidth and quality of service requirements assigned to the virtual circuit at configuration. The FIFO provides elastic storage between the Ethernet Module and the STX module which may be polling and multiplexing up to 14 Ethernet modules.

Reassembly

When the STX Module receives a cell from the DS3 UNI Module (or other ATM module), it broadcasts it to all Ethernet Module ports. As cells are received by the reassembler, their header is read by the CPU to determine if they belong to the port. If so, the header is stripped and the cell is stored in memory appended to the previous ones for that virtual circuit.

The CPU also looks for the AAL5 trailer that signifies the end of a packet. When it finds a trailer, it performs the CRC calculation, checks the length of the cells since the previous trailer to be sure no cells were missed, strips the trailer, appends the cell to the others to reform the original packet, and sends the packet through the Ethernet I/F to the LAN.

Spanning Tree

Spanning Tree (IEEE 802.1d) is a technique that detects loops in a network and logically blocks the redundant paths, ensuring that only one route exists between any two LANs. It eliminates the duplication of packets and provides fault tolerance for resilient networks.

As the Spanning Tree is being constructed, bridges exchange information, which is transmitted in packets called Configuration Bridge Protocol Data Units (C-BPDUs). During this process, the Spanning Tree Algorithm and Protocol (STAP) module elects a root bridge in order to establish a stable spanning tree topology. The root bridge determines the spanning tree topology and controls which bridges block packets and which forward packets.

Once the topology is stable, all STAP bridges listen for special "Hello" C-BPDUs transmitted from the root bridge at regular intervals (usually every two seconds). If a STAP bridge timer expires before receiving a "Hello" C-BPDU, it assumes that the root bridge, or a link between itself and the root bridge, has gone down. It then initiates a reconfiguration of the Spanning Tree.

When a port goes down (for instance, when an ATM VC is deleted), the port card notifies the STAP module of such a change. The STAP module then reinitiates the process of electing a root bridge, and the Spanning Tree calculation process begins all over again.

Spanning Tree Operation

The Spanning Tree operates as follows:

For more detailed information about how the Spanning Tree operates, see IEEE802.1d.

- An STAP module runs as a task on the management card. This task is responsible for maintaining all data structures for Spanning Tree operation for all ports and for sending/receiving Spanning Tree configuration packets.
- Spanning Tree Bridge configuration Protocol Data Units (BPDUs) are received at Ethernet port cards (on Ethernet and ATM ports) and are sent to the STAP module on the management card.
- The management card STAP module examines the packet, reads the MAC address of the sender, and analyzes the costs reported by the sender.
- When state of a port changes, the STAP module notifies the port card of the change.
- When a port card receives change information for a port, it updates the operational state of the port so as to change the bridging operation on the port. For instance, if a port in a forwarding state (normal operation mode of receiving and forwarding packets) is discovered to be forming a loop, it can be put in a blocking state. Once the port goes in the blocking state, the port card will stop receiving frames on the port.

Spanning Tree Instances

The Spanning Tree logic supports a maximum of 255 physical and virtual ports, thereby allowing a maximum of 254 ATM VCs. (One Ethernet port is required be set aside for other purposes.)

For the purpose of Spanning Tree operation, each set of one Ethernet port and its associated ATM VCs is treated as one bridge entity. The STAP module runs a separate instance for each bridge entity. Since the PathBuilder S700 shelf can be filled with a maximum of 14 Ethernet cards, each with two Ethernet ports, a maximum of 28 instances of STAP can be running on the management card.

Each STAP instance runs independently of the other STAP instances and processes configuration packets as if they came from a different physical bridge device. This approach helps segregate Ethernet ports completely for the purposes of bridging and Spanning Tree and enables the PathBuilder S700 to operate as 28 separate bridges.

VC-VC Bridging operation The Ethernet module supports full-mesh bridging between its Ethernet port and all of its associated VCs. This bridging must be bidirectional and should be conditional upon the operational status of the Spanning Tree. If Spanning Tree operation is disabled, VC-VC bridging is not necessary since the PathBuilder S700 is not expected to forward traffic coming from the ATM network.

For instructions on enabling and disabling the Spanning Tree, see "Enabling and Disabling the Spanning Tree" in Chapter 5.

CBR Application

The CBR module consists of 4 or 8 DSX-1/E1 interfaces capable of accepting superframe or extended superframe DS1 inputs. The DS1 signal is then mapped over a Constant Bit Rate (CBR) virtual channel. Encapsulation of the T1 within the ATM service is based on the ATM Forum (AF-SAA-0032.000) Circuit Emulation Service Interoperability specification. The ATM Forum specification designates two modes of operation:

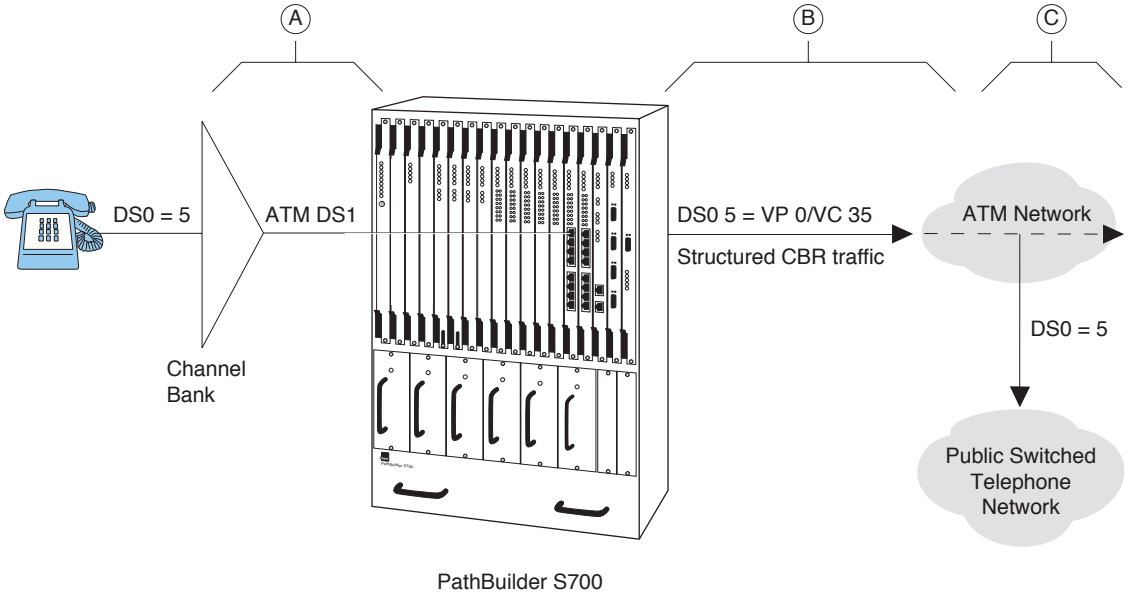
Structured —Modeled after fractional T1. Only the timeslots which will be used are sent.

Unstructured —Merely encapsulates the entire DS1 onto an ATM path. It allows timing and FDL to pass through.

Structured DS1

Implement the structured service if you require DS0 midspan drop-and-insert. See Figure 52.

Figure 52 CBR Structured DS1



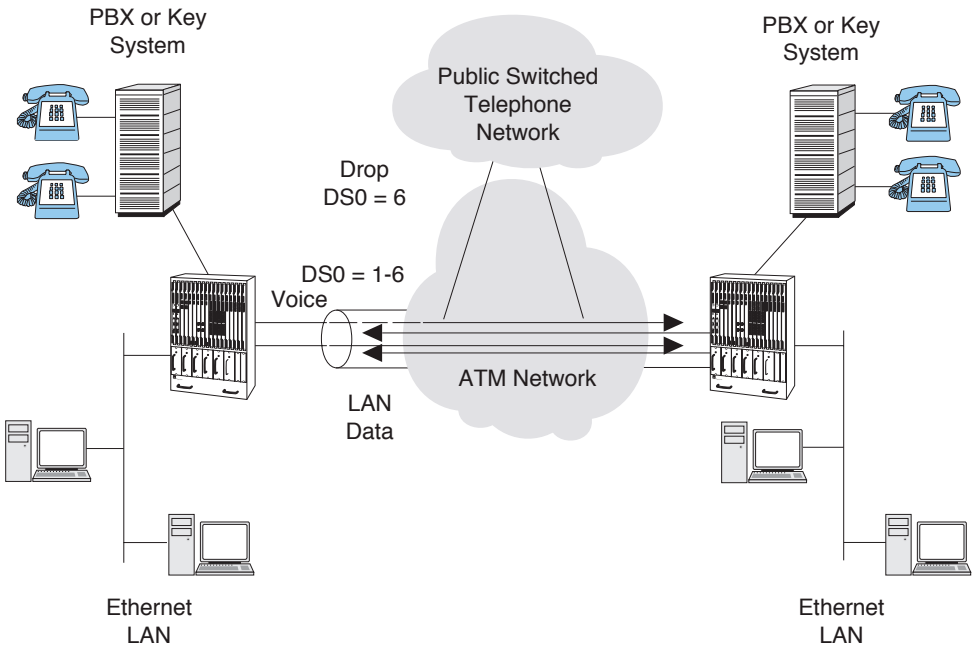
Ⓐ Channel bank converts analog signal to T1; putting voice channel on DS0 5.

Ⓑ PathBuilder S700 puts DS0 5 on virtual circuit (VP 0/VC 35) and passes structured CBR traffic through to the ATM network.

Ⓒ ATM network continues to carry CBR traffic on to another ATM network or drops the traffic (on DS0 5) to a public switched telephone network.

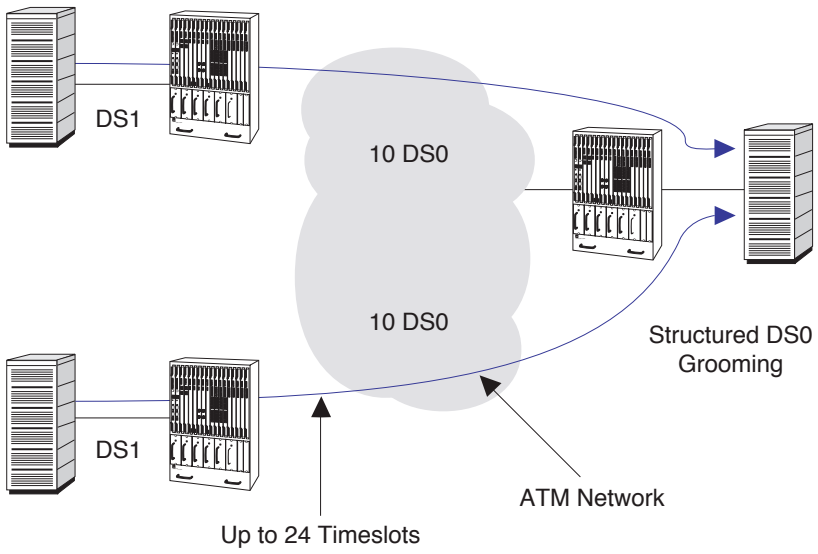
Midspan drop and insert allows services such as public switched telephone service to be inserted into the ATM link. Combining this service with Ethernet bridge service provides you with a complete integrated communications access solution. See Figure 53.

Figure 53 Integrated PathBuilder S700 Application



Drop-and-Insert DS0 channels can also be allowed to transit the entire path. This provides DS0 to DS0 connectivity between end locations. Structured DS0s can be groomed to be combined through an ATM network allowing end to end DS0 switching as shown in Figure 54.

Figure 54 Structured DS0 Combining



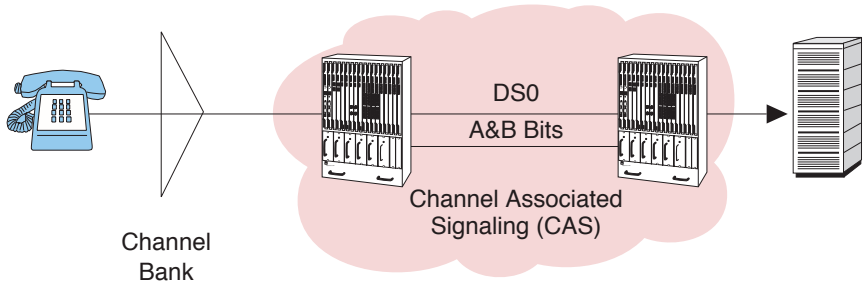
PBX - Private Branch Exchange
VCC - Virtual Channel Connection

DS0 Signaling and Dynamic Bandwidth Allocation

Structured DS0s provide channel associated signaling (CAS) by providing a path for DS0 ABCD bits. See Figure 55.

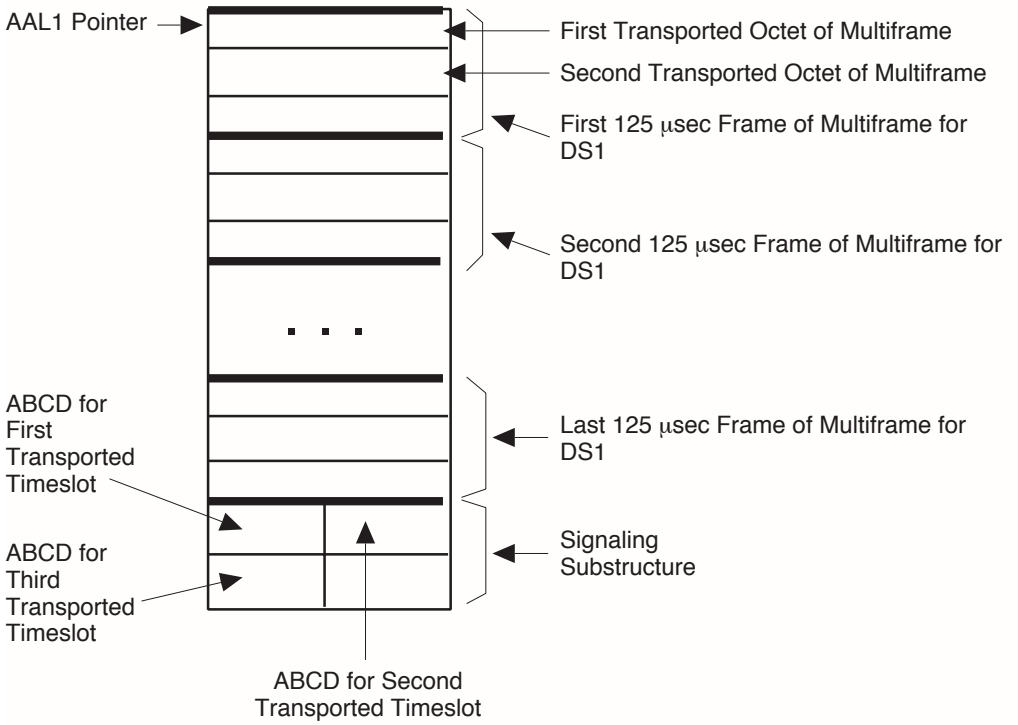
Channel associated signalling allows telephone supervision to be signaled end to end. Note that structured DS1 CBR occupies only the needed bandwidth for the DS0s selected.

Figure 55 Channel Associated Signaling



These frames are then followed by the ABCD bits of each active DS0. Two DS0s ABCD bits are provided in each byte after the last DS0 group. Figure 56 illustrates an example of 3 DS0s and their ABCD bits sent in a structured encapsulation.

Figure 56 Multiframe Structure for 3x64kbit/s DS1 or E1 with CAS



The PathBuilder S700 software can also monitor a full 8-bit pattern on a DS0 to determine circuit activity. This is the basis for the two supported types of dynamic bandwidth allocation (DBA):

- Structured voice DBA
- Structured data DBA

Structured Voice DBA When a CBR port is configured as structured voice, signaling bits of voice channels are carried along with their payload in AAL1 cells. These signalling bits, which are received from T1/E1 framers, are stored in buffers provided in the SAR processor. The CBR software periodically reads the stored signaling bits and checks for an idle condition of voice channels with on-hook detection enabled.

- When an on-hook (idle) signal is detected, the CBR virtual circuit is deactivated, and the bandwidth reserved for that channel is released for other uses (such as VBR traffic).
- When an off-hook signal is detected, the CBR virtual circuit is activated.

Structured Data DBA When a CBR port is configured as structured data, only DSO payload bytes are carried in AAL1 cells. These data cells are stored in buffers provided in the SAR processor. The CBR software periodically reads the stored data bits and checks for an idle code in the stored data bits of each DS0 channel. All virtual circuits in the port use a user-selected DBA bit mask to mask off bits that are not a portion of the idle code.

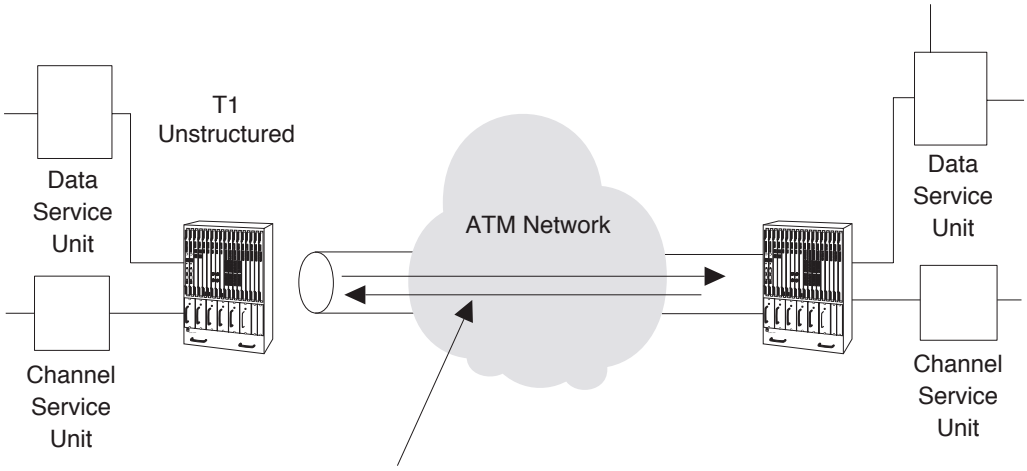
- When an on-hook condition (idle code) is detected, the CBR virtual circuit is deactivated, and the bandwidth reserved for that channel is released for other uses.
- When an off-hook condition (no idle code) is detected, the CBR virtual circuit is activated.

A structured DS1 channel will not pass the original DS1 frame to the remote end. For instance, ESF network management will terminate at the PathBuilder S700 on a structured DS1, so CSU to CSU Facility Data Link (FDL) communication will not be possible. FDL communication is possible with unstructured DS1.

Unstructured DS1

Implement unstructured DS1 service when you want DS1 tunneling through an ATM system. DS1 tunneling allows an entire DS1 frame including framing bits to transit an ATM networks. See Figure 57.

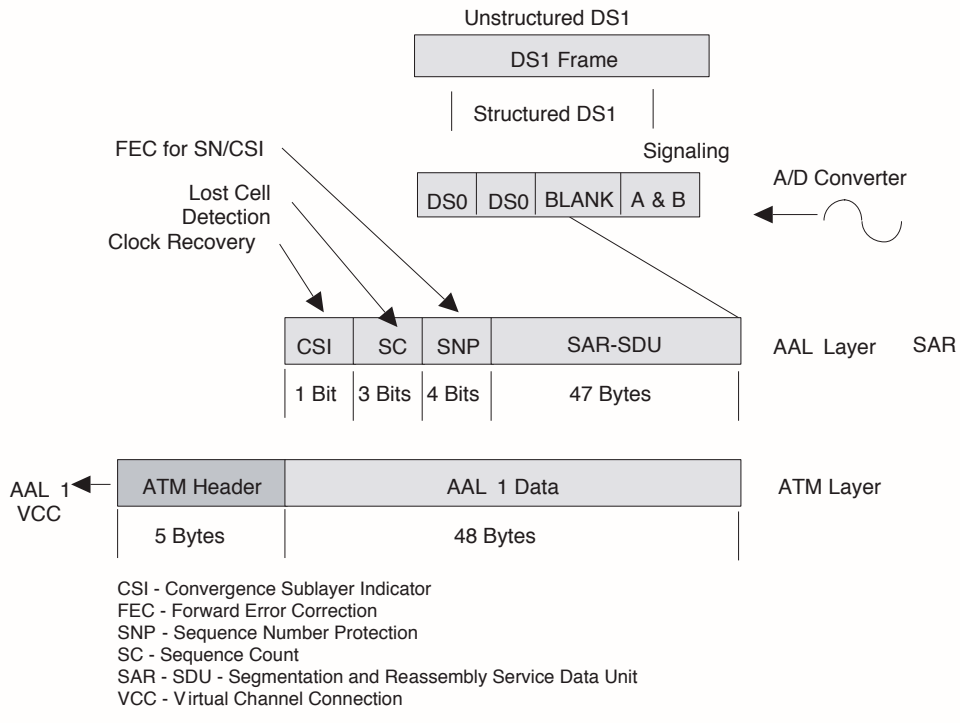
Figure 57 DS1 Unstructured Tunneling



DS1 Signal Tunneled Through a PVC

Use unstructured services when DS0 midspan access is not required and end to end DS1 service is required, for example to provide CSU or DSU end to end connectivity. The encapsulation of unstructured DS1 occupies DS1 bandwidth on the VCC and uses AAL 1 SAR, as shown in Figure 58.

Figure 58 AAL1 Unstructured DS1



Structured versus Unstructured Summary

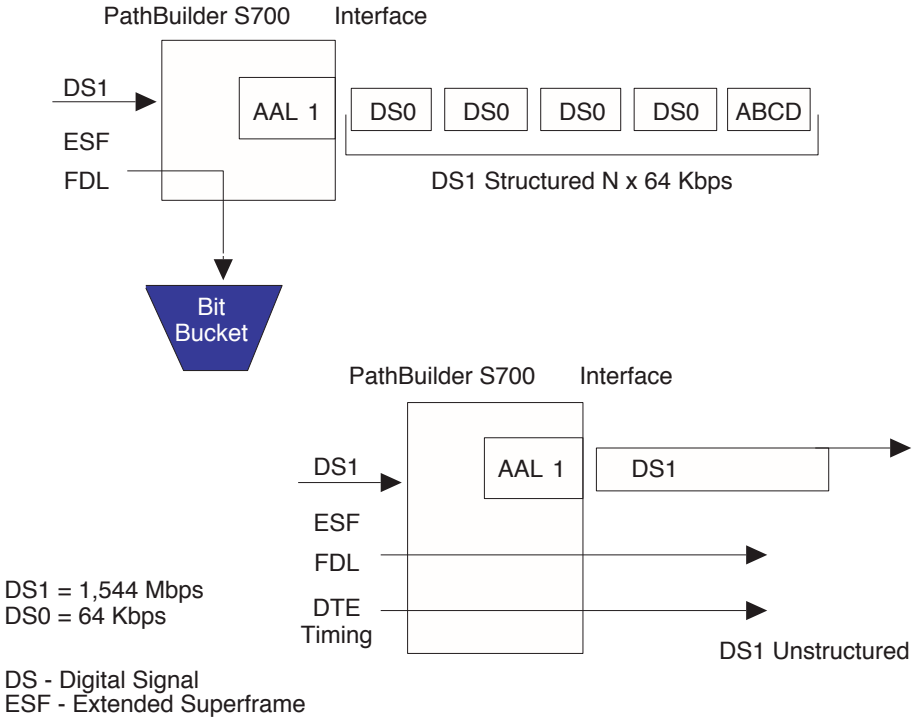
Use Table 30 to select whether to use structured or unstructured DS1 CBR.

Table 30 Selecting Structured Mode Versus Unstructured Mode

	Structured	Unstructured
DSO midspan drop and insert	X	
DSO access grooming	X	
DS1 network management end to end		X
DS1 end to end (no DSO access)	X	X
DS1 CBR 1.536 Mbps of bandwidth	X	X
DS1 CBR 1.544 Mbps of bandwidth		X
Dynamic Bandwidth Allocation (DBA)	X	

Figure 59 depicts the effects of structured versus unstructured service on the DS1/E1 framing.

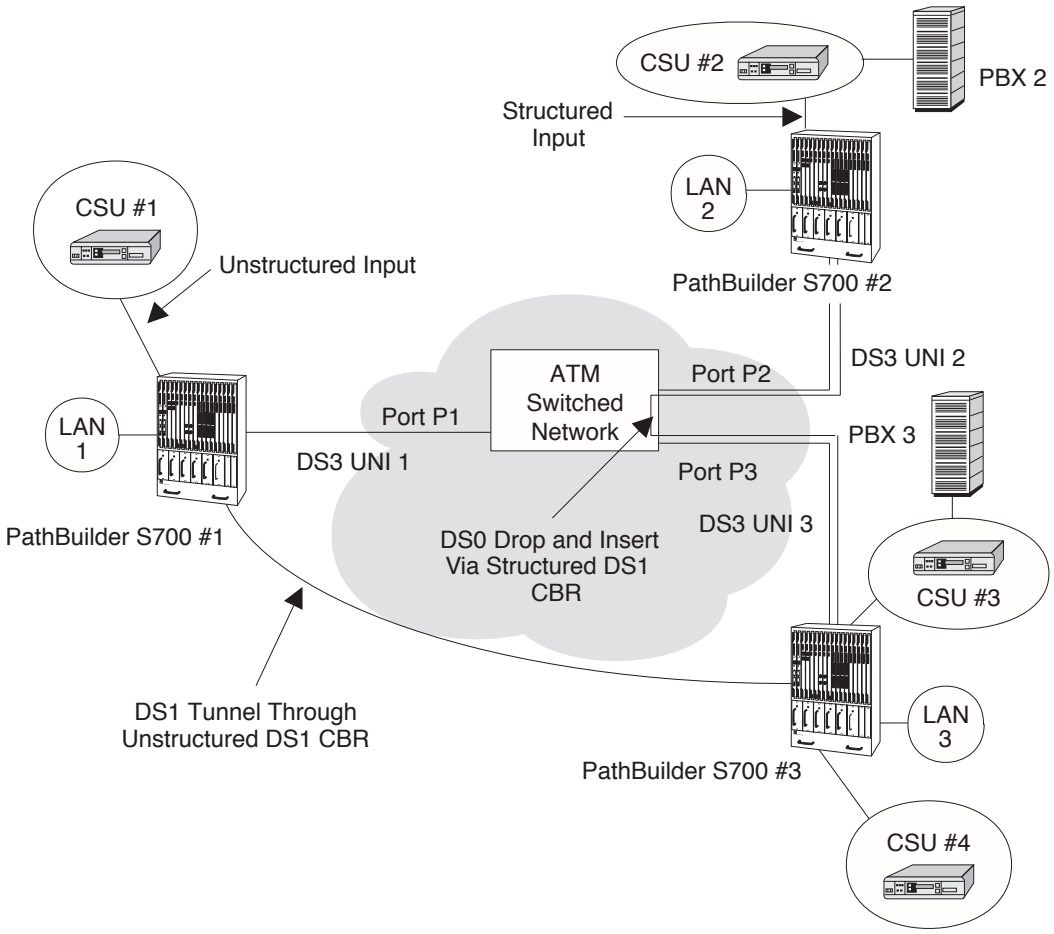
Figure 59 Structured Versus Unstructured Effects on Transit DS1



Ethernet and Voice Application

A typical configuration involves multiple PathBuilder S700s connected through an ATM network that could consist an ATM switch or an ATM network consisting of multiple switches. This configuration is shown in Figure 60.

Figure 60 Typical PathBuilder S700 Configuration



Circuits Set Up on The PathBuilder S700 #1

PVC	END1	END2	VPI/VCI	Conn To
#1	LAN1	DS3	0/200	LAN2
#2	LAN1	DS3	0/300	LAN3
#3	CSU1	DS3	0/500	CSU4

Circuits Set Up on the PathBuilder S700 #2

PVC	END1	END2	VPI/VCI	Conn To
#1	LAN2	DS3	0/100	LAN1
#2	LAN2	DS3	0/300	LAN3
#3	PBX2	DS3	0/400	PBX3

Circuits Set Up By The Carrier (Cross Connects)

PVC	END1	VPI/VCI1	END2	VPI/VCI2
#1	P1	0/200	P2	0/100
#2	P1	0/300	P3	0/100
#3	P2	0/300	P3	0/200
#4	P2	0/400	P3	0/300
#5	P1	0/500	P3	0/500

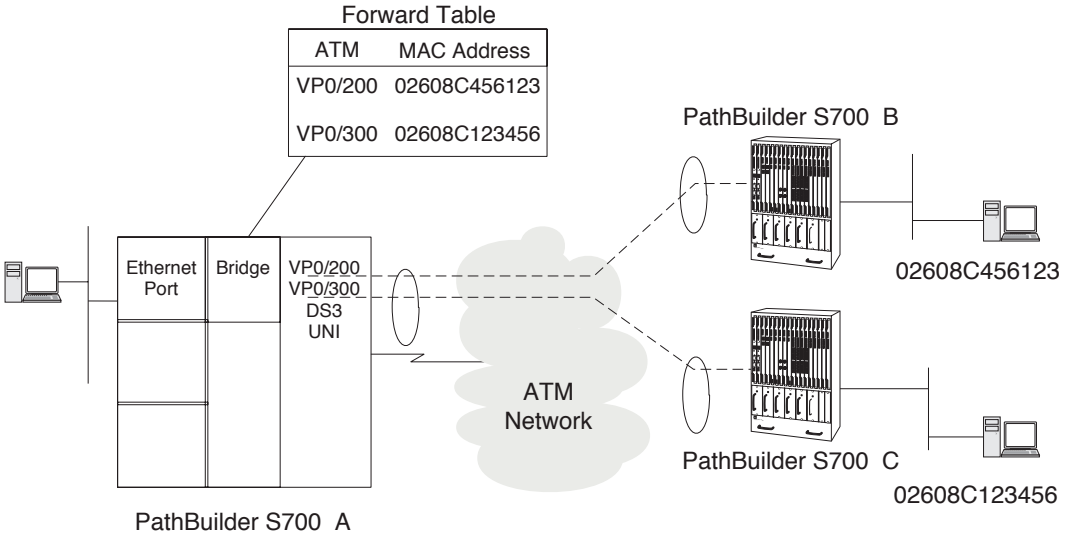
Circuits Set Up on the PathBuilder S700 #3

PVC	END1	END2	VPI/VCI	Conn To
#1	LAN3	DS3	0/100	LAN1
#2	LAN3	DS3	0/200	LAN2
#3	PBX3	DS3	0/300	PBX2
#4	CSU4	DS3	0/500	CSU1

Forward and Reverse VCCs Match in This Example. VCCs are Unidirectional. Only Forward Vccs are Shown for Easier Viewing.

Figure 61 shows three PathBuilder S700s connected through a carrier ATM network or a private switch. The ATM switch or network should be configured with Permanent Virtual Circuits (PVCs) connecting one LAN or DS1 port on one PathBuilder S700 to another port on another PathBuilder S700.

Figure 61 ATM Bridging



Note that the numbers given for these circuits by the carrier are local to one PathBuilder S700 and have no global significance. For example, VCC number 0/100 is used on two different PathBuilder S700s to mean two different circuits. The carrier will assign each PathBuilder S700 at each location any number of circuits to connect each PathBuilder S700 Ethernet port to any other PathBuilder S700 Ethernet port desired.

The connections in the carrier network are shown for illustration only. Figure 61 shows an example for an ATM switch configuration. Note that the VCC numbers get translated by the ATM switch since they have local meaning only for every switch port. For example, the carrier would provide the PathBuilder S700 at the #1 location, four VCCs for the forward and reverse path to connect respectively to LAN2 and LAN3. VCCs are unidirectional; therefore, two VCCs are designated on a port of an PathBuilder S700 to transmit to, and receive from, another location.

The PVCs are provisioned by the carrier for use on each PathBuilder S700. These PVCs are entered in circuit tables within each PathBuilder S700. After these circuits are built the bridge can use this information to send ATM cells to remote sites.

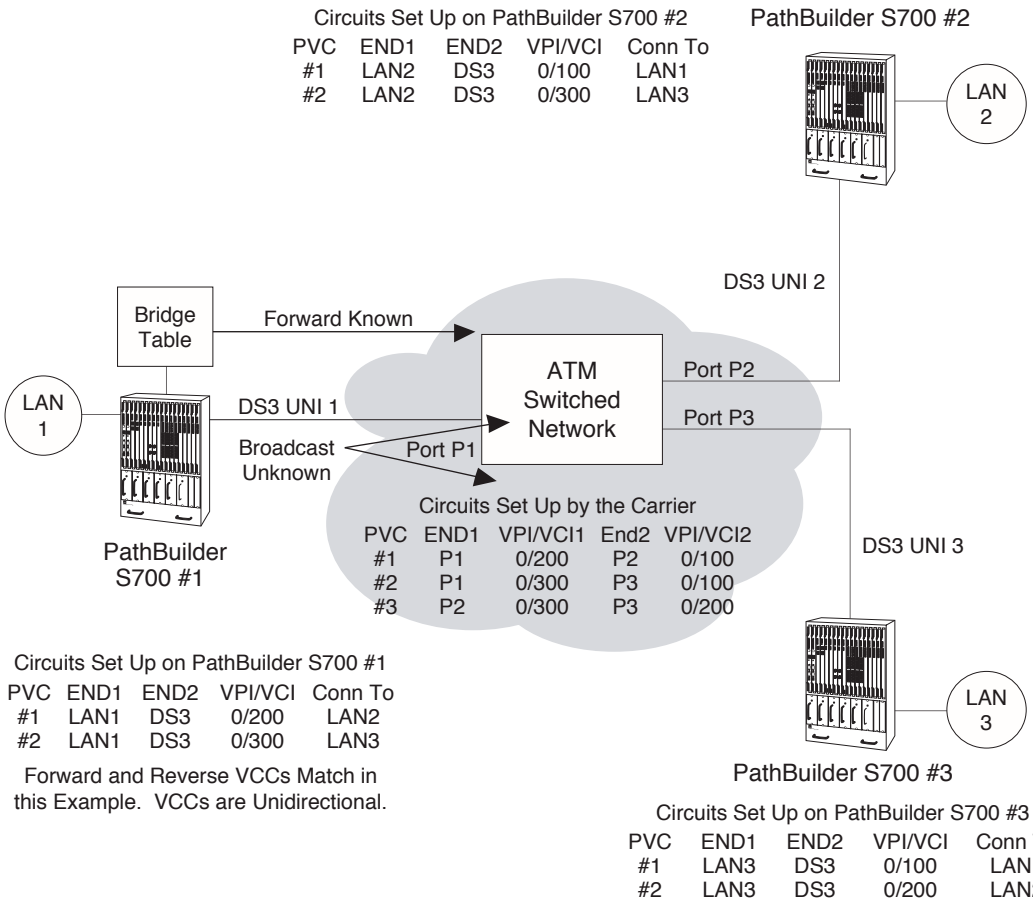
The PathBuilder S700 supports a maximum of 256 VCs per IMA group, 4000 VCs for the whole shelf. You first configure each PathBuilder S700 with the PVC information using menus that prompt you to input specific information about each Permanent Virtual Circuit. See "Configuring Virtual Circuits" in Chapter 5, for details.

These PVCs are tied to specific PathBuilder S700 ports (Ethernet slot 4, port 1). You can associate several PVCs associated to one PathBuilder S700 port. Each PVC represents the logical circuit being used to connect one PathBuilder S700 port to a remote PathBuilder S700 port.

Once you have entered all PVCs, the bridge learns the network addresses for the local and remote sites and starts bridging packets to the correct destination by segmenting the packets into cells which are destined to a remote PathBuilder S700 port. See Figure 61. The ATM network will transport the cells according to the VPI/VCI headers.

Figure 62 shows three PathBuilder S700s configured to provide LAN connectivity between three different LAN segments. This example is a simple configuration which only uses 1 port on 1 Ethernet port card in each PathBuilder S700.

Figure 62 LAN Connectivity



Each Ethernet port will run Bridging (Learning) programs to determine if received LAN packets should be passed to the WAN on a specific PVC. In the example shown in Figure 62, multi-port bridging software will determine if packets will be passed or dropped. When a packet comes in from LAN 1 port and the Bridge code does not have the destination MAC address associated with one of its logical ports (Ethernet, PVC #1, PVC #2), it will broadcast the packet on all PVCs attached with this port. Once Packets are received from the WAN on specific PVC logical ports, their source addresses will be learned and associated with the logical port. Once you and your carrier have set up PVCs to all remote PathBuilder S700 Ethernet ports, the Bridging code will do the rest. For further information on bridging, see "Bridging" later in this chapter.

Frame Application

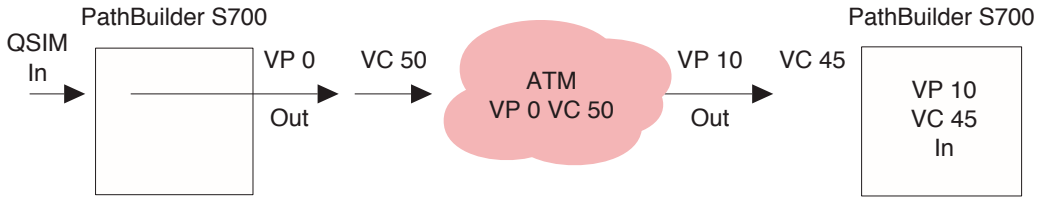
The QSIM/HSIM/FAM modules support 3 modes of Frame to Cell transit services:

- DXI Mode 1A
- Frame Relay Forum Specification 5 and 8; Service and Network Interworking
- HDLC/SDLC

Each service is designed to support a different type of user application. However, they all share the same ATM backbone characteristics. The QSIM/HSIM/FAM port modules are mapped over ATM PVCs.

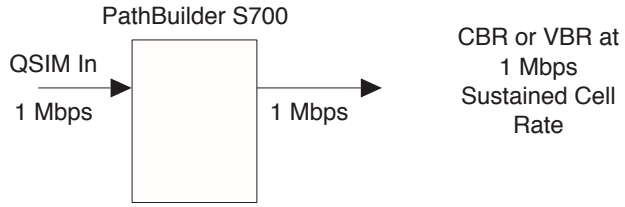
When you are connecting the PathBuilder S700 to an ATM network, verify that the PVC mapping for in and out ports is defined for proper operation. See Figure 63.

Figure 63 PathBuilder S700 to ATM PVC



It is also important to select the proper traffic contract from the ATM switch/service provider. This card should utilize a VBR or CBR circuit set at the speed of the connected port. See Figure 64.

Figure 64 PathBuilder S700 Traffic Contract



VBR service will work, however the synchronous path will be subjected to possible discards and delay.

DXI Mode 1A

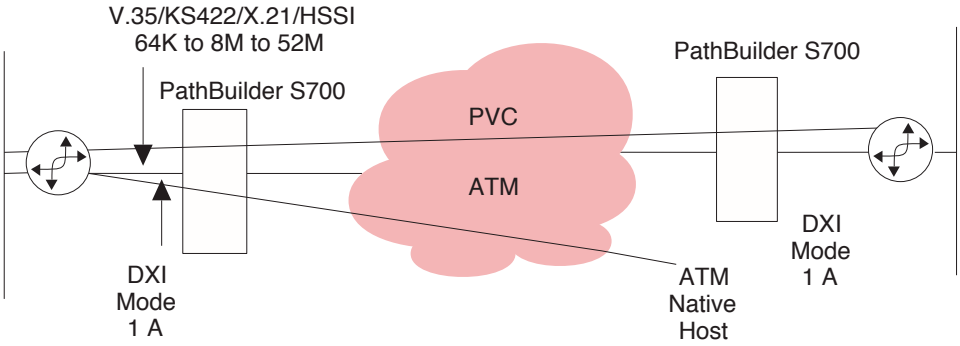
DXI protocol frame is an HDLC LLC1 frame similar to PPP protocol. In terms of the brouter, it is easier to implement DXI Protocol since it only requires the brouter to encapsulate the SDU.

The ATM Forum defines the DXI service in three modes: 1A, 1B, and 2. The PathBuilder S700 supports Mode 1A, which includes the following features:

- up to 1023 virtual connections
- supports an AAL5 transit encapsulation
- maximum DTE SDU size 9232 bytes
- Uses 16-bit FCS

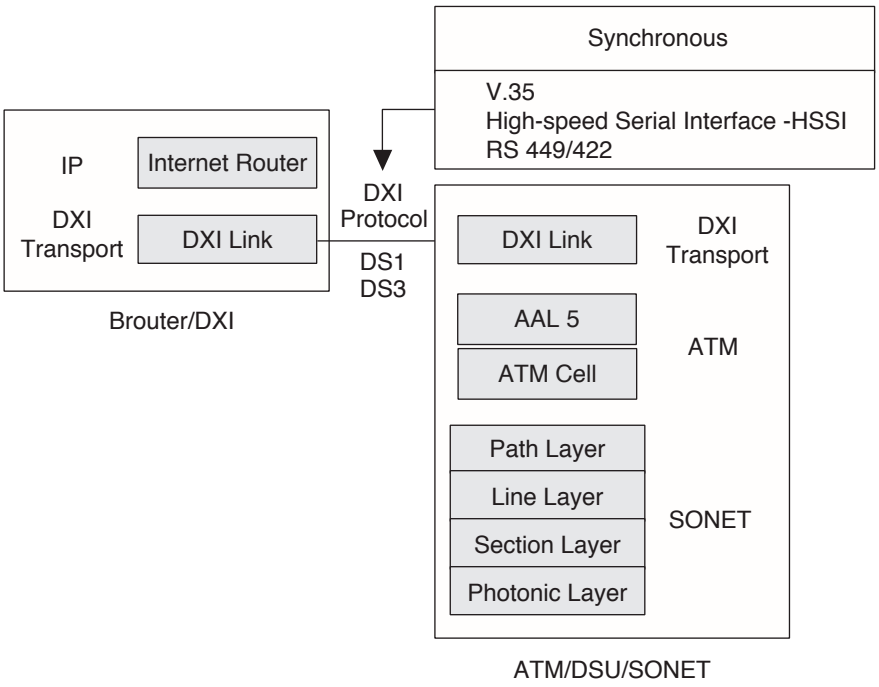
Figure 65 shows the application for DXI.

Figure 65 DXI Application



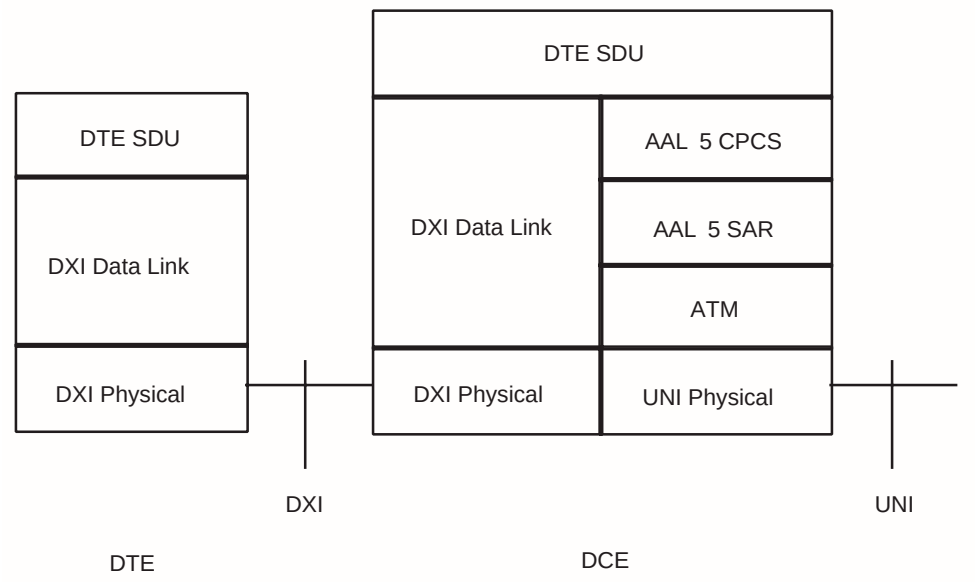
DXI Mode 1A is designed to allow legacy routers to utilize frame based transmission to transit an ATM network to the DXI Mode 1A device (PathBuilder S700 QSIM/HSIM/FAM), which then performs SAR and AAL5 mapping to an ATM PVC. See Figure 66.

Figure 66 DXI Router to ATM Connection



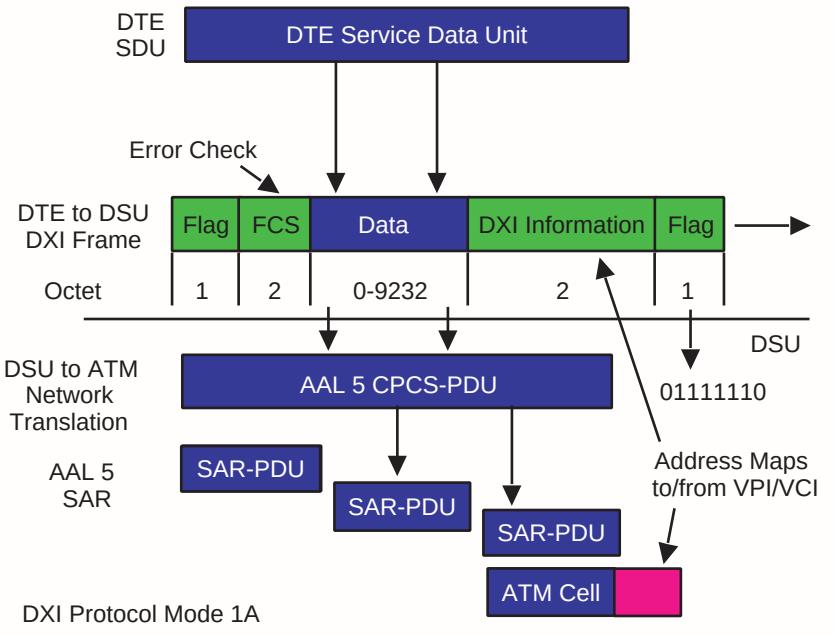
Through ATM DXI, the DCE allows the DTE to participate in an ATM network. See Figure 67.

Figure 67 DCE Allows DTE to Participate in ATM Network through ATM DXI



DXI protocol defines an open interface between brouter and Data Service Unit. The Data Service Unit off-loads cell encapsulation services from the brouter. This allows your current brouter to support ATM simply by supporting V.35 and High-level Data Link Control (HDLC). The DXI protocol itself is based on HDLC and provides simple and efficient encapsulation of the Data Service Unit and the mapping within the HDLC frame to place the brouter data on an appropriate VC. See Figure 68.

Figure 68 DXI Format Mode 1A Encapsulation



Frame Relay Interworking Functions

The PathBuilder S700 provides two functions to interconnect a frame relay network with an ATM network:

- Service Interworking
- Network Interworking

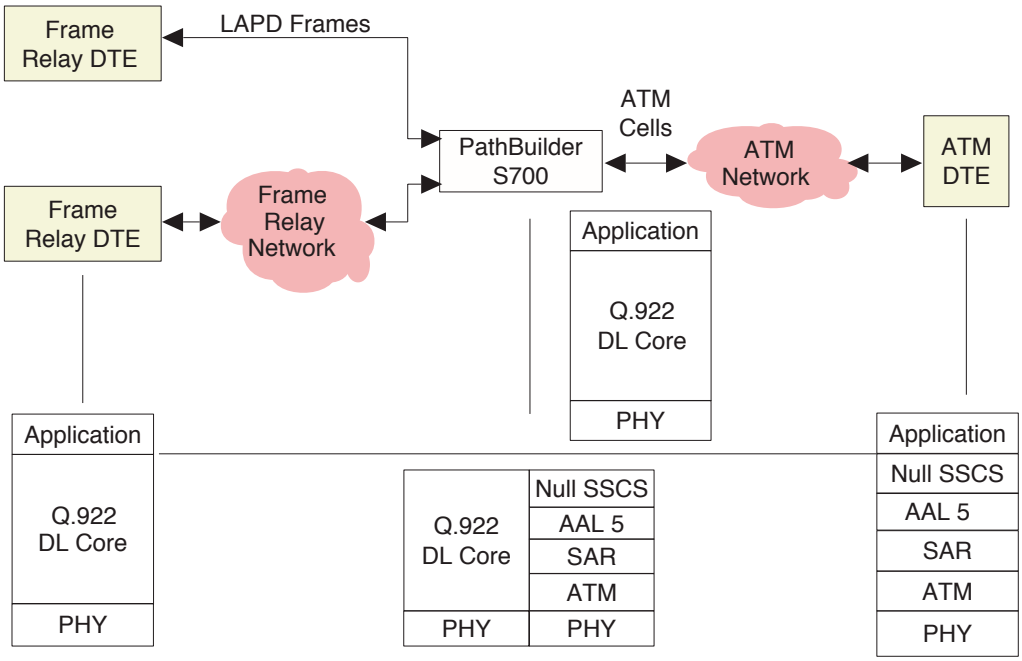
These interworking features are described in FRF.5 and FRF.8 respectively. As far as the interworking function is concerned, the major difference between these two features is that there is no FR-SSCS function required for Service Interworking.

The following sections describe the details of these two functions as well as the features provided by the PathBuilder S700.

Service Interworking Function Figure 69 shows an PathBuilder S700 with Service Interworking function between a Frame Relay and ATM services. In this setup, a Frame Relay DTE will be communicating with an ATM DTE, but neither one knows there is a different type of DTE sitting at the other end.

In this interworking scheme, the application on the frame DTE passes its data through Q.922 core service. It assumes there is an end-to-end pipe to carry its data from its end to the other DTE at the far end.

Figure 69 Frame Relay/ATM Service Interworking Connection



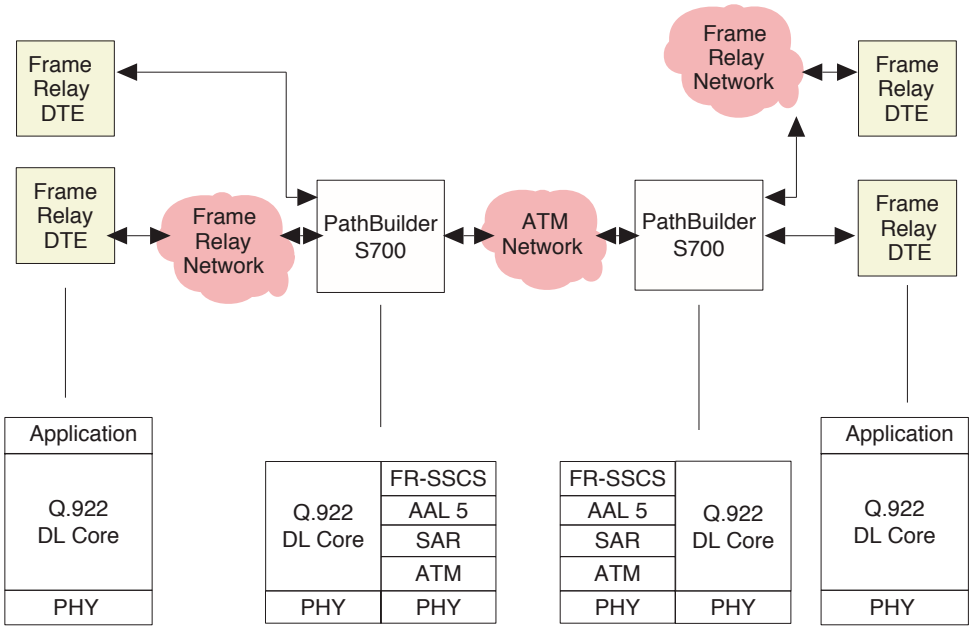
The Q.922 core sees only a point-to-point link to the next connection point. It has no knowledge about what type of network is behind the current link. On the other end, the application residing in ATM DTE passes its data through a NULL SSCS that sits on top of AAL 5. What this ATM DTE sees is the ATM network to which it is connected. The PathBuilder S700 sitting in the middle performs all the required translation and management functions between these two networks and implements the stacks as indicated above in Figure 69.

You can configure each port on a QSIM, HSIM, or FAM module independently to provide this type of service, and the PathBuilder S700 will perform the following functions:

- Q.922 Frame to ATM AAL 5 PDU translation and vice versa
- Frame PVC Management
- Traffic Management
- Congestion Handling

Network Interworking Function Figure 70 shows how an PathBuilder S700 fits into a network interworking configuration.

Figure 70 Frame Rely/ATM Network Interworking Connection



In this configuration, a Frame Relay DTE communicates with the other Frame Relay DTE through an ATM network. The Frame Relay DTE at either end works exactly the same way as that in the service Interworking configuration. It passes its data through Q.922 core service, assuming that there is an end-to-end pipe to carry its data from its end to the other DTE at the far end. On the other hand, the application resides in a Frame DTE instead of an ATM DTE. The PathBuilder S700 performs all the required translation and management functions between these two networks.

HDLC/SDLC

The PathBuilder S700 will SAR AAL5 and map HDLC/SDLC frames on to an ATM VCC. You can use the HDLC service for:

- Router to Router Links
- X.25 to X.25 Links
- Other HDLC User

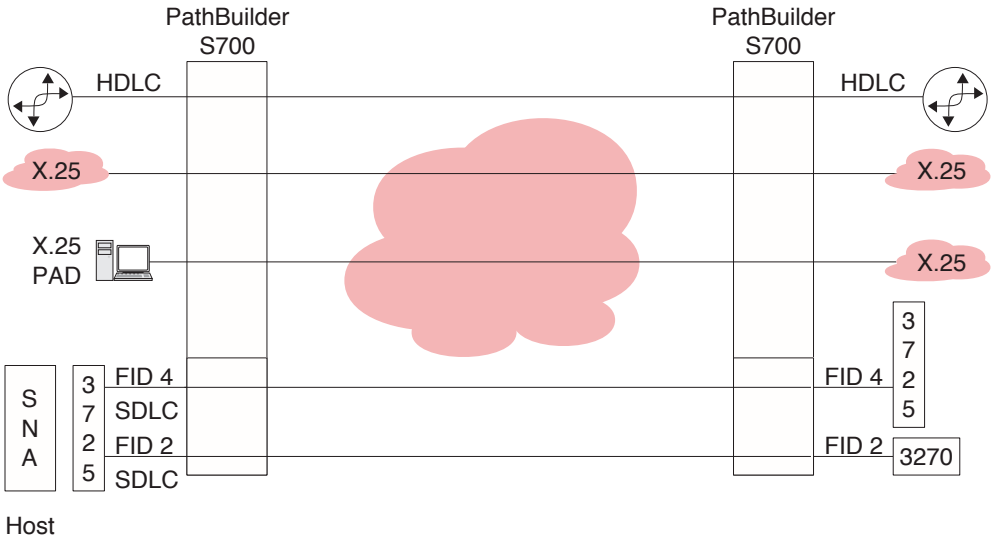
You can use the SDLC service for:

- IBM FID2 3270 SNA Peripheral
- IBM FID4 372X SNA Backbone
- Other SDLC User

Figure 71 shows HDLC/SDLC applications.

NRZI should be disabled on the FEP (i.e. IBM 3745). NRZI is commonly used when the FEP is connected to DSUs over non-digital line. PathBuilder S700 does not require NRZI to be enabled.

Figure 71 HDLC/SDLC Applications



5 CONFIGURING PATHBUILDER S700 MODULES, PORTS, AND APPLICATIONS

This chapter tells you how to configure the modules, circuits, and related applications supported by the PathBuilder S700 WAN access switch (PathBuilder S700) so that the device can pass traffic. It contains the following sections:

- Viewing and Configuring System Information
- PathBuilder S700 Configuration Overview
- Configuring the PathBuilder S700 Shelf and the Application Modules
- Configuring the Shelf
- Configuring the Management CPU
- Configuring Virtual Interfaces
- Configuring Input Shapers
- Configuring the STX Module
- Configuring OC3/STM-1 UNI Modules
- Configuring DS3 UNI Modules
- Configuring E3 UNI Modules
- Configuring DS1 UNI or E1 UNI with IMA Modules
- Configuring Ethernet Modules
- Configuring DSX-1 CBR or E1 CBR Modules
- Configuring QSIM/HSIM/FAM Modules
- Configuring Virtual Circuits

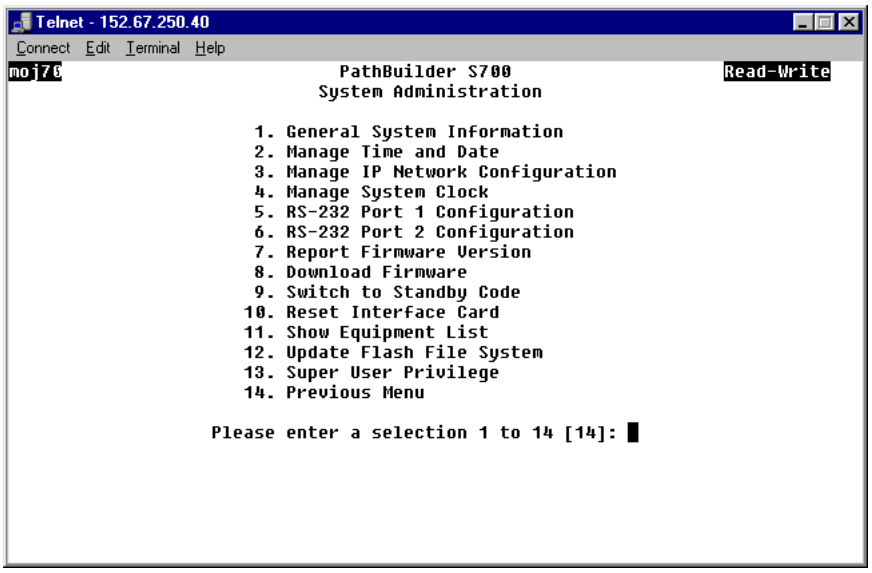
Viewing and Configuring System Information

The System Administration menu, shown in Figure 72, includes options that allow you to view and configure system information. In addition to using this menu for initial configuration, as described in Chapter 3, you can:

- Specify general system information.
- Manage the system clock.
- View system parameters for the RS-232 ports.
- View the current firmware version.
- Download new firmware.
- Update the flash file system.
- Reset the interface card.
- View an equipment list.

The following subsections describe these System Administration menu options.

Figure 72 System Administration Menu



Specifying General System Information

General system information includes the following:

Shelf name—Change the name of the node.

Customer name—Change or enter the customer name.

Phone number—Change or enter the phone number.

Maintenance contact—Change or enter the maintenance contact.

Location—Change or enter the location.

Auto logout time—Change the logout time (1-99 minutes).

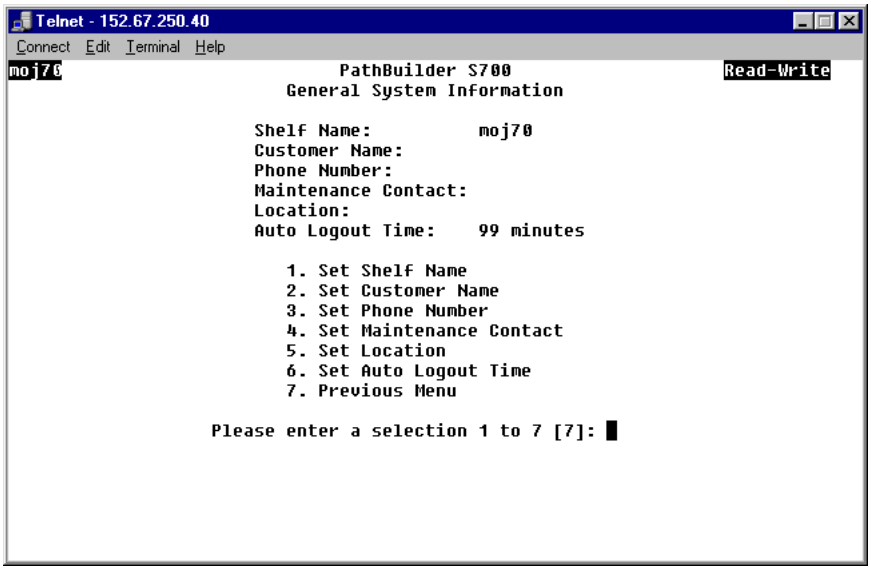
Password—Change the password. The default is **password**.

To specify or change general system information, follow these steps:

1. From the System Administration menu, select *[1] General System Information* to display the General System Information menu shown in Figure 73. This menu displays the current system information and provides options that allow you to change the current settings.
2. Select the option corresponding to the setting you want to change. A prompt appears at the bottom of the screen.
3. Enter the new setting.
4. Repeat steps 2 and 3 for any other settings you want to change.
5. Select *[8] Previous Menu* to return to the System Administration menu.

For information about the options related to initial configuration (setting communication parameters, configuring in-band management, setting the time and date, changing the default password, and taking over a read-write session), see Chapter 3.

Figure 73 General System Information Menu



Managing the System Clock

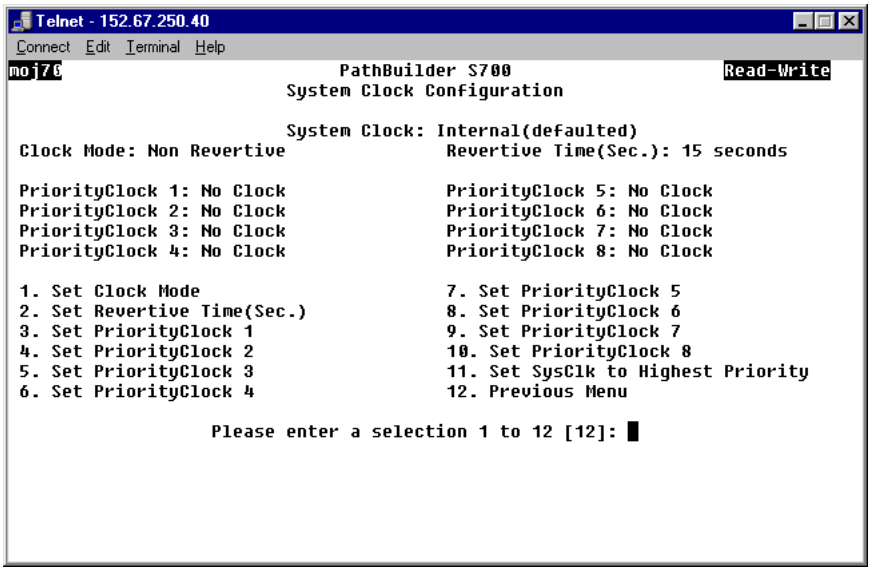
You can manage the system clock for the PathBuilder S700 in the following ways:

- Specify the clock sources to be used for system timing. You can set up to eight priority clock sources, including multiple ports of the same card,
- Specify the clock mode: revertive or non-revertive
- (revertive mode only) Set the revertive time—the length of time the system monitors the highest priority system clock source before either reverting to it (if it has become operative) or continuing to use a lower priority clock source.

To manage the system clock, follow these steps:

1 From the System Administration menu, select *[4] Manage System Clock* to display the System Clock Configuration menu, shown in Figure 74.

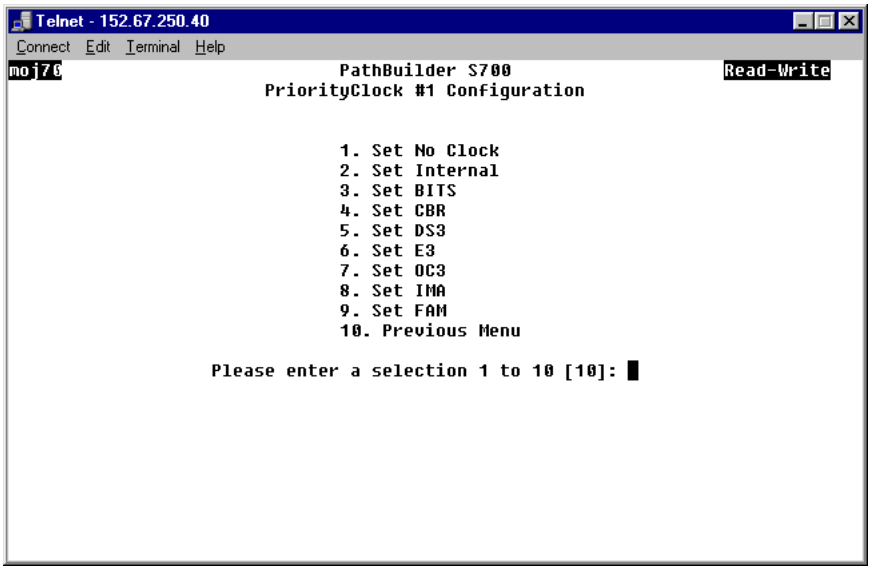
Figure 74 System Clock Configuration Menu



2 Specify the clock sources to be used for system timing.

a From the System Clock Configuration menu select: *[3] Set PriorityClock 1* to open the Priority Clock Configuration menu, shown in Figure 75.

Figure 75 Priority Clock Configuration Menu



b Select the option corresponding to the clock source you want to use for the system reference clock. In addition to the internal clock, you can designate any of the following cards as clock source:

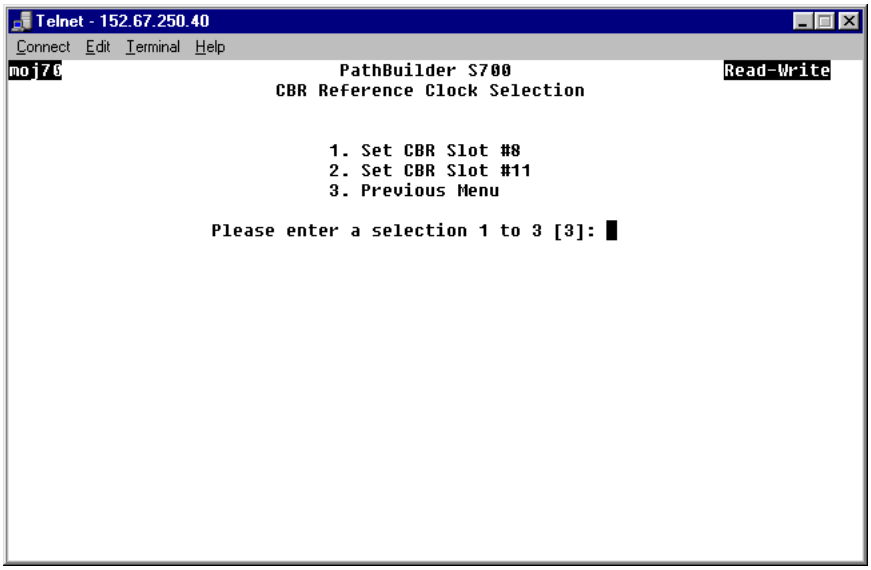
- BITS
- CBR, port n (n=1-4 for 4-port card or 1-8 for 8-port card)
- DS3
- E3
- OC3
- IMA, port n (n = 1-8)
- FAM, port n (n = 1-8)

You can designate a card or a port as a clock source even if it has an alarm; however, the card or port must be In Service. *If a card or port is* Out of Service*, it will not appear as an option on the Priority Clock Configuration or Reference Clock Port Selection menu.*

c If you selected a non-multiple port clock source (Internal, BITS, DS3, E3, or OC3) in step b, skip to step h; otherwise continue with step d.

d If you select a card that has multiple ports (CBR, IMA, or FAM), a reference clock selection menu opens when you select that card as a clock source. Figure 76 shown the CBR Reference Clock Selection menu. The reference clock selection menus for the other multiple port cards are similar.

Figure 76 CBR Reference Clock Selection menu



e Select the option corresponding to the card and slot number you want to designate as the clock source to open the reference clock port selection menu. This menu lists all the *In Service* ports on the selected card.

f Select the option corresponding to the port you want to designate as the clock source.

g Return to the System Clock Configuration menu.

h Repeat steps 2a-2g for up to seven additional clock sources (you can set up to eight), substituting the appropriate option ([4] -[10]) for *[3] Set PriorityClock 1* in step a.

If priority clock #1 fails, priority clock #2 becomes operative; if priority clock #2 fails, priority clock #3 becomes operative, and so on. For a list of the alarm conditions which cause a clock source to fail, see Table 31 later in this section.

3 Select [*1] Set Clock Mode*, and set the clock mode to one of the following:

Revertive—If priority clock #1 fails, and priority clock #2 or higher becomes operative, the system reverts to priority clock #1 if this clock source becomes valid again within the specified *Revertive Time* (see step 4),

Non-Revertive—If priority clock #1 fails, and priority clock #2 or higher becomes operative, the system does not revert to priority clock #1 after it becomes valid again.

In non-revertive mode only, you can manually switch to priority clock source #1—or the highest valid clock source. To do this, select [11] Set SysClk to Highest Priority *from the System Clock Configuration menu.*

4 (revertive mode only) Select *[2] Set Revertive Time* and specify the length of time (10-900 seconds) the system will monitor priority clock #1 before either reverting to it (if the clock source becomes valid again) or continuing to use a lower priority clock source.

Alarm Conditions that Cause Clock Source Failure

Table 31 lists the alarms conditions that cause different cards to fail as clock sources.

Table 31 Clock Source Failure Alarms

Card	Alarms
BITS	LOSS OF CLK
CBR	LOS, OOF
DS3	LOS, OOF, LCD (if on PCLP)
E3	LOS, OOF, LCD (if on PCLP)
OC3	LOS, LOF, LOCD
IMA	LOS, OOF
FAM	LOS, OOF

Viewing and Configuring RS-232 Parameters

The Management CPU module has two RS-232 ports:

- Port #1 connects to a local VT100 terminal. You can view the communication parameters for this port, but you cannot change them via the NMS menus.
- Port #2 allows you to run PPP. This port can connect via a modem to the user management network. You can view and configure communications parameters for this port via the NMS menus.

You must configure your terminal or workstation to match the default settings of RS-232 port #1 and normally you will want to do the same for port #2.

Table 32 lists the default settings for the RS-232 ports.

Table 32 RS-232 Port Default Settings

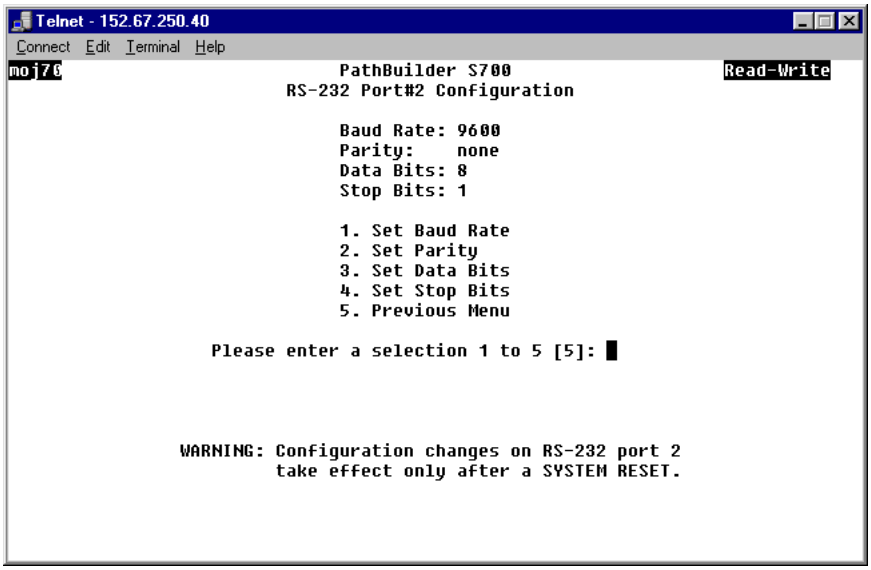
	Port 1	Port 2
Baud Rate	9600	9600
Parity	none	none
Data Bits	8	8
Stop Bits	1	1

To use other settings for port #2, follow these steps:

1 From the System Administration menu, select *[6] RS-232 Port 2 Configuration* to display the RS-232 Port #2 Configuration menu, shown in Figure 77.

Selecting [5] RS-232 Port 1 Configuration *displays the current settings only—The RS-232 Port 1 Configuration menu does not provide options for changing the communication parameters for port #1.*

Figure 77 RS-232 Port #2 Configuration Menu



2 Change any of the following parameters as desired:

Baud Rate—*300*, *1200*, *2400*, *4800*, *9600*, *19200*, or *38400*

Parity—*one*, *even*, or *odd*

Data Bits—*7* or *8*

Stop Bits—*1* or *2*

When you make a change to the port to which you are currently connected, it does not take effect until you log out. After you log out, change the configuration of your terminal port to agree with that of the PathBuilder S700 management port and then start a new session.

Changing to a slower baud rate may slow down communications to the point where it is obvious on the display (menus will change and form more slowly). Conversely, increasing the baud rate will speed up the menu system.

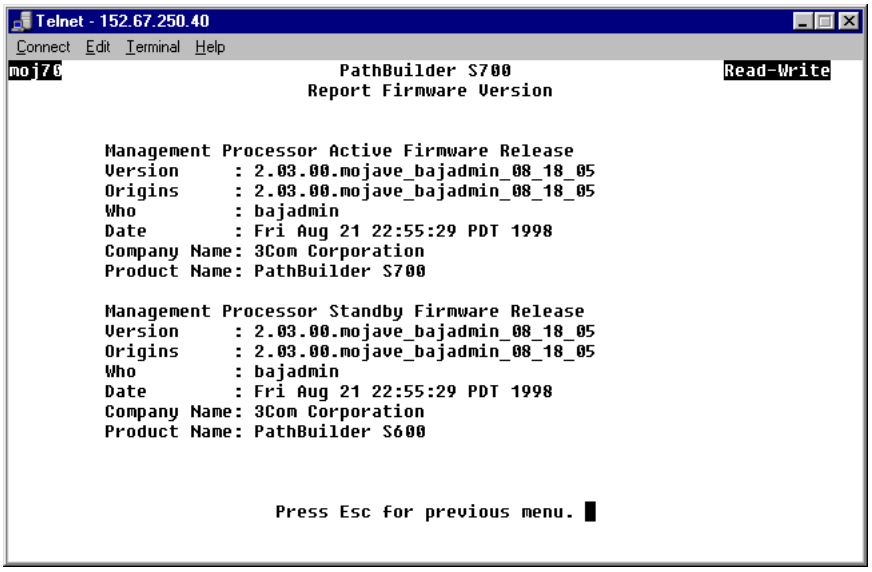
Viewing the Firmware Version

To view the version number for the firmware that is currently running on the CPU:

From the System Administration menu, select *[7] Report Firmware* Version.

The Report Firmware Version screen appears, as shown in Figure 78.

Figure 78 Report Firmware Version Screen



The Report Firmware Version screen displays the following information about both the active firmware (the firmware currently being used by the MCPU) and the standby firmware (the upgradable firmware stored in a standby memory bank):

Version—The released firmware version number. This is the version number that is displayed on the login screen.

Origins—The original engineering build number for the release.

If the Version *and* Origins *release numbers are the same, then the release is not an official release but rather a Beta test version.*

Who—The user login ID for this software build.

Date—The date and time that the build was made.

Company Name—3Com Corporation (or OEM partner if desired)

Product Name—The PathBuilder product for which this image was built: *PathBuilder S700*, *PathBuilder S600*, *PathBuilder S330*, or *PathBuilder S310*.

Downloading New Firmware

The PathBuilder S700 MCPU module retains the operation firmware in a standby memory bank. On power-up or reset, the code image is copied from the standby bank to the active memory bank. The standby memory retains a copy of the operation firmware. You can upgrade the standby memory in the following ways:

- Via TFTP over the Ethernet interface, through a Telnet session.
- Via the Xmodem protocol over the serial port
- Via FTP

We recommend that you avoid using the serial port to download firmware unless the Ethernet port is unavailable. Downloading via the serial port can take more than 30 minutes at 9600 baud.

When you download new firmware, the standby memory is overwritten with the new code. Once the firmware is successfully downloaded, reset the system to bring up the new code.

Downloading Firmware via the Ethernet Port

To download new firmware using TFTP, via a telnet session over the Ethernet port, follow these steps:

Be sure to log in via Telnet. If you log in at a serial port, the download sequence will attempt an Xmodem protocol download rather than a TFTP download.

1. Obtain the correct image file location and name from 3Com Customer Service.
2. Telnet into the PathBuilder S700 unit.
3. From the System Administration menu, select *[8] Download Firmwar*e. The following prompt appears:

   ```
   This action will erase the standby code area.
   Do you want to download firmware (Y/N) [N]?
   ```

4. Enter **y** and wait for the `Ready to download...` message.
5. From a workstation or PC (typically the same one doing the Telnet), invoke TFTP using the PathBuilder S700 IP address.
6. From TFTP, enter the following command:

   ```
   binary
   put <filename>
   ```

   where <filename> is the filename of the image file to be downloaded.

   The download should complete in about two minutes (over lightly-loaded Ethernet). When the download is finished, the TFTP screen should indicate that the file is transferred, and the Telnet screen should display the following message:

   ```
   download complete.
   ```

7. From the System Administration menu, select *[9] Switch to Standby Code* to run the new firmware. The Switch to Standby Code screen appears. This screen lists the current code release and the standby code release and displays the following prompt:

   ```
   This action will cause a SOFT RESET of the system.
   Do you want to switch to standby code (Y/N) [N]
   ```

8. Verify that the Standby Code is correct version, then enter **y** to switch to Standby Code. The PathBuilder S700 will reboot.

Downloading Firmware via the Serial Port

To download new firmware using the Xmodem protocol over a serial port, follow these steps:

You must use a terminal emulation program that supports Xmodem protocol.

1. Obtain the correct image file location and name from 3Com Customer Service.
2. Log into the PathBuilder S700 through a serial port.
3. From the System Administration menu, select *[8] Download Firmware*. The following prompt appears:

   ```
   This action will erase the standby code area.
   Do you want to download firmware (Y/N) [N]?
   ```

4. Enter **y** to download the new firmware.

   The firmware stored in the management terminal is downloaded to the PathBuilder S700 using the Xmodem protocol. The first step is to erase Standby

Bank and download new firmware into Standby Bank. Prompts advise you of the progress of the download.

The typical download time at 9600 baud is more than 30 minutes.

5 From the System Administration menu, select *[9] Switch to Standby Code* to run the new firmware. The Switch to Standby Code screen appears. This screen lists the current code release and the standby code release and displays the following prompt:

```
This action will cause a SOFT RESET of the system.
Do you want to switch to standby code (Y/N) [N]
```

6 Verify that the Standby Code is correct version, then enter **y** to switch to Standby Code. The PathBuilder S700 will reboot.

Downloading Firmware via FTP

To download new firmware using FTP, follow these steps:

1 Obtain the correct image file location and name from 3Com Customer Service.

2 Log in to the PathBuilder S700 unit.

3 From the System Administration menu, select *[8] Download Firmware*. The following prompt appears:

```
This action will erase the standby code area.
Do you want to download firmware (Y/N) [N]?
```

4 Enter **y** and wait for the `Ready to download...` message.

5 From a workstation or PC, invoke FTP, logging in with the PathBuilder S700 shelf name and password to get read-write access.

6 From FTP, enter the following command:

```
binary
put <filename> image
```

where <filename> is the filename of the image file to be downloaded.

When the download is finished, the FTP screen should indicate that the file is transferred

7 From the System Administration menu, select *[9] Switch to Standby Code* to run the new firmware. The Switch to Standby Code screen appears. This screen lists the current code release and the standby code release and displays the following prompt:

```
This action will cause a SOFT RESET of the system.
Do you want to switch to standby code (Y/N) [N]
```

8 Verify that the Standby Code is correct version, then enter **y** to switch to Standby Code. The PathBuilder S700 will reboot.

Updating the Flash File System

The flash file system contains system configuration information which is automatically saved in flash memory at a predetermined interval. To update the flash file system immediately, rather than at the next scheduled interval, follow these steps:

1 From the System Administration menu, select *[12] Update Flash File System*. The following prompt appears:

```
Do you want to update the flash file system (Y/N) [N]
```

2 Enter **y** to update the flash file system.

The user configuration data is automatically saved into flash memory every minute. I there is a system failure (a power failure, for example), any changes that you make during the auto-saving interval will be lost. Thus, we recommend that you use the [12] Update Flash File System *option, as described above, immediately after you make major configuration changes.*

Resetting the Interface Card

To reset any PathBuilder S700 module, follow these steps:

If you reset the interface card, you will terminate your Telnet session.

1 From the System Administration menu, select *[10] Reset Interface Card*. The following prompt appears:

```
Which slot to reset (1-18)?
```

2 Enter the number of the slot in which the card you want to reset is installed. The following prompt appears:

```
Are you sure you want to reset this card (Y/N) [N]?
```

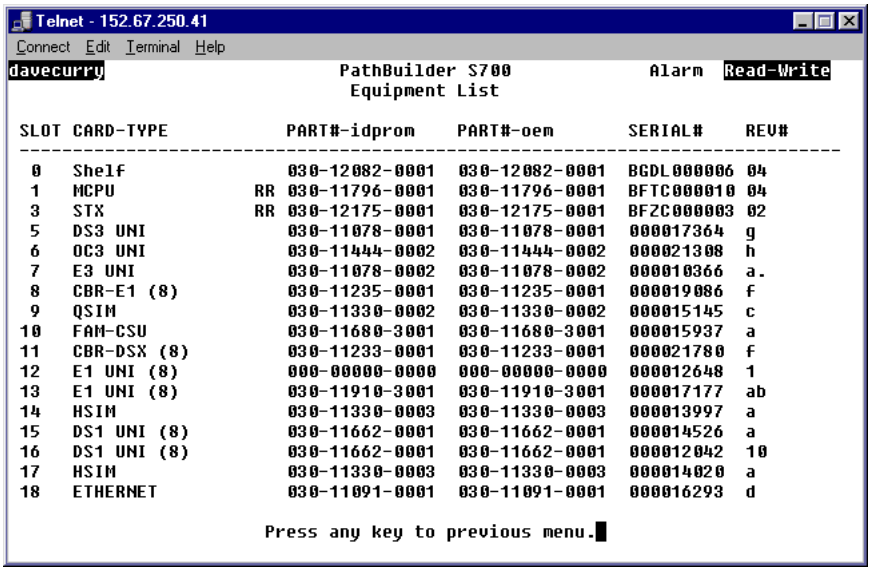
3 Enter **y** to reset the card.

Viewing an Equipment List

To view information about the modules currently installed on your PathBuilder S700:

From the System Administration menu, select *[11] Show Equipment List*. Figure 79 shows a sample Equipment List.

Figure 79 Equipment List



The Equipment List displays the following information for each installed module:

SLOT—A reference number for the ports on the motherboard. This number corresponds to the number on the List Card menu. (See Figure 78, later in this chapter.)

Slot numbers 2 and 4 are unused in this release. These slots are reserved for redundant MCPU and STX modules, which will be supported in subsequent releases.

CARD-TYPE—The card type: Shelf, MCPU, STX, DS1 UNI (4), E1 UNI (4), OC3 UNI, DS3 UNI, E3 UNI, QSIM, HSIM, FAM, Ethernet, E1 CBR, or DSX-1 CBR.

An RR *notation to the left of the* PART#-idprom *indicates a rear redundant module.*

PART#-idprom—The part number as programmed at the factory.

PART#-oem—The part number for OEM customers.

SERIAL#—The serial number for the card.

REV#—The revision number for the card.

Backing up and Restoring the Database and Code Image

The configuration database is stored in non-volatile flash memory in the PathBuilder S700. As further protection, 3Com recommends that you back up the database after any major configuration changes.

A power cycle of the shelf is necessary to synchronize the database on the MCPU if it is being restored. No additional action is necessary if you are just backing up the database.

Backing up the Database

To back up the database, follow these steps:

1. Select *[1] System Administration* to display the System Administration menu.
2. Select *[10] Reset Interface Card* to display the Reset Port Card screen.
3. Enter *[1]*, for the MCPU card.
4. Enter **`y`** at the confirmation prompt to reset the card.
5. Create a directory that will hold only the database files.
6. Move to the directory you created in step 5.
7. FTP to the node (**`FTP <node>`**).
   - FTP login will be the node name (upper left hand corner of user interface).
   - FTP password will be the node password (the password used to access user interface).
8. Switch to binary mode by entering:

   ```
   binary
   ```

9. Change directory to /fileDev/disk by entering:

   ```
   cd /fileDev/disk
   ```

10. Back up all files by entering:

    ```
    mget *
    ```

11. Exit FTP by entering:

    ```
    bye
    ```

Restoring the Database

To restore the database, follow these steps:

You must have read/write access on the node to perform the restore operation.

1. Move to the directory you created earlier, in step 5 under "Backing up the Database". This directory should contain only the database files.
2. FTP to the node (**`FTP <node>`**).
   - FTP login is the node name (upper left corner of user interface)
   - FTP password is the node password (password used to access the interface)
3. Switch to binary mode by entering:

   `binary`
4. Change directory to /fileDev/disk by entering:

   `cd /fileDev/disk`
5. Restore all files by entering:

   `mput*`
6. Exit FTP by entering:

   `bye`
7. Telnet to the node.
8. Select *[1] System Administration* to display the System Administration menu.
9. Select *[12] Update Flash File System.*
10. Enter **`y`** at the confirmation prompt to update the flash file system.

    Wait for the `Update Completed` message before continuing to Step 11.
11. Select *[10] Reset Interface Card* to display the Reset Port Card screen.
12. Enter **`1`**, for the MCPU card.
13. Enter **`y`** at the confirmation prompt to reset the card.
14. Repeat steps 11-13 for each card in the shelf.

Backing up the Code Image

To back up the code image, follow these steps:

1. FTP <node>.
   - FTP login will be the node name (upper left hand corner of user interface).
   - FTP password will be the node password (the password used to access user interface).
2. Switch to binary mode by entering:

   `binary`
3. Change directory to /fileDev/main by entering:

   `cd /fileDev/main`
4. Change directory to /flashDev/main (type "cd /flashDev/main").
5. Get file image by entering:

   `get image bootmgmt.abs`

It is not necessary to rename the file image to bootmgmt.abs*, but renaming the file image makes the restore seem the same as a code download.*

6 Exit FTP by entering:

```
bye
```

Restoring the Code Image

To restore the code image, follow these steps:

1 Move to directory that contains the bootmgmt.abs file.

2 FTP <node>.

- FTP login will be the node name (upper left hand corner of user interface).
- FTP password will be the node password (the password used to access user interface).

3 Switch to binary mode by entering:

```
binary
```

4 Verify that the current directory is /flashDev/standby.

5 Put file bootmgmt.abs by entering:

```
put bootmgmt.abs image
```

6 Exit FTP by entering:

```
bye
```

7 Telnet to the node.

8 Select *[1] System Administration* to display the System Administration menu.

9 Select *[9] Switch to Standby Code* to display the Switch to Standby Code screen.

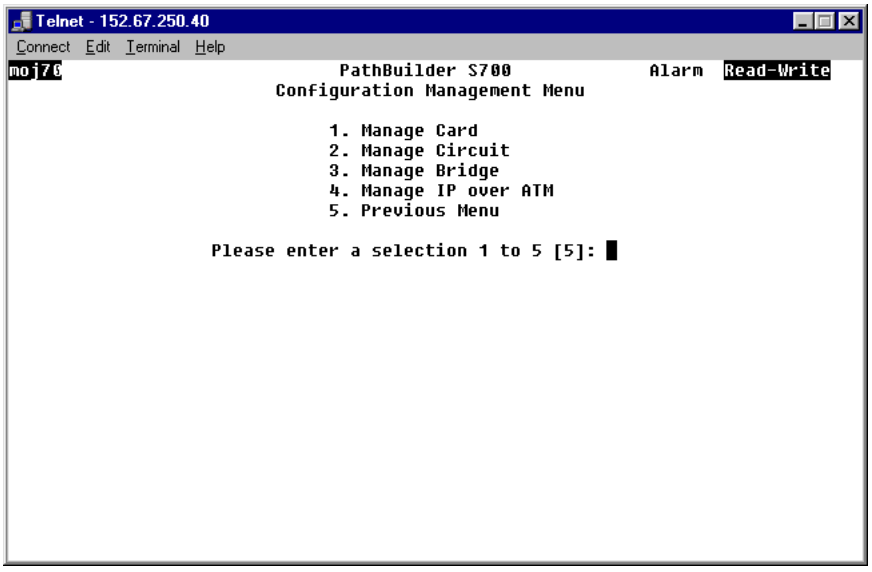
10 Enter **`y`** to switch to standby code.

PathBuilder S700 Configuration Overview

Select *[2] Configuration Management* from the Main menu to display the Configuration Management menu, shown in Figure 80. Use this menu to access submenus and screens that allow you to:

- **Manage cards**—View shelf configuration information and configure the PathBuilder S700 application modules.
- **Manage circuits**—List, add, modify, and delete virtual circuits.
- **Manage the bridge**—Set the bridge aging timer and configure the bridge.
- **Manage IP over ATM**—Configure and enable/disable IP over ATM for Ethernet ports.

Figure 80 Configuration Management Menu



The options on the Configuration Management menu correspond to the major steps involved in configuring the PathBuilder S700:

- Configuring application modules
- Setting up virtual circuits and assigning them to the appropriate card's ports
- Configuring application-specific options

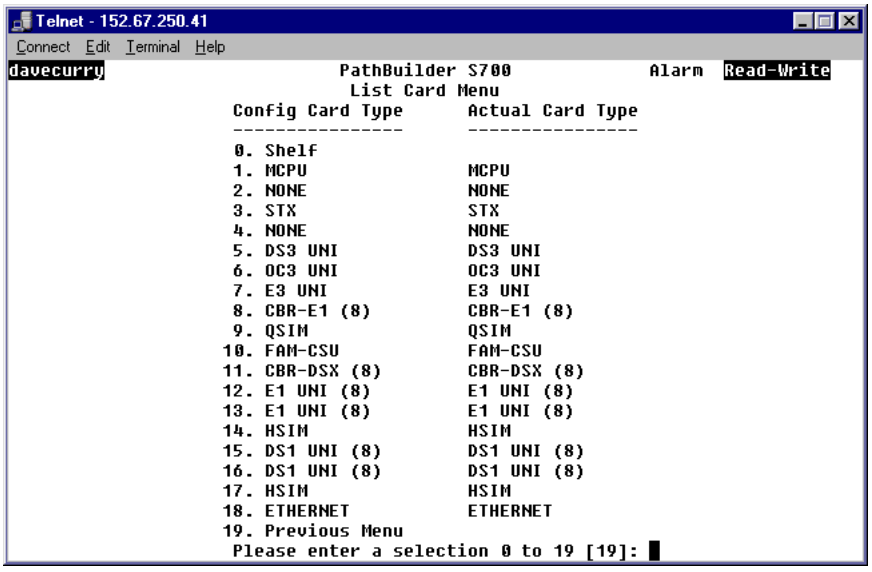
  You can apply specialized functions such as bridging of the LAN traffic and IP over ATM to virtual circuits as needed and/or supported.

Configuring the PathBuilder S700 Shelf and the Application Modules

The starting point for configuring the PathBuilder S700 shelf and the application modules is the List Card menu, shown in Figure 81. To display the List Card menu:

From the Configuration Management menu, select *[1] Manage Card.*

Figure 81 List Card Menu



The List Card menu lists the PathBuilder S700 shelf and all the modules installed in the shelf. The numbers correspond to the slot numbers. For each slot number, the List Card menu displays:

Config Card Type—The type of module configured for the slot.

Actual Card Type—The type of module actually installed in the slot.

Slots 2 and 4 are unused in this release. These slots are reserved for redundant MCPU and STX modules, which will be supported in subsequent releases.

To access the configuration menu(s) for a particular module, simply enter the corresponding slot number.

The configured card type must match the actual card type before you can access the configuration menus for that card. If there is a mismatch between the configured card type and the actual card type, an error message appears when you enter the slot number from the List Card menu.

You can reset the slot to match the actual card type by entering **y** at the following prompt:

```
Do you want to configure this slot to match the actual card type (Y/N)?
Press 'Y' to match card type or 'N' to return to previous menu.
```

CAUTION: *Changing the card type in a slot will reset all existing configuration data for that slot.*

Setting Application Module Status

The application modules each have an administrative and an operational status (*In Service* or *Out of Service*). You set the administrative status on the appropriate module configuration menu. The system displays the operational status, also on the module configuration menu.

When the administrative status is set to Out of Service*, the card's configuration menu lists the operational status as* Out of Service *whether or not the card is actually operational. Once you set the administrative status to* In Service*, the operational status listed will indicate the true card status (*Out of Service *if there is a card failure or* In Service *if the card is operational).*

To set up a virtual circuit, you must set the administrative status of the card and port which will carry the circuit to *In Service*. For details about setting up virtual circuits, see "Configuring Virtual Circuits" later in this chapter.

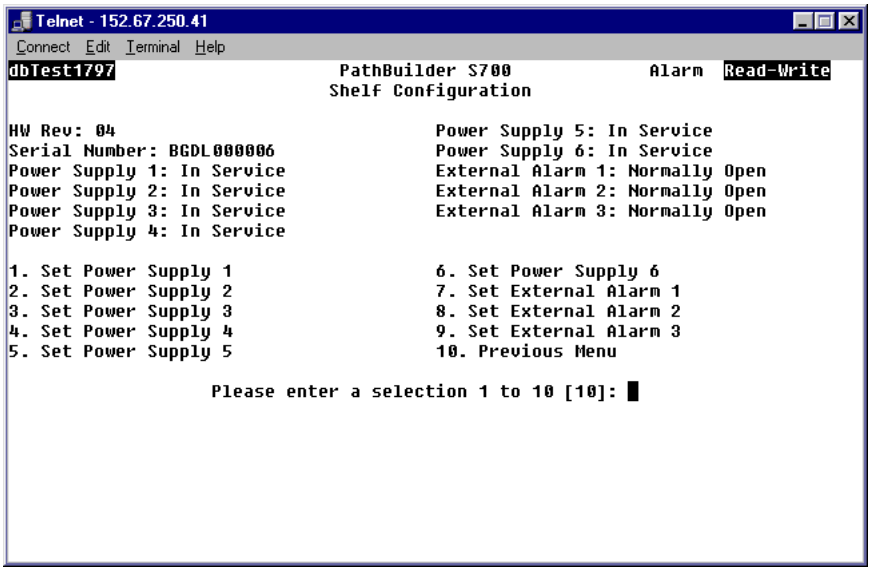
The following sections tell you how to configure specific PathBuilder S700 modules.

Configuring the Shelf

From the Shelf Configuration menu, shown in Figure 82, you can get information about the shelf and configure it by setting and unsetting the power supplies and setting external alarms.

To display the Shelf Configuration menu, select *[0] Shelf* from the List Card menu.

Figure 82 Shelf Configuration Menu



The Shelf Configuration menu displays the following information about the shelf:

- Hardware revision
- Serial number
- Power supply status (in service or out of service) for power supplies 1-6
- External alarm status (normally open or normally closed) for external alarms 1-3

Setting Power Supply Status

To set the status of a power supply, follow these steps:

1. From the List Card menu, shown earlier in Figure 81, select *[0] Shelf* to open the Shelf Configuration menu, shown earlier in Figure 82.
2. Enter the number corresponding to the power supply that you want to set. The following prompt appears:

   ```
   Enter Power Supply (1= Out of Service, 2= In Service):
   ```

3. Enter **1** to take the power supply out of service or **2** to put the power supply into service.

Setting External Alarm Status

The PathBuilder S700 supports up to three alarms from outside equipment. To set the external alarms, follow these steps:

1. From the List Card menu, shown earlier in Figure 81, select *[0] Shelf* to open the Shelf Configuration menu, shown earlier in Figure 82.
2. Enter the number corresponding to the external alarm that you want to set (**7** for alarm #1, **8** for alarm #2, or **9** for alarm #3).

   The following prompt appears:

   ```
   Enter External Alarm 1 (1= Normally Open, 2= Normally Closed)
   ```

3. Enter **1** to set the alarm to normally open or **2** to set the alarm to normally closed.

   For details about how to connect the external alarms, see "Connecting the Office Alarms" in Chapter 2.

Configuring the Management CPU

Configuring the management CPU involves the following tasks:

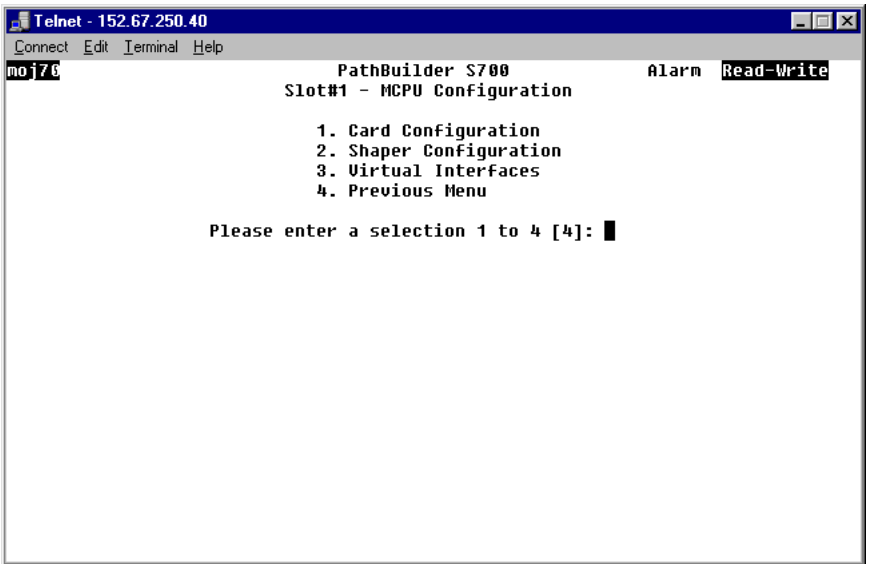
- Viewing the current configuration for the CPU module
- Configuring virtual interfaces
- Configuring shapers

The MCPU Configuration menu, shown in Figure 83, provides access to the submenus and screens from which you perform these tasks.

To display the MCPU Configuration menu:

From the List Card menu, select *[1] MCPU*.

Figure 83 MCPU Configuration Menu



Viewing MCPU Configuration Information

To view MCPU configuration information, follow these steps:

1. From the MCPU Configuration menu, select *[1] Card Information* to display the following information:
   - Hardware revision
   - Serial number
   - Status (*In Service* or *Out of Service*)
2. Press any key to return to the MCPU Configuration menu.

Configuring Virtual Interfaces

From the MCPU Configuration menu, as well as from other card menus, you can create and configure virtual interfaces.

A Virtual Interface (VI) represents a group of 4 ATM queues and a bulk shaper value. When you build a VC (virtual channel) or VP (virtual path), you specify, for each side, the VI at which the transmit cells are queued and shaped.

- For the MCPU module (slot 1), you can configure one VI.
- For modules installed in slots 5 and 6, you can configure up to 15 VIs per module.
- For modules installed in slots 7-18, you can configure up to 24 VIs per bus. Each bus supports three slots (7-9, 10-12, 13-15, and 16-18). You can allocate all 24 VIs on a particular bus to a single slot, or you can divide them among the 3 slots supported by the bus.

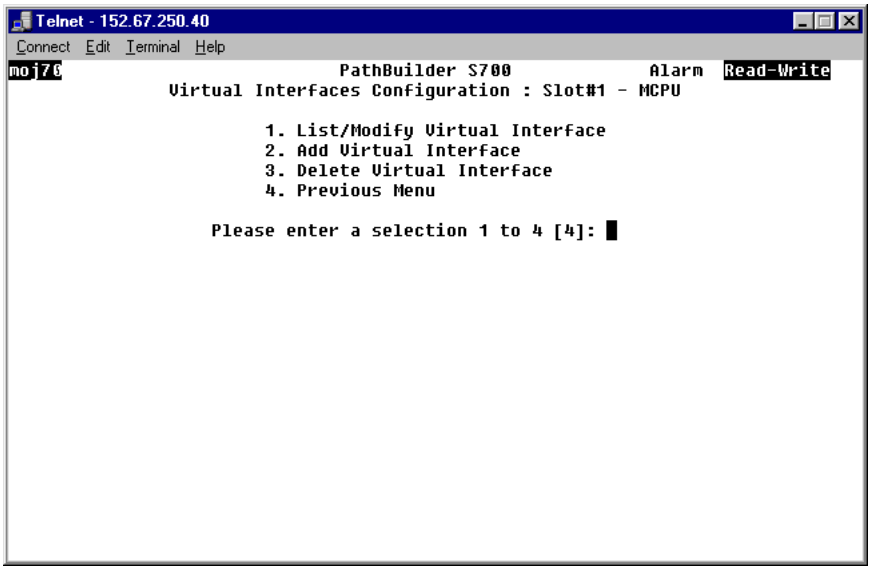
Adding Virtual Interfaces

To create a virtual interface, follow these steps:

1. From the List Card menu, enter the slot number corresponding to the card for which you want to add a virtual interface. The configuration menu for that card appears.
2. Select the *Virtual Interfaces* option to display the Virtual Interfaces Configuration menu. The option number you select varies depending on the card type. From the MCPU menu shown earlier in Figure 83, for example, you select *[3] Virtual Interfaces*.

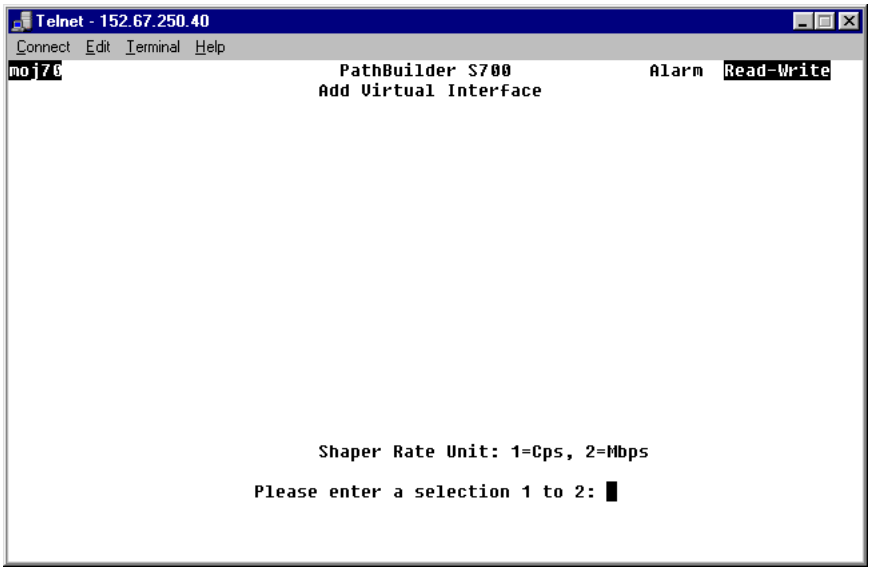
   Figure 84 shows the MCPU Virtual Interfaces Configuration menu. The menus for the other cards are the same.

   Figure 84 Virtual Interfaces Configuration Menu



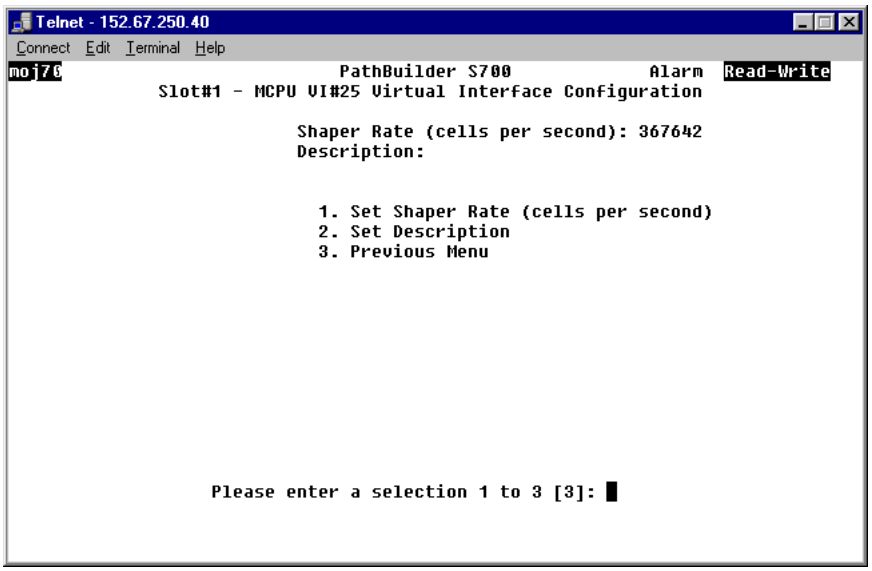
3. Select *[2] Add Virtual Interface*. The Add Virtual Interface menu appears, as shown in Figure 85.

Figure 85 Add Virtual Interface Menu—Selecting the Shaper Rate Unit



4 Enter **1** to configure the shapers in Cps or **2** to configure the shapers in Mbps. Then press Enter to open the Add Virtual Interface Configuration menu. Figure 86 shows the MCPU Add Virtual Interface Configuration menu. The Add Virtual Interface Configuration menus for the other cards are the same.

Figure 86 Add Virtual Interface Configuration Menu



5 Select *[2] Set Description* and enter a description for the virtual interface.

6 Select *[1] Set Shaper Rate* and select a shaper rate. The range of acceptable shaper rates is 151 to 367642 cells per second or 64Kbps to 155.88Mbps.

When the shaper rate is set, a prompt similar to the following appears:

```
VI 1 is updated.
```

7 Select *[3] Previous Menu* to return to the Add Virtual Interface Configuration menu.

8 Repeat steps 3-6 to add additional virtual interfaces as desired.

Viewing and/or Modifying Existing Virtual Interfaces

Once a Virtual Interface has been established, you can modify the values for *Shaper Rate* or *Description*.

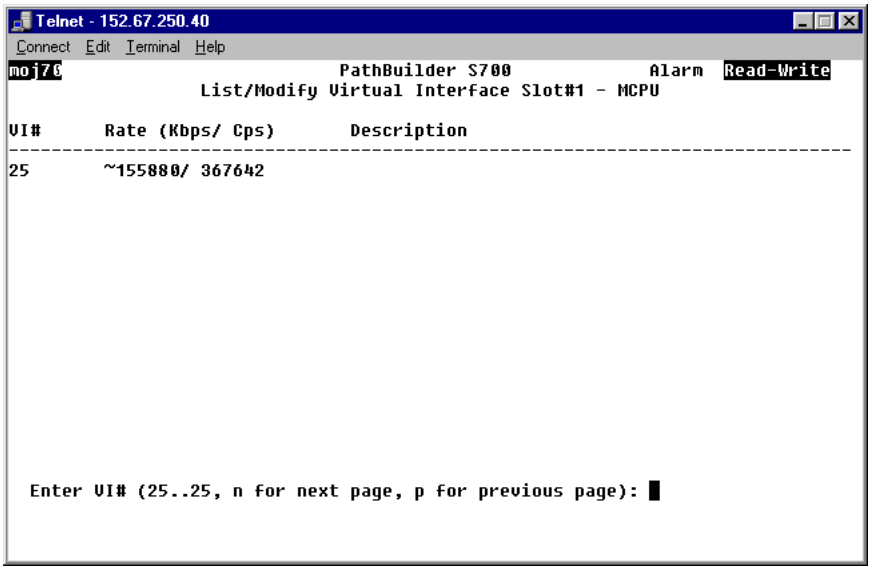
To view and/or modify an existing virtual interface, follow these steps:

1. From the List Card menu, enter the slot number corresponding to the card for which you want to view and/or modify a virtual interface. The configuration menu for that card appears.
2. Select the *Virtual Interfaces* option to display the Virtual Interfaces Configuration menu. Figure 84, above, shows the MCPU Virtual Interfaces Configuration menu. The menus for the other cards are the same.
3. Select *[1] List/Modify Virtual Interface* to open the List/Modify Virtual Interface menu. Figure 87 shows the MCPU List/Modify Virtual Interface menu. The menus for the other cards are the same.

   The List/Modify Virtual Interface menu shows a summary of existing virtual interfaces, with a virtual interface number (VI#) assigned to each. The menu also displays the following information for each virtual interface:

   - Rate, in cells per second
   - User-entered description

Figure 87 List/Modify Virtual Interface Menu



4. If you want to modify a virtual interface, enter the number corresponding to the virtual interface which you want to modify to display the Modify Virtual Interface menu for the selected virtual interface. This menu is the same as the Add Virtual Interface menu shown earlier in Figure 86.
5. Change the *Shaper Rate* and/or *Description* for the virtual interface as desired.

Deleting Virtual Interfaces

To delete a virtual interface, follow these steps:

1. From the List Card menu, enter the slot number corresponding to the card for which you want to delete a virtual interface. The configuration menu for that card appears.
2. Select the *Virtual Interfaces* option to display the Virtual Interface Configuration menu. The option number may vary, depending on the card type.
3. From the Virtual Interface Configuration menu, select *[3] Delete Virtual Interface*. The Delete Virtual Interface menu appears. This menu is the same as the List/Modify Virtual Interfaces menu, shown earlier in Figure 87. It lists the existing virtual interfaces, with a virtual interface number (VI#) assigned to each.
4. Enter the number corresponding to the virtual interface you want to delete.
5. Enter `y` in response to the confirmation prompt to delete the virtual interface.

Configuring Input Shapers

The MCPU, Ethernet, QSIM, HSIM, and FAM modules allow you to configure shapers based on the Dual Leaky Bucket algorithm. Unlike the virtual interface shapers described under "Configuring Virtual Interfaces" above, these shapers are not bulk shapers; rather, they are input shapers that shape the traffic toward the cell bus per virtual circuit,

The PathBuilder S700 supports three input shaper parameters:

Peak Cell Rate (PCR)—The maximum rate that can be passed.

Sustained Cell Rate (SCR)—The maximum average rate that a bursty, on-off traffic source can send; used in conjunction with maximum burst size.

Maximum Burst Size (MBS)—The maximum number of cells that can be sent at the peak rate; used in conjunction with sustained cell rate.

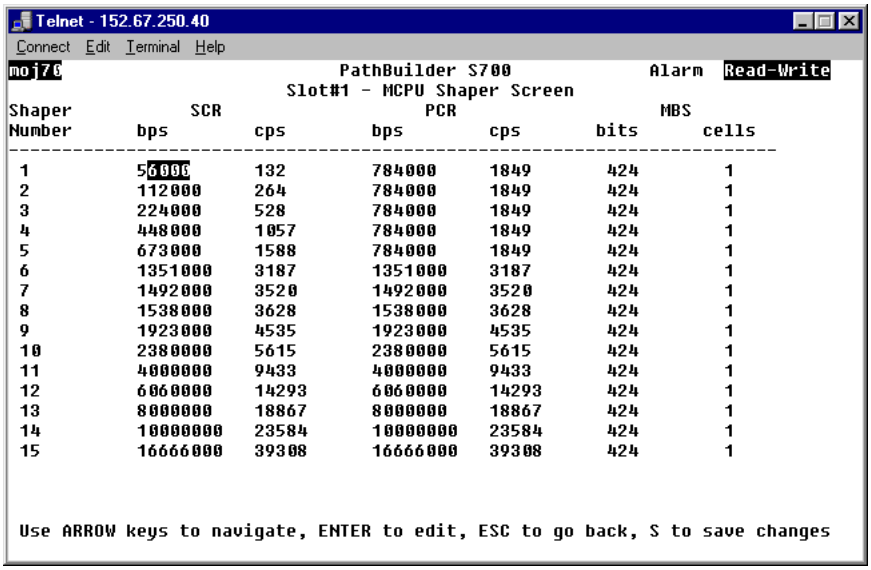
You can configure up to 15 shapers for each supported card. The values that you set for the shapers are the values that are then available for the *Shaper Number* parameter that you set when you configure certain types of virtual circuits. See "Configuring Virtual Circuits" later in this chapter, for details.

To configure input shapers, follow these steps:

1. From the List Card menu, enter the slot number corresponding to the card for which you want to configure shapers. The configuration menu for that card appears.
2. Select the *Shaper Configuration* option to display the Shaper screen. The option number you select varies, depending on the card type.

   Figure 88 shows the MCPU Shaper screen. The screens for the other cards are the same. The Shaper screen consists of a table listing the current shaper values in bits/second (bits for the maximum burst size shaper) and cells/second (cells for the maximum burst size shaper). Initially, the shapers are set to default values.

Figure 88 Input Shaper Screen



3 To enter a new shaper value, use the arrow keys on your keyboard to move to the cell in the shaper table that you want to change.

- To set a new *Sustainable Cell Rate* or *Peak Cell Rate* shaper, enter the new value in the bits/second (bps) column. The system automatically calculates the cells/second (cps) based on the value you enter.
- To set a new *Maximum Burst Size* shaper, enter the new value in the cells column. The system automatically calculates the bits based on the value you enter.

How you configure the input shapers depends on the type of service you have.

- If you have a peak rate service:
  - Set the peak rate at the maximum allowable value.
  - Set the sustained cell rate at the same rate as the peak rate.
- If you have a sustained rate service:
  - Set the peak rate at the line rate (for example 45Mbps for a DS3 line).
  - Set the sustained cell rate and maximum burst rate at the values given to you by your service provider.

4 When you are finished, press [ESC] to return to the MCPU Card Configuration menu.

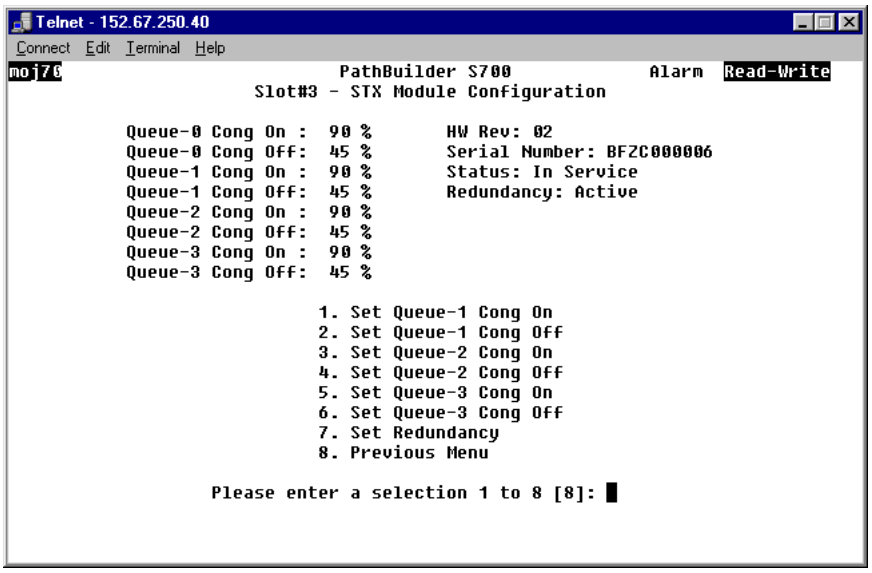
Configuring the STX Module

To configure the STX module, follow these steps:

1 From the List Card menu, enter *[3] STX* to display the STX Module Configuration menu, shown in Figure 89. This menu displays the current information for the STX card and allows you to configure the congestion settings for up to three traffic priority queues.

Option [7] Set Redundancy *is disabled in Release 2.03 but will be enabled in future releases when the PathBuilder S700 supports redundant MCPU, STX, and application modules.*

Figure 89 STX Module Configuration Menu



2 Select the appropriate numbers and enter the desired *Congestion On* and *Congestion Off* thresholds for the priority queues you want to configure. The ranges are *51%-100%* for *Congestion On* and *0% to 50%* for *Congestion Off*.

You cannot set congestion thresholds for Queue 0, which is the highest priority queue. This ensures that the traffic passing through Queue 0 is preserved and treated with highest priority.

The congestion settings indicate the threshold level of cell buffers.

- When the congestion level of the cell buffer for a particular queue reaches the *Congestion On* threshold, a congestion state is declared.
- When the congestion level falls back to the *Congestion Off* threshold, the congestion state is cleared.
- When the congestion state is set to *on*, Early Packet Discard (EPD) is initiated until Congestion State is set to *Off*.

For example, if you set the *Congestion On* and *Congestion Off* thresholds for a queue to 90 and 45 respectively, a congestion state would be declared when the cell buffer is 90% full and cleared when the cell buffer is 45% full.

The Congestion On *and* Congestion Off *settings are on a per queue basis, but once you set the congestion thresholds for a particular queue, those settings are used for that queue for all cards.*

Configuring OC3/STM-1 UNI Modules

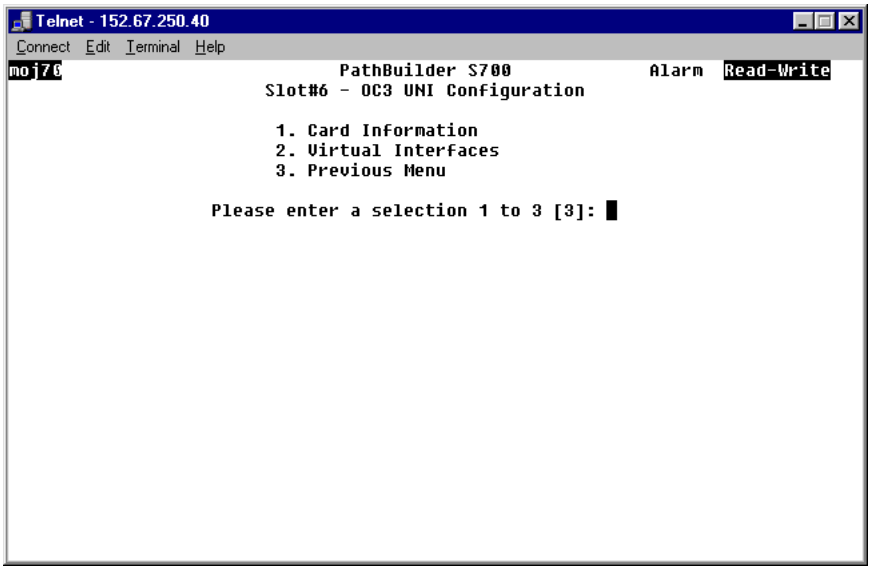
Configuring an OC3/STM-1 UNI module involves the following tasks:

- Configuring the card
- Configuring the virtual interfaces

To configure an OC3/STM-1 UNI module, follow these steps:

1 From the List Card menu, select the slot number corresponding to the OC3/STM-1 UNI module to display the OC3/STM-1 Configuration menu, shown in Figure 90.

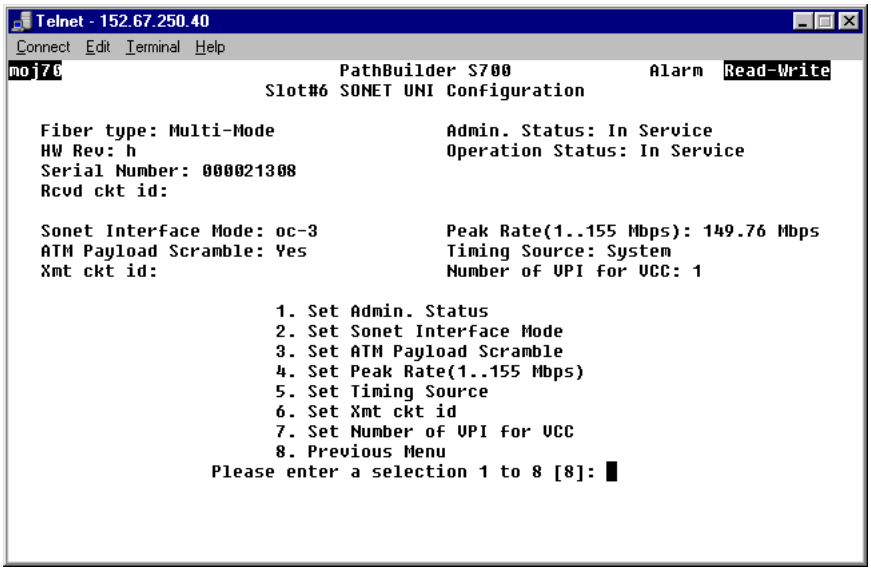
Figure 90 OC3/STM-1 UNI Configuration Menu



2 Configure the OC3/STM-1 card.

a Select *[1] Card Information* to display the OC3/STM-1 UNI Card Configuration menu, shown in Figure 91. This menu displays the current configuration for the OC3/STM-1 UNI module and provides options for changing certain parameters.

Figure 91 OC3/STM-1 UNI Card Configuration Menu



b Set the following parameters as desired:

Admin Status—Administrative Status: *In Service* or *Out of Service*.

Sonet Interface Mode—Synchronous Optical Network mode: *OC3* or *STM-1*. *OC3* (SONET) is a high-speed synchronous system technology used on fiber-optic cable networks. *STM-1* (SDH or Synchronous Digital Hierarchy) is the European equivalent of SONET.

ATM Payload Scramble—Enables (*Yes*) or disables (*No*) payload scrambling for the OC3/STM-1 port. Payload scrambling scrambles the 48-byte payload in outgoing cells in a defined manner and unscrambles the payload in incoming

cells. It is a technique used to avoid certain transmission equipment behaviors (for example, erroneous alarm conditions) that are caused by sensitivity to certain bit patterns in the ATM payload. You must match this setting at the two ends of the OC3/STM-1 trunk.

Peak Rate—The peak ATM payload, in Mbps: *1* to *155*. This parameter is a feature specifically designed for the PathBuilder S700. It allows you and your service provider to traffic shape all connections to an optimum rate, assigned as part of the ATM service contract.

Timing Source—The timing source for the OC3/STM-1 transmit clock: *System* or *Loop*. If you set the *OC3/STM-1 Timing Source* to *System* at one end of the OC3/STM-1 trunk, you must set it to *Loop* at the other end.

System—Configures the port interface to use the system reference clock within the shelf as a reference for transmitting.

Loop—Configures the port interface to use the input port Rx clock as the timing source; timing is received from the service "loop." Select this option if the OC3/STM-1 UNI module is used for the network/carrier service termination, in which case the carrier (the service "loop") typically provides the timing source.

Xmt Ckt ID—The transmit path trace identifier. This is a user-entered identifier for the transmit circuit of up to either 16 characters (if *Sonet Interface Mode* is set to *STM-1*) or 64 characters (if *Sonet Interface Mode* is set to *OC3*). The path trace is a byte used to repetitively transmit a 64-byte fixed length string so that a receiving terminal in a path can verify its continued connection to the intended transmitter.

Number of VPI for VCC—The number of distinct VPIs that can be used for VCCs on this card: *1..256*. Any VPIs not currently in use by VCCs are available for VPCs.

c Select *[8] Previous Menu* to return to the OC3/STM-1 Configuration menu.

3 Configure virtual interfaces for the OC3/STM-1 UNI card.

a Select *[2] Virtual Interfaces* to open the OC3/STM-1 Virtual Interfaces Configuration menu. This menu is the same as the MCPU Virtual Interfaces menu, shown earlier in Figure 84.

b Configure virtual interfaces as described under "Configuring Virtual Interfaces" earlier in this chapter. You configure virtual interfaces for the OC3/STM-1 UNI card in the same way that you configure virtual interfaces for the MCPU card.

Configuring DS3 UNI Modules

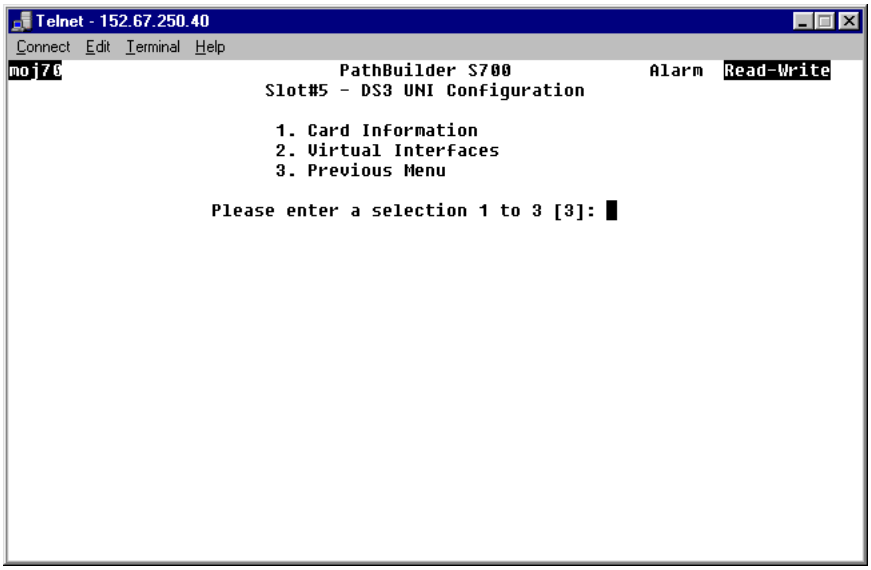
Configuring a DS3 UNI module involves the following tasks:

- Configuring the card
- Configuring the virtual interfaces

To configure a DS3 UNI module, follow these steps:

1 From the List Card menu, select the slot number corresponding to the DS3 UNI module to display the DS3 UNI Configuration menu, shown in Figure 92. The options on this menu allow you to access other menus from which you can configure either card configuration information or virtual interfaces.

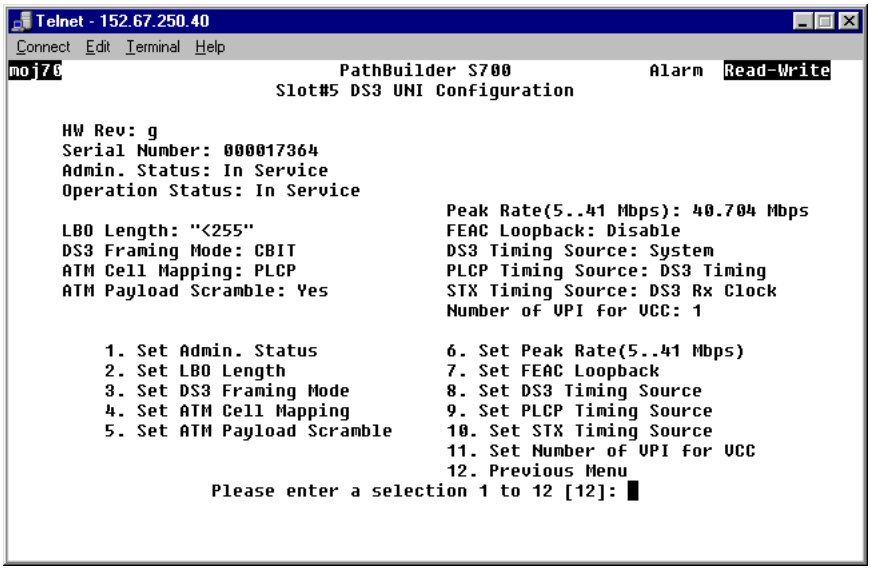
Figure 92 DS3 UNI Configuration Menu



2 Configure the DS3 card.

a Select *[1] Card Information* to display the DS3 UNI Card Configuration menu, shown in Figure 93. The DS3 Card Configuration menu displays the current configuration for the DS3 module and provides options for changing certain parameters.

Figure 93 DS3 UNI Card Configuration Menu



b Set the following parameters as desired:

Admin Status—Administrative Status: *In Service* or *Out of Service*.

LBO Length—Line Build Out length. The signal generation/regeneration of the distance between the PathBuilder S700 and the next crossconnect or FOTs (Fiber Optic Terminal system), in feet: *0-225* or *225-450*.

DS3 Framing Mode—The type of frame organization configured for the specified port interface: *Cbit* or *M23*. Set this parameter to match the framing type offered by your service provider. Cbit is the most common setting, as its

use of overhead bits for administration and maintenance allows the service provider more visibility in isolating any issues with the physical line connections through the WAN. You must match this setting at the two ends of the DS3 trunk.

ATM Cell Mapping—How the carrier will provision the DS3 UNI service from the carrier ATM switch: *Clear* (HEC) or *PLCP* (Physical Layer Convergence Protocol). *Clear* is the option preferred by both domestic and international service providers and within private ATM networks, as it gives more payload bandwidth than *PLCP*. You must match this setting at the two ends of the DS3 trunk.

ATM Payload Scramble—Enables (*Yes*) or disables (*No*) payload scrambling for the DS3 port. Payload scrambling scrambles the 48-byte payload in outgoing cells in a defined manner and unscrambles the payload in incoming cells. It is a technique used to avoid certain transmission equipment behaviors (for example, erroneous alarm conditions) that are caused by sensitivity to certain bit patterns in the ATM payload. You must match this setting at the two ends of the DS3 trunk.

Peak Rate—The peak DS3 payload, in Mbps: 5.1 to 40.7 if *Cell Mapping* is set to *Clear*; 5 to 40 if *Cell Mapping* is set to *PLCP*. This parameter is a feature specifically designed for the PathBuilder S700. It allows you and your service provider to traffic shape all connections to an optimum rate, assigned as part of the ATM service contract.

FEAC Loopback—Enables or disables the system from responding to FEAC (Far-End Alarm Condition) loopback commands (loopback activate and deactivate FEAC codes) from the central office. FEAC is a DS3 overhead function that the service provider may use for establishing loopback for problem resolution of the network. The service provider uses FEAC codes to obtain downstream or upstream conditions of a DS3 network. When the FEAC Loopback option is enabled, the system responds to a loopback activate command by enabling the DS3 line loopback. The system removes the loopback automatically after 15 minutes or when it receives the deactivate command.

DS3 Timing Source—The timing source for the DS3 transmit clock: *system* or *loop*. If you set the *DS3 Timing Source* to *system* at one end of the DS3 trunk, you must set it to *loop* at the other end.

System—Configures the port interface to use the system reference clock within the shelf as a reference for transmitting.

Loop—Configures the port interface to use the input port Rx clock as the timing source; timing is received from the service "loop." Select this option if the DS3 UNI module is used for the network/carrier service termination, in which case the carrier (the service "loop") typically provides the timing source.

PLCP Timing Source—The PLCP timing source for the DS3 port:

System Clock—PLCP is timed from the internal 8kHz backplane clock.

DS3 Timing—PLCP is timed from the 8kHz reference clock derived from the received PLCP.

STX Timing Source—The timing sent to the STX card: *PLCP Clock* or *DS3 Rx Clock*. This is the clock the system will use if you select the DS3 card as the timing source from the Priority Clock Configuration menu, shown earlier in Figure 75,

Number of VPI for VCC—The number of distinct VPIs that can be used for VCCs on this card: *1..256*. Any VPIs not currently in use by VCCs are available for VPCs.

c Select *[12] Previous Menu* to return to the DS3 Configuration menu.

3 Configure virtual interfaces for the DS3 UNI card.

a Select *[2] Virtual Interfaces* to open the DS3 UNI Virtual Interfaces Configuration menu. This menu is the same as the MCPU Virtual Interfaces menu, shown earlier in Figure 84.

b Configure virtual interfaces as described under "Configuring Virtual Interfaces" earlier in this chapter. You configure virtual interfaces for the DS3 UNI card in the same way that you configure virtual interfaces for the MCPU card.

Configuring E3 UNI Modules

Configuring an E3 UNI module involves the following tasks:

- Configuring the card
- Configuring the virtual interfaces

To configure an E3 UNI module, follow these steps:

1 From the List Card menu, select the slot number corresponding to the E3 UNI module to display the E3 UNI Configuration menu.

The E3 UNI Configuration menu is the same as the DS3 UNI Configuration menu shown earlier in Figure 92. The options on this menu allow you to access other menus from which you can configure either card configuration information or virtual interfaces.

2 Configure the E3 UNI card.

a Select *[1] Card Information* to display the E3 UNI Card Configuration menu, shown in Figure 94. The E3 UNI Card Configuration menu displays the current configuration for the E3 UNI module and provides options for changing certain parameters.

b Set the following parameters as desired:

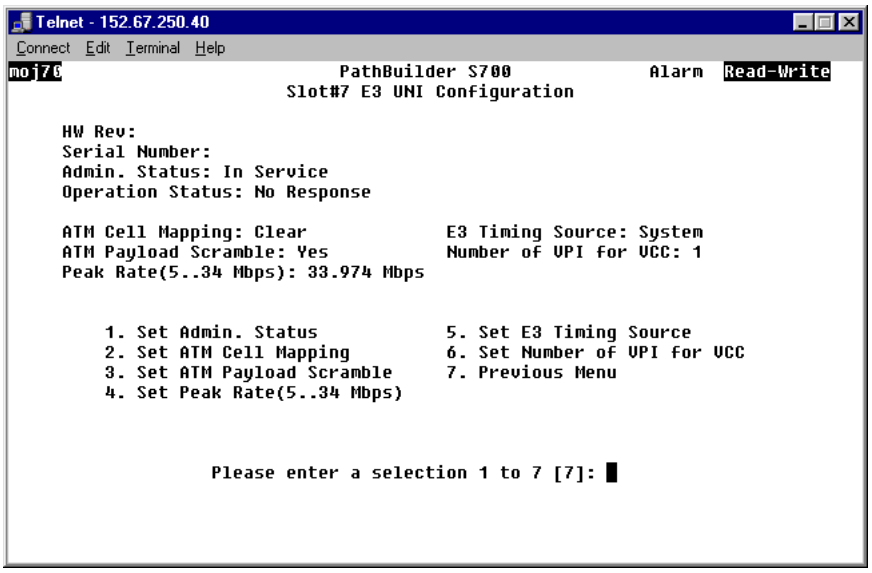
Admin Status—Administrative Status: *In Service* or *Out of Service*.

ATM Cell Mapping—How the carrier will provision the E3 UNI service from the carrier ATM switch: *Clear* (HEC).

ATM Payload Scramble—Enables (*Yes*) or disables (*No*) payload scrambling for the E3 port. Payload scrambling scrambles the 48-byte payload in outgoing cells in a defined manner and unscrambles the payload in incoming cells. It is a technique used to avoid certain transmission equipment behaviors (for example, erroneous alarm conditions) that are caused by sensitivity to certain bit patterns in the ATM payload.

Peak Rate—The peak E3 payload Mbps: *5* to *34.* This parameter is a feature specifically designed for the PathBuilder S700. It allows you and your service provider to traffic shape all connections to an optimum rate, assigned as part of the ATM service contract.

Figure 94 E3 UNI Card Configuration Menu



E3 Timing Source—The timing source for the E3 transmit clock: *system* or *loop*. If you set the *E3 Timing Source* to *system* at one end of the E3 trunk, you must set it to *loop* at the other end.

System—Configures the port interface to use the system reference clock within the shelf as a reference for transmitting.

Loop—Configures the port interface to use the input port Rx clock as the timing source; timing is received from the service "loop." Select this option if the E3 UNI module is used for the network/carrier service termination, in which case the carrier (the service "loop") typically provides the timing.

Number of VPI for VCC—The number of distinct VPIs that can be used for VCCs: *1..256*. Any VPIs not currently in use by VCCs are available for VPCs.

c Select *[7] Previous Menu* to return to the E3 Configuration menu.

3 Configure virtual interfaces for the E3 UNI card.

a Select *[2] Virtual Interfaces* to open the E3 UNI Virtual Interfaces Configuration menu. This menu is the same as the MCPU Virtual Interfaces menu, shown earlier in Figure 84.

b Configure virtual interfaces as described under "Configuring Virtual Interfaces" earlier in this chapter. You configure virtual interfaces for the E3 UNI card in the same way that you configure virtual interfaces for the MCPU card.

Configuring DS1 UNI or E1 UNI with IMA Modules

The PathBuilder S700 supports both a DS1 UNI and an E1 UNI module with IMA (Inverse Multiplexing for ATM). The configuration procedure is the same for both modules, but different parameters are available on the port configuration menu, as described under "Configuring DS1/E1 UNI Ports" below.

Configuring a DS1/E1 UNI module involves the following tasks:

- Configuring the individual DS1/E1 ports
- Setting up and configuring IMA and/or UNI groups (if desired)
- Viewing IMA link and group status
- Configuring the DS1/E1 card

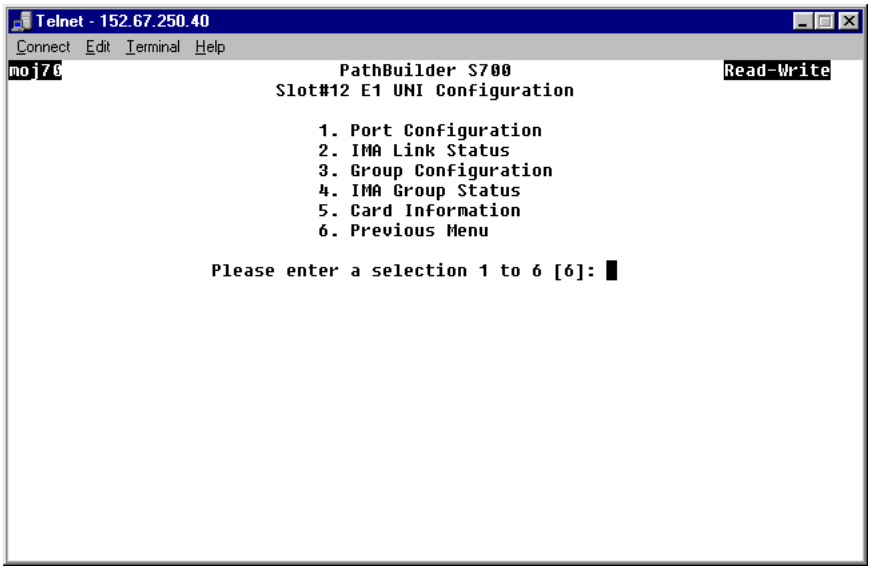
Configuring DS1/E1 UNI Ports

To configure individual DS1/E1 UNI ports, follow these steps:

1. From the List Card menu, shown earlier in Figure 81, select the number corresponding to the slot in which the DS1 UNI or E1 UNI card is installed to open the DS1 or E1 UNI Configuration menu.

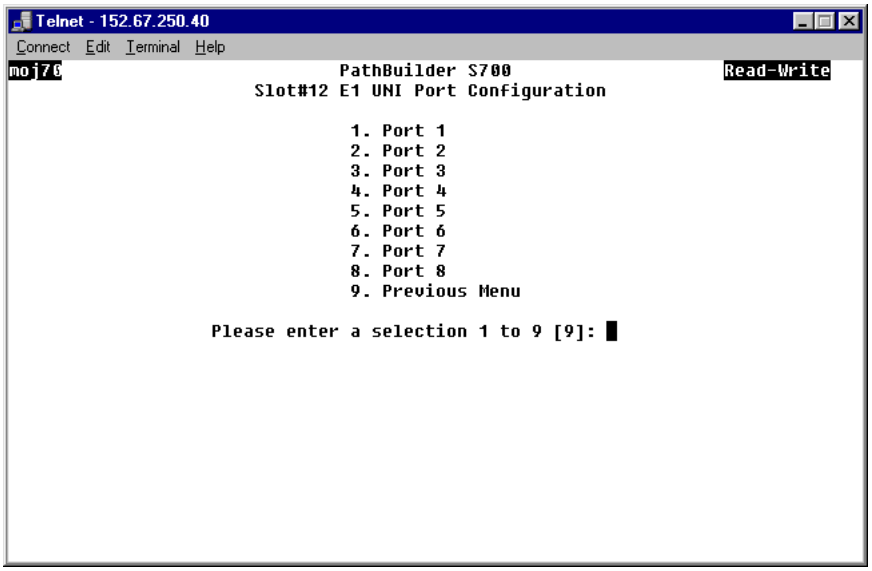
   Figure 95 shows the E1 UNI Configuration menu. The DS1 UNI Configuration menu is the same.

   Figure 95 E1 UNI Configuration Menu



2. Select *[1] Port Configuration* open the DS1 UNI or E1 UNI Port Configuration selection menu. Figure 96 shows a E1 UNI Port Configuration selection menu. The DS1 UNI menu is the same.

   Figure 96 E1 UNI Port Configuration Selection Menu



3. Select the number corresponding to the DS1 or E1 port you want to configure to open the DS1 UNI or E1 UNI Port Configuration menu.

Figure 97 shows the E1 UNI Port Configuration menu. The DS1 UNI Configuration menu is similar. These menus display the current configuration for the selected DS1 UNI or E1 UNI port and provide options for changing certain parameters.

Figure 97 E1 UNI Port Configuration Menu

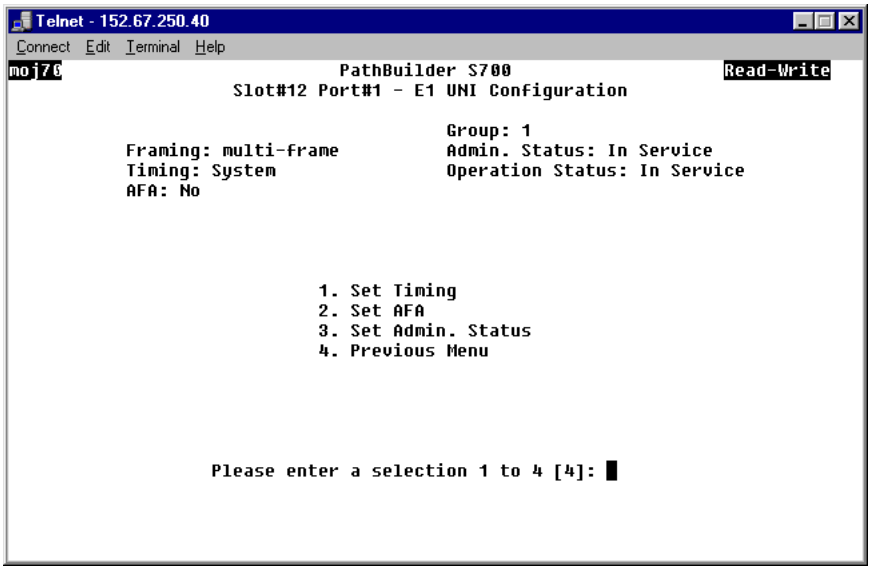
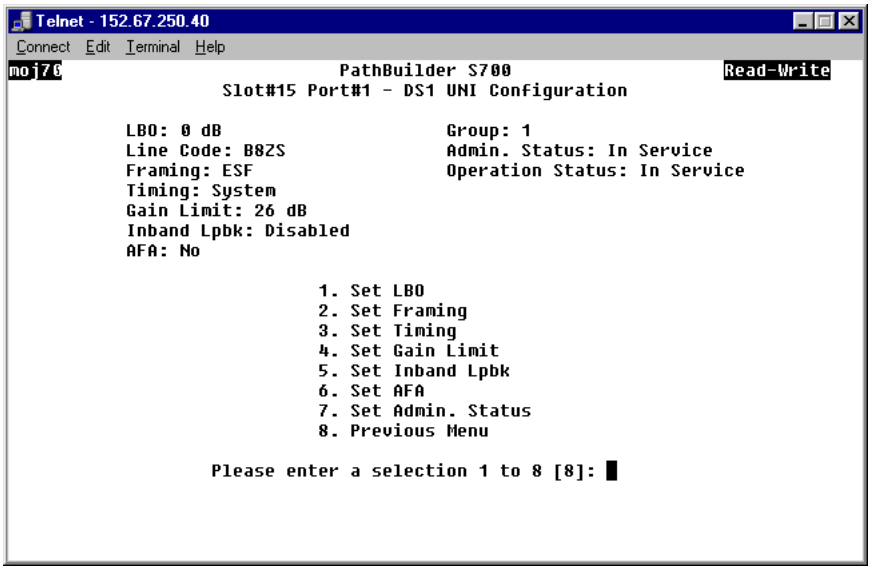


Figure 98 DS1 UNI Port Configuration Menu



4 Set the following parameters as desired:

LBO (DS1 only)—Line Build Out. The setting for the transmit signal level: *0, 7.5, 15,* or *22.5 db*. The LBO compensates for the distance between the card and the CSU/repeater. It is a setting for the transmit signal level.

Line Code (DS1 only)—The zero code suppression technique configured to the DS1 port interface: *B8ZS* for DS1; *HDB3* for E1. This is a read-only parameter.

B8ZS—Binary 8 Zero Substitution; a T1 (1.544Mbps) carrier line coding format used to accommodate "ones density" for clear channel transmission.

HDB3—High Density Binary 3 zero Substitution; an E1 carrier line coding format

Framing—The type of frame organization configured for the T1 port interface: *D4* or *ESF* for DS1. Set this parameter to match the service provider or device connection framing. For E1, *Framing* is a read-only parameter and is always set to *multi-frame*.

CAUTION: *A framing mismatch can cause LOF, OOF alarm conditions and result in traffic loss.*

Timing—The type of input clock service configured for the DS1 module. Set the timing source to *system* if you are using the DS1 module to connect to the network.

System—Configures the DS1 module to use the internal clock as the timing source.

Loop—Configures the DS1 module to use the input port Rx clock as the timing source; timing is received from the service "loop." Select Loop if the DS1 UNI module is used for the network/carrier service termination, in which case the carrier (the service "loop") typically provides the timing source.

Gain Limit (DS1 only)**—**Setting for the receive signal level: *26* or *36 dB*.

Inband Lpbk (DS1 only)—Inband loopback. Enables the inband loop-up or loop-down code: loop-up (*enabled*) or loop-down (*disabled*).

AFA—Enables (*yes*) or disables (*no*) Automatic Frequency Adjustment. AFA monitors the error rate detected by the CRC (cyclic redundancy check) error-checking scheme of each of the DS1/E1 links (ports). It automatically disables and re-enables a port when the error rate on that port is at a set level for a set time.

Activation Rate—The CRC (cyclic redundancy check) BER (bit error rate) at which AFA takes a link out of service based on the *Activation Min.*: 10^{-4}, 10^{-5}, 10^{-6}, 10^{-7}. For further details about setting this parameter, see "Activation/Deactivation Bit Error Rates" below. This parameter appears only when *AFA* is *enabled*.

Activation Min.—The period during which AFA monitors the link condition prior to taking it out of service, in minutes: *1* to *15*. This parameter appears only when *AFA* is *enabled*.

Deactivation Rate—The CRC (cyclic redundancy check) BER (bit error rate) at which AFA puts a link in service based on the *Deactivation Min.*: 10^{-4}, 10^{-5}, 10^{-6}, 10^{-7}. For further details about setting this parameter, see "Activation/Deactivation Bit Error Rates" below. This parameter appears only when *AFA* is *enabled*.

Deactivation Min.—The period during which AFA monitors the link condition prior to putting it in service, in minutes: *1* to *15*. This parameter appears only when *AFA* is *enabled*.

Activation/Deactivation Bit Error Rates

Table 33 translates bit errors rates into the total number of errors for various time periods. Use this table as a reference when you are selecting activation and deactivation bit error rates for the AFA feature.

Table 33 Bit Error Rates Translated into Total Number of Errors

Bit Error Rate (BER)	Total Errors in 1 second	Total Errors in 1 Minute	Total Errors in 2 Minutes	Total Errors in 5 Minutes	Total Errors in 15 Minutes
10^{-4}	15	900	1800	4500	13500
10^{-5}	1.5	90	180	450	1350
10^{-6}	0.15	9	18	45	135
10^{-7}	0.015	1	2	5	13

Group—The number of the group to which the ports belong.

Admin. Status—Administrative status: *Out of Service* or *In Service*.

Operation Status—Operation status: *Response* or *No Response*.

5 Select *[13] Previous Menu* to return to the DSI UNI Configuration menu.

6 Repeat steps 4 and 5 for any other DS1 or E1 ports that you want to configure.

Configuring UNI and IMA Groups

You can map two to eight DS11/E1 ports into an IMA group, thereby creating a logical, inverse-multiplexed, high-speed link. The PathBuilder S700 also supports UNI groups.

Adding UNI Groups

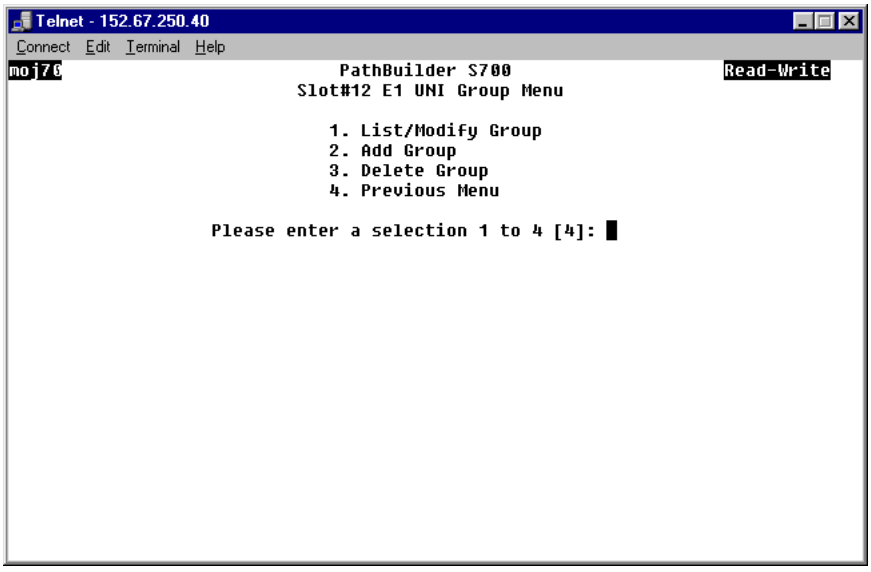
To set up a UNI group, follow these steps:

1 From the Configuration Management menu, shown earlier in Figure 80, select *[1] Manage Card*.

2 From the List Card menu, shown earlier in Figure 81, select the number corresponding to the slot in which the DS1 UNI or E1 UNI card is installed to open the DS1 or E1 UNI Configuration menu, shown earlier in Figure 95.

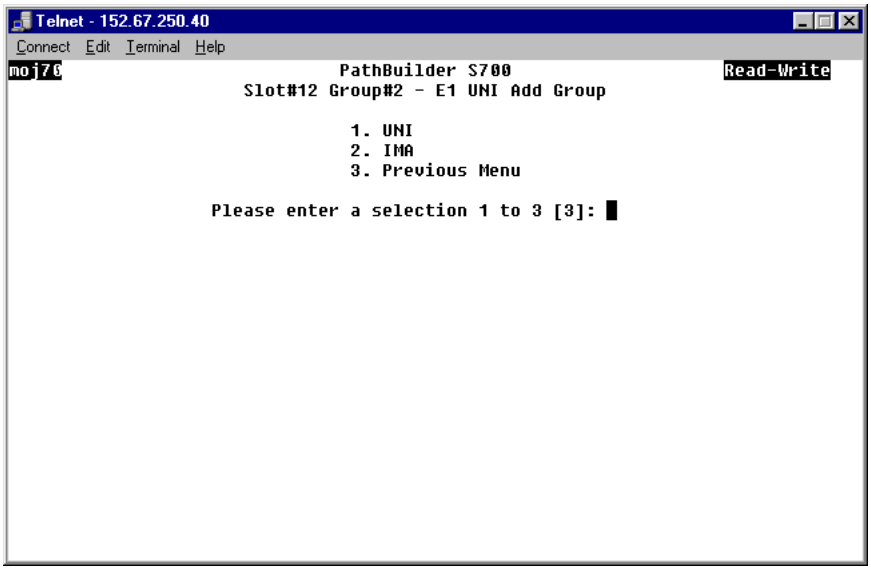
3 From the DS1 or E1 UNI Configuration menu, select *[3] Group Configuration* to display the Group menu, shown in Figure 99.

Figure 99 Group Menu



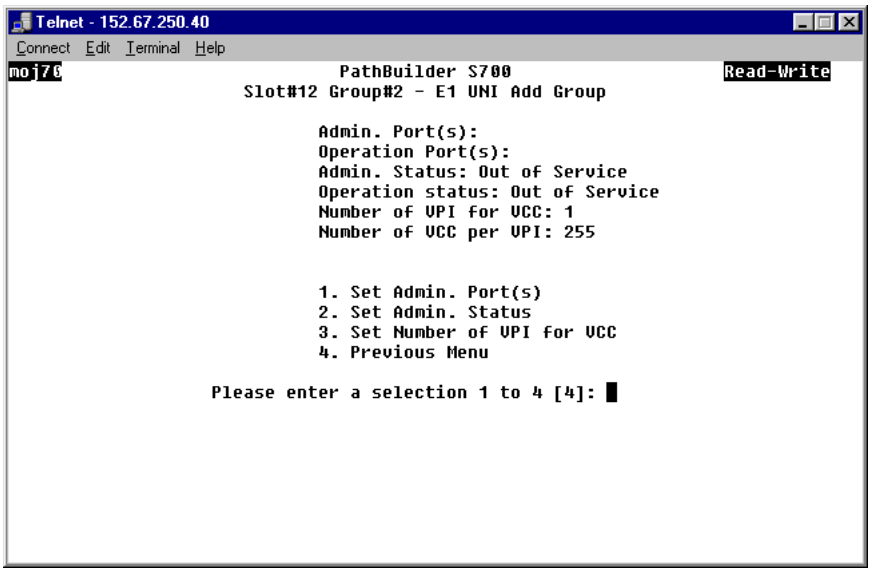
4 Select *[2] Add Group* to display the Add Group menu, shown in Figure 100.

Figure 100 Add Group Menu (Selecting Group Type)



5 Enter *[1] UNI*. The Add Group menu appears as shown in Figure 101.

Figure 101 Add Group Menu (Adding UNI Group)



6 Select *[1] Set Admin. Port(s)*. The following prompt appears at the bottom of the screen:

```
Enter Admin Port(s) (1..4):
```

7 Enter the port number(s) of the T1/E1 port(s) you want to include in the UNI group.

8 Select *[2] Set Admin. Status* and enter *[2]* to put the group in service.

9 Select *[3] Set Number of VPI for VCC* and specify the number of distinct VPIs that can be used for VCCs on this card: *1-256*. Any VPIs not currently in use by VCCs are available for VPCs.

10 Select *[3]* Previous Menu.

11 If desired, repeat steps 5-8 to set up a additional UNI groups and put them into service.

Adding IMA Groups

To set up an IMA group, follow these steps:

1 From the Configuration Management menu, select *[1] Manage Card* to display the List Card menu, shown earlier in Figure 81.

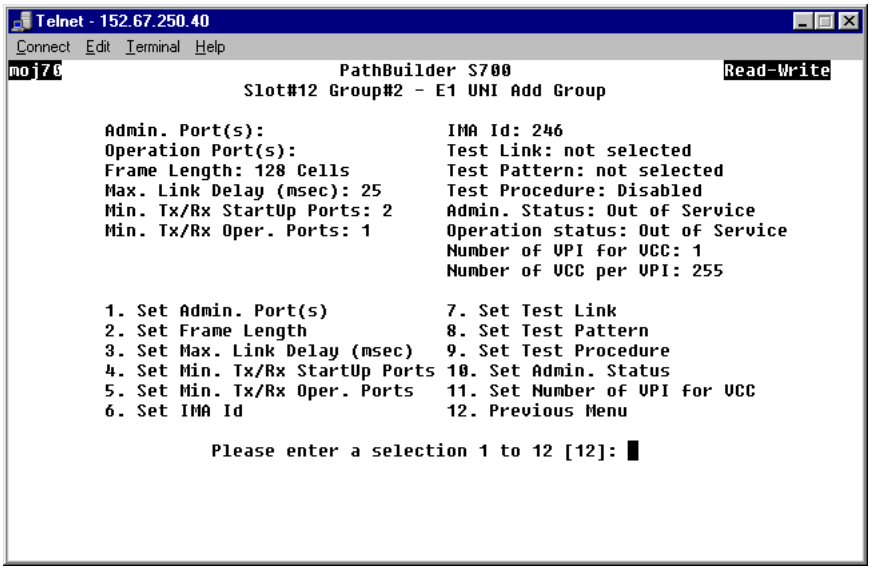
2 From the List Card menu, select the number corresponding to the slot in which the DS1 UNI or E1 UNI card is installed to display the DS1 UNI or E1 UNI Configuration menu, shown earlier in Figure 95.

3 Select *[3] Group Configuration* to display the Group menu, shown earlier in Figure 99.

4 Select *[2] Add Group* to display the Add Group menu, shown earlier in Figure 100.

5 Enter *[2] IMA*. The Add Group menu appears as shown in Figure 102.

Figure 102 Add Group Menu (Adding IMA Group)



6 Select *[1] Set Admin. Port(s)*. The following prompt appears:

```
Enter Admin Port(s) (1..4):
```

7 Enter the port numbers for the DS1/E1 ports you want to include in the group. You can use a hyphen to indicate a range of ports. For example, to include ports 1-3 in a group you could enter **`1-3`**.

8 Set the following parameters to configure the IMA group:

Frame Length—The frame length: 32, 64, 128, 256.

Max. Link Delay—The maximum link differential delay allowed in the group: *0 to 70* msec for DS1, *0 to 56* msec for E1

Min Tx/Rx Startup Ports—The minimum number of ports in the group that must be operational in order for the group to come up: *1* to *n*, where *n* is the number of ports in the group.

Min Tx/Rx Oper. Ports—The minimum number of ports in the group that must be operational in order for the group to come up and be operational: *1* to *n*, where *n* is the number of ports in the group.

IMA ID—A user-selected number to identify the IMA group.

Test Link—The port number of the link that is to perform the test procedure.

Test Pattern—The pattern to be looped back in the test procedure: *0-254*.

Test Procedure—Enables or disables the test procedure. When the test procedure is enabled, the test pattern is sent out on the designated test link and then looped back on the other links in the group.

Admin Status—The administrative status of the group: *In Service* or *Out of Service*.

Number of VPI for VCC—The number of distinct VPIs that can be used for VCCs on this card: *1-32*. Any VPIs not currently in use by VCCs are available for VPCs.

9 Select *[12] Previous Menu*.

10 If desired, repeat steps 5-8 to set up another IMA group.

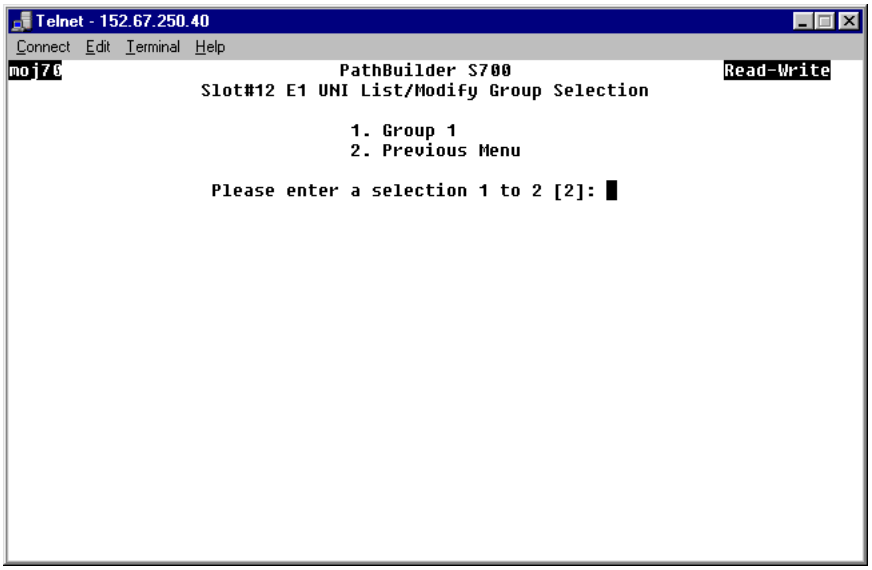
Viewing and Modifying IMA and UNI Groups

Once you have added a group, you use the List/Modify Group menu to view and modify group configuration parameters.

To view and/or modify an existing group, follow these steps:

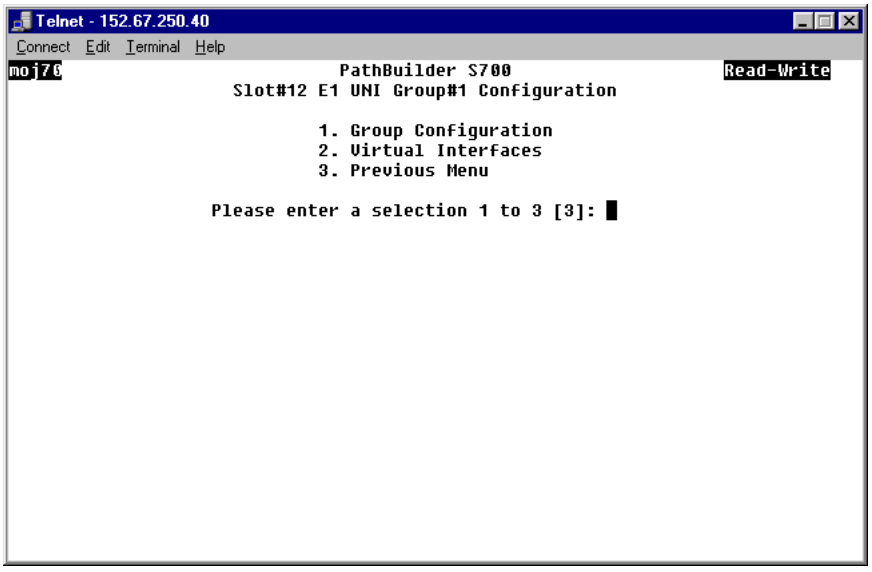
1 From the Group menu, shown earlier in Figure 99, select *[1] List/Modify Group* to open the List/Modify Group Selection menu. Figure 103 shows the E1 List/Modify Group Selection menu. The DS1 menu is the same. The List/Modify Group Selection menu lists the existing groups, by group number.

Figure 103 List/Modify Group Selection Menu



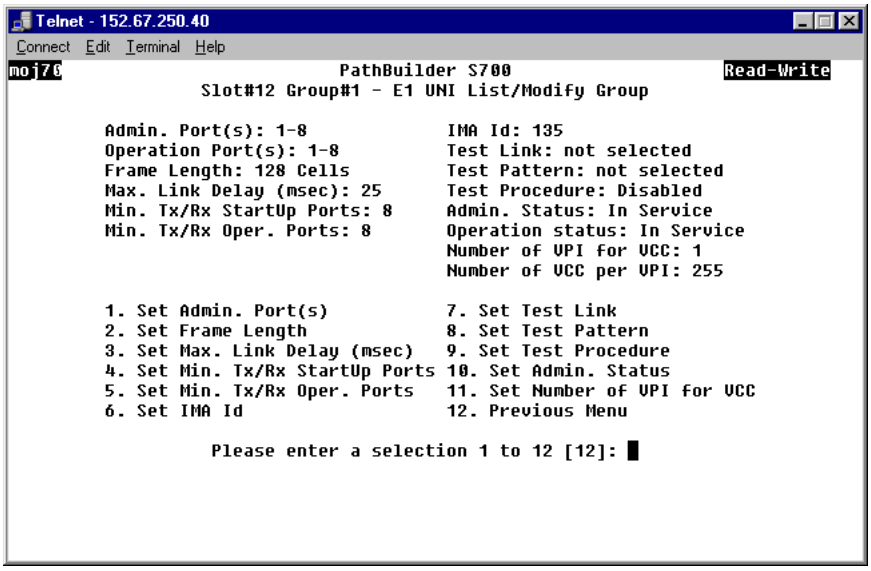
2 Enter the number corresponding to the group you want to view or modify to display the Group Configuration Options menu for that group. Figure 104 shows the E1 UNI Group Configuration Options menu. The DS1 UNI menu is the same. The options on this menu allow you to access other menus from which you can configure group parameters or virtual interfaces.

Figure 104 Group Configuration Options Menu



3 Select *[1] Group Configuration* to display the List/Modify Group menu. Figure 105 shows the E1 UNI List/Modify Group menu. The DS1 UNI menu is the same.

Figure 105 UNI List/Modify Group



4 If the *Admin. Status* of the group is *In Service*, select *[10] Set Admin. Status* and enter *[1]* to take the group out of service.

You must take the group out of service before you can modify it.

5 Change any of the group parameters as desired. For parameter definitions, see "Adding IMA Groups" earlier in this chapter.

Configuring Virtual Interfaces for IMA Groups

To configure virtual interfaces for IMA groups, follow these steps:

1 From the Group menu, shown earlier in Figure 99, select *[1] List/Modify Group* to open the List/Modify Group Selection menu, shown earlier in Figure 103.

2 Enter the number corresponding to the group for which you want to configure virtual interfaces to display the Group Configuration Options menu for that group.

3 From the Group Configuration Options menu, shown earlier in Figure 104, select *[2] Virtual Interfaces* to open the Virtual Interface Configuration menu. This menu is the same as the MCPU Virtual Interfaces Configuration menu, shown earlier in Figure 84.

4 Configure virtual interfaces as described under "Configuring Virtual Interfaces" earlier in this chapter. You configure virtual interfaces for IMA groups in the same way that you configure virtual interfaces for the MCPU card.

Deleting IMA and UNI Groups

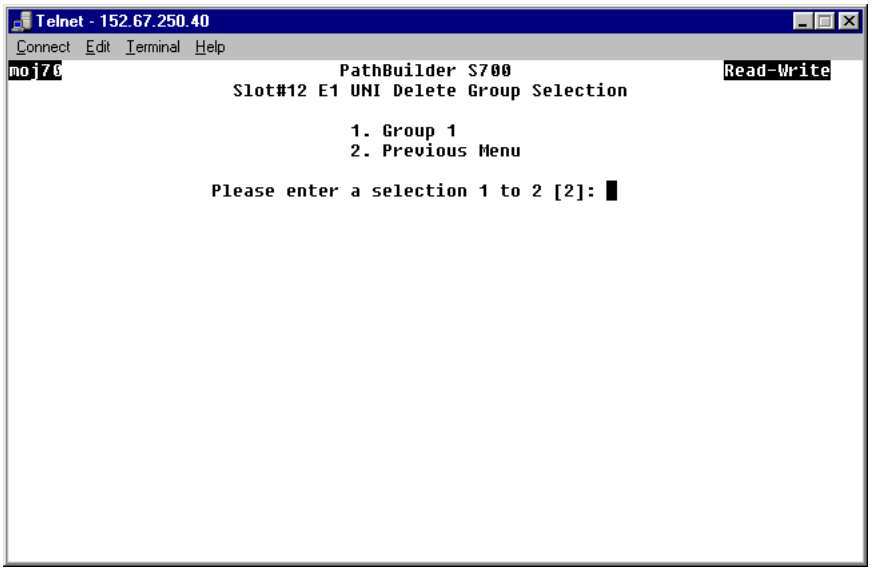
To delete an existing IMA or UNI group, follow these steps:

1 From the List Card menu, shown earlier in Figure 81, select the number corresponding to the slot in which the DS1 UNI or E1 UNI card is installed to display the DS1 UNI or E1 UNI. Configuration menu, shown earlier in Figure 95.

2 Select *[3] Group Configuration* to display the Group menu, shown earlier in Figure 99.

3 From the Group menu, select *[3] Delete Group*. The Delete Group Selection menu appears, as shown in Figure 106.

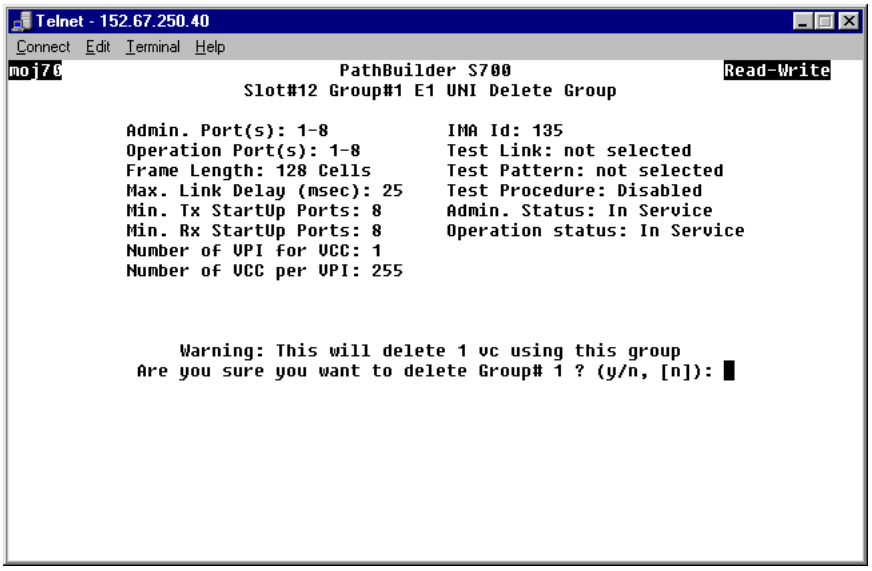
Figure 106 Delete Group Selection Menu



4 Enter the number corresponding to the group you want to delete to open the Delete Group menu. Figure 107 shows a representative Delete Group menu.

CAUTION: *When you delete a group, you also delete all virtual circuits using that group.*

Figure 107 Delete Group Menu



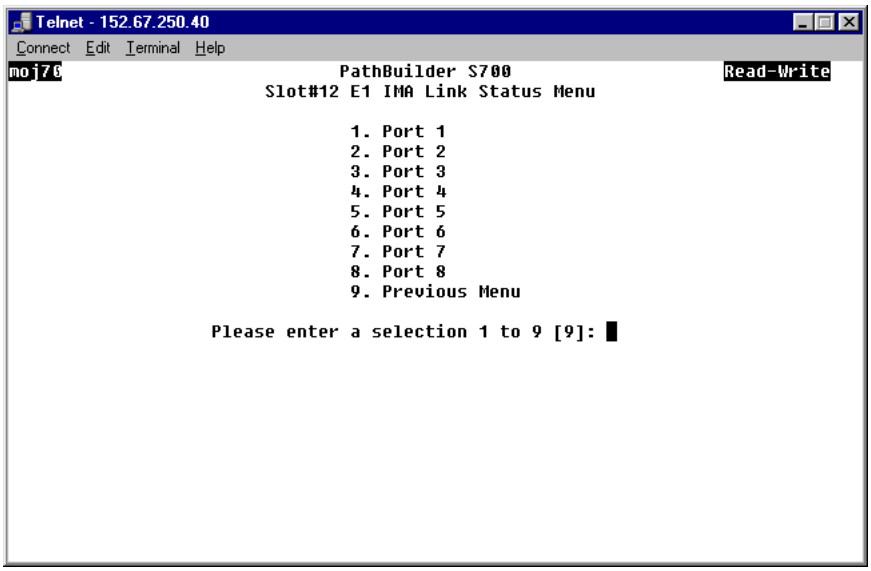
5 Enter **y** in response to the warning/confirmation prompt to delete the group.

Viewing IMA Link Status

To view IMA Link Status for a selected DS1 or E1 port, follow these steps:

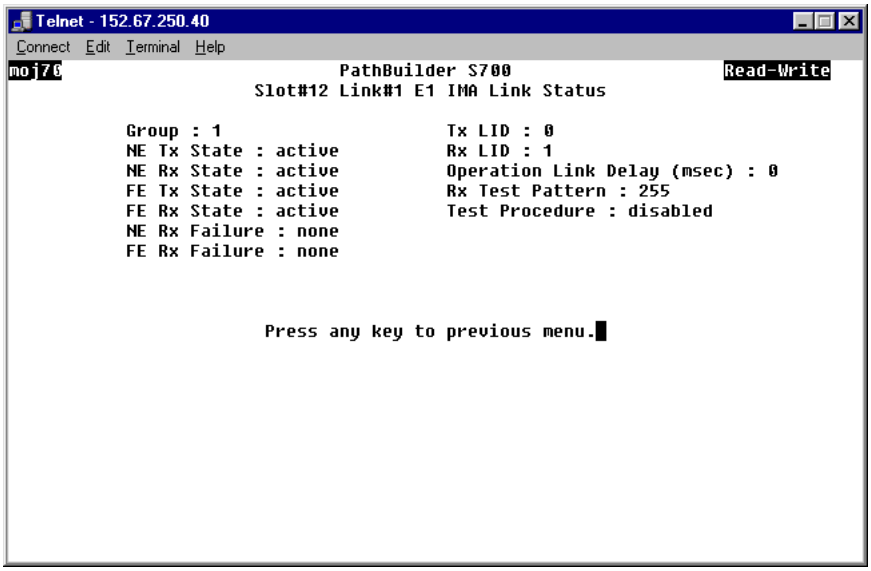
1. From the List Card menu, shown earlier in Figure 81, select the number corresponding to the slot in which the DS1 UNI or E1 UNI card is installed to open the UNI Configuration menu, shown earlier in Figure 95.
2. Select *[2] IMA Link Status* to open the IMA Link Status Selection menu, shown in Figure 108. The IMA Link Status Selection menu lists only the ports that are members of an IMA group.

Figure 108 IMA Link Status Selection Menu



3. Enter the number corresponding to the port for which you want to view IMA link status. The IMA Link Status screen for that port appears, as shown in Figure 109.

Figure 109 IMA Link Status Screen



The IMA Link Status screen lists the following information pertaining to the IMA status of an individual link in an IMA group.

NE Tx State—Near-end transmit state in the interworking link state machine. Table 34 lists the possible link states.

NE Rx State—Near-end transmit state in the interworking link state machine. Table 34 lists the possible link states.

FE Tx State—Far-end transmit state in the interworking link state machine. Table 34 lists the possible link states.

FE Rx State—Far-end transmit state in the interworking link state machine. Table 34 lists the possible link states.

Table 34 Possible IMA Link States

State	Tx Condition	Rx Condition
not in group	This link is not part of the IMA group.	This link is not part of the IMA group.
unusable blocked	This is caused by LOS, which would result in back clock from the framer if the port is in looped timing.	This is caused by AFA, excessive delay, or mismatched protocol.
usable	This link is ready to pass data.	This link is ready to pass data.
active	This link is passing data.	This link is passing data.

FE Rx Failure—Far-end Rx failure status in the interworking link state machine. Table 35 lists the possible IMA link failure status conditions.

NE Rx Failure—Near-end Rx failure status in the interworking link state machine. Table 35 lists the possible IMA link failure status conditions.

Table 35 Possible IMA Link Failure Status Conditions

Failure	Description
link failure	This is caused by LOS, AIS, OOF, or LCD
LIF failure	This is caused by LIF
LODS failure	This is caused by LODS.
Misconnected	This is caused by bad IMA ID, bad link ID, or bad SCCI.
blocked	This is caused by AFA, excessive delay, or mismatched protocol.
fault	This is caused by bad M value, bad symmetry, bad offset, or duplicate link ID.
far end Tx link unusable	This is caused by the far end reporting Tx unusable in the ICP cells.
far end Rx link unusable	This is caused by the far end reporting Rx unusable in the ICP cells.
no failure	The link has no failure.

Tx LID—Transmit logical link ID: 0-31. This number reflects the local IMA ID.

Rx LID—Receive logical link ID: 0-31. This number reflects the remote IMA ID.

Operation LInk Delay—The differential link delay referenced to the fastest link in the same group.

Rx Test Pattern—The received test pattern received: 0-254; 255 indicates that no pattern has been received.

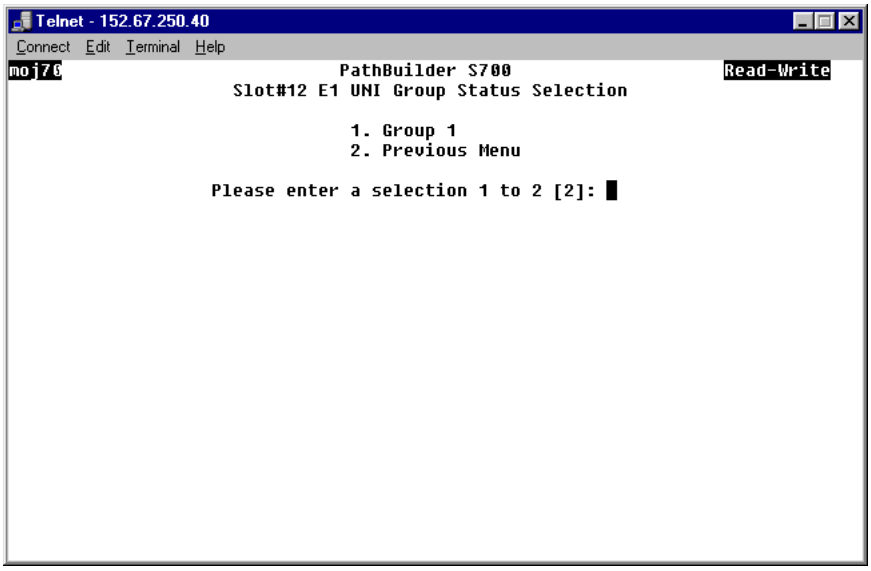
Test Procedure—The status of the test procedure: *disabled*, *operating*, or *link failed*.

Viewing IMA Group Status

To view IMA status for a selected group, follow these steps:

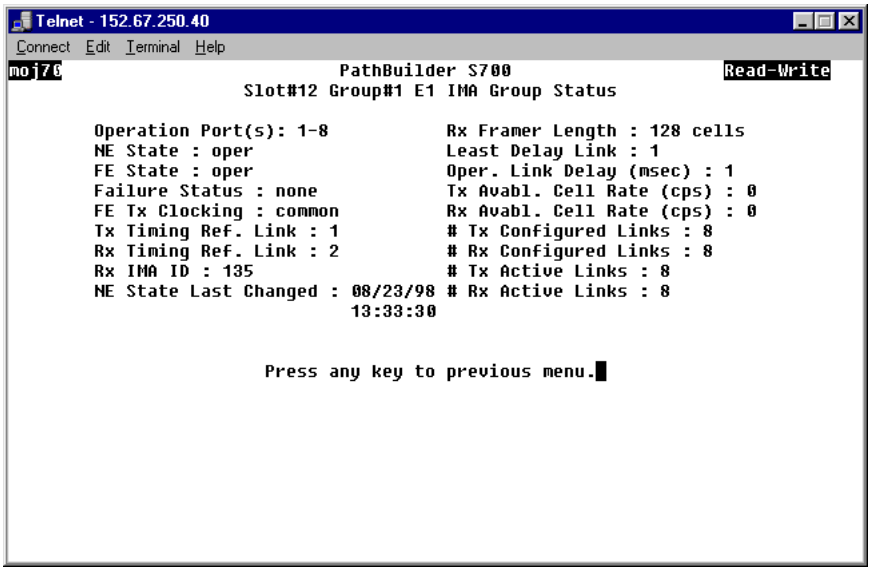
1. From the List Card menu, shown earlier in Figure 81, select the number corresponding to the slot in which the DS1 UNI or E1 UNI card is installed to open the UNI Configuration menu, shown earlier in Figure 95.
2. Select *[4] IMA Group Status* to open the IMA Group Status Selection menu, shown in Figure 110. The IMA Group Status Selection menu lists existing IMA groups.

Figure 110 Group Status Selection Menu



3. Enter the number corresponding to the group for which you want to view IMA status. The IMA Group Status screen for that group appears, as shown in Figure 111.

Figure 111 IMA Group Status Screen



The IMA Group Status screen lists the following information pertaining to the IMA status of the group as a whole.

Operation Port(s)—The port numbers of the active links in the group.

NE State—The status of the near end group state machine: *not configured*, *startup*, *startupAck*, *unsupported M*, *incompatible symmetry*, *other config abort*, *insufficient links*, *blocked*, or *operational*.

FE State—The status of the far end group state machine: *not configured*, *startup*, *startupAck*, *unsupported M*, *incompatible symmetry*, *other config abort*, *insufficient links*, *blocked*, or *operational*.

Failure Status—Failure status of the near end interworking group state machine. Table 36 lists the possible IMA group failure status conditions.

Table 36 Possible IMA Group Failure Status Conditions

Failure	Description
Near End Asymmetric	Near end rejected asymmetrical configuration or operation chosen by the far end.
Far End Invalid M	Far end rejected the M value chosen by the user on the near end.
Other Failures	The near end group detected multiple IMA ID, multiple M, or multiple symmetry, or the group has duplicated IMA ID, or the far end reported configuration abort without any reason.
Near End Insufficient Links	This is a normal transitional state when the near end group is coming up. If it persists, it indicates that the group indeed does not have enough links to come up and pass data.
Far End Insufficient Links	This is a normal transitional state when the far end group is coming up. If it persists, it indicates that the group indeed does not have enough links to come up and pass data.
Near End Blocked	The near end group cannot pass data due to LODS.
Far End Blocked	The far end group has enough links, but cannot pass data for some other reason.
Near End Startup	This is a normal transitional state when the near end group is coming up.
Far End Startup	This is a normal transitional state when the far end group is coming up.
No Failure	The group has no failure.

FE Tx Clocking—Far-end transmit clocking mode: common or independent.

Tx Timing Ref. Link—The near end transmitting timing reference port for cell clock recovery: *1 to N*.

Rx Timing Ref. Link—The near end received timing reference port for cell clock recovery: *1 to N*.

Rx IMA ID—The IMA receive group ID: *0-255*. This number reflects the remote IMA ID.

NE State Last Changed—The date and time at which the near-end state last changed.

Rx Framer Length—Receive M value: *32*, *64*, *128*, or *256*. The frame length of the first link that can communicate with the far end is chosen as the frame length of the far end group.

Least Delay Link—The port number of the fastest link in the group.

Oper. LInk Delay—Operational link delay; the actual value of the link differential delay: *0-70 msec* for T1, *0-50 msec* for E1.

Tx Avable. Cell Rate (cps)—The available cell rate for active Tx links in this group: *0-28,728 cps* for DS1, M=128; *0-35,920 cps* for E1, M=128. The available cell rate indicates how much bandwidth can be carried across the group. It varies, depending on how many links in the group are actually working.

Rx Avable Cell Rate (cps)—The available cell rate for active Rx links in this group: *0-28,728 cps* for DS1, M=128; *0-35,920 cps* for E1, M=128. The available cell rate indicates how much bandwidth can be carried across the group. It varies, depending on how many links in the group are actually working.

 # Tx Configured Links—The number of configured transmit links.

 # Rx Configured Links—The number of configured receive links.

#Tx Active links—The number of active transmit links.

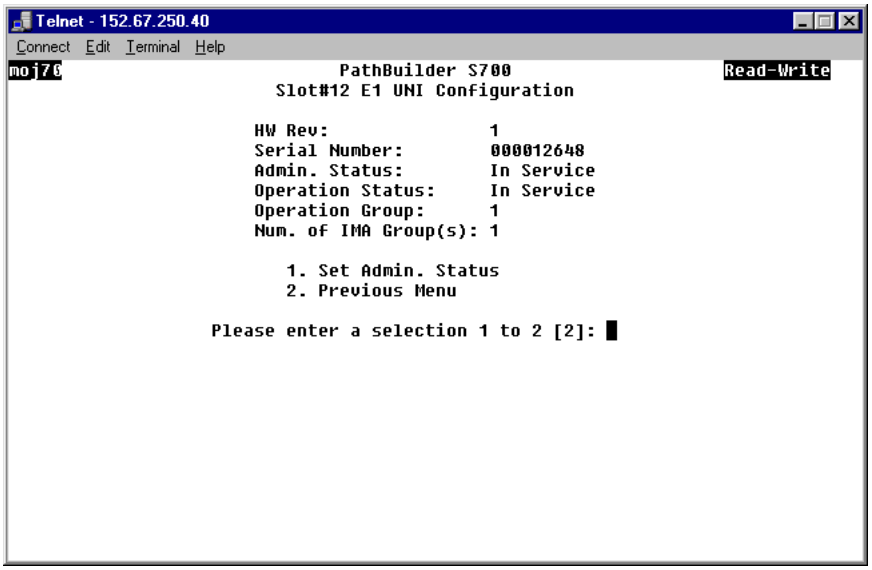
#Rx Active links—The number of active receive links.

Configuring DS1 UNI or E1 UNI Cards

The only type of configuration you can perform on a DS1 UNI or E1 UNI card is to put it in service or out of service. To put a DS1/E1 UNI card in service or out of service, follow these steps:

1. From the List Card menu, shown earlier in Figure 81, select the number corresponding to the slot in which the DS1 UNI or E1 UNI card is installed to display the DS1 UNI or E1 UNI Configuration menu, shown earlier in Figure 95.
2. From the DS1 UNI or E1 UNI Configuration menu, select *[5] Card Information* to display the Card Configuration menu. Figure 112 shows the E1 UNI Card Configuration menu. The DS1 UNI Card Configuration menu is the same.
3. Select *[1] Set Admin Service* and enter *[2]* to put the card in service or *[1]* to take it out of service.

Figure 112 E1 UNI Card Configuration Menu



In addition to the current DS1/E1 card configuration, the DS1/E1 UNI Card Configuration menu lists the following group-related information:

Operation Group—The active IMA groups in the card.

Num. of IMA Group(s)—The number of IMA groups created (but not necessarily active) on the card.

Configuring Ethernet Modules

Configuring an Ethernet module involves the following tasks:

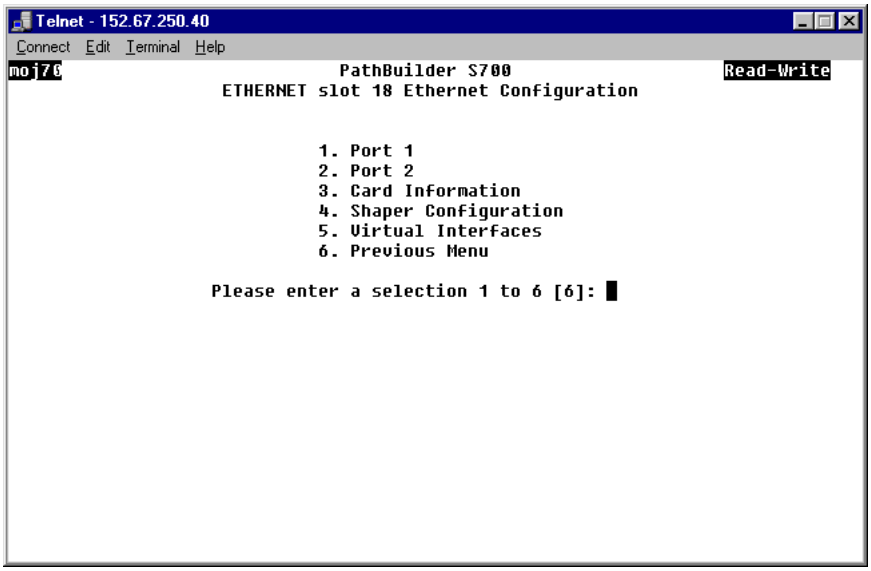
- Configuring the Ethernet ports, card, shapers, and virtual interfaces
- Configuring the bridge

Configuring Ethernet Ports, Cards, Shapers and Virtual Interfaces

To configure Ethernet ports, card, shapers, and virtual interfaces, follow these steps:

1 From the List Card menu, shown earlier in Figure 81, select the slot number corresponding to the Ethernet module to display the Ethernet Configuration menu, shown in Figure 113.

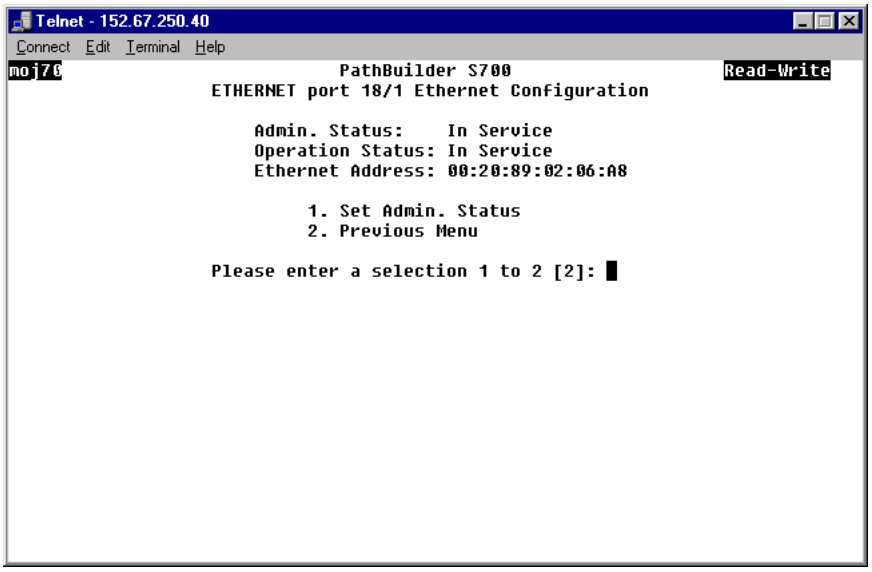
Figure 113 Ethernet Configuration Menu



2 Set the administrative status of the Ethernet ports (put them into service and take them out of service).

a From the Ethernet Configuration menu, select the option corresponding to the Ethernet port you want to configure to display the Ethernet Port Configuration menu for that port. Figure 114 shows a representative Ethernet Port Configuration menu.

Figure 114 Ethernet Port Configuration Menu



b Select *[1] Set Admin. Status* and enter *[2]* to put the Ethernet port into service or *[1]* to take it out of service.

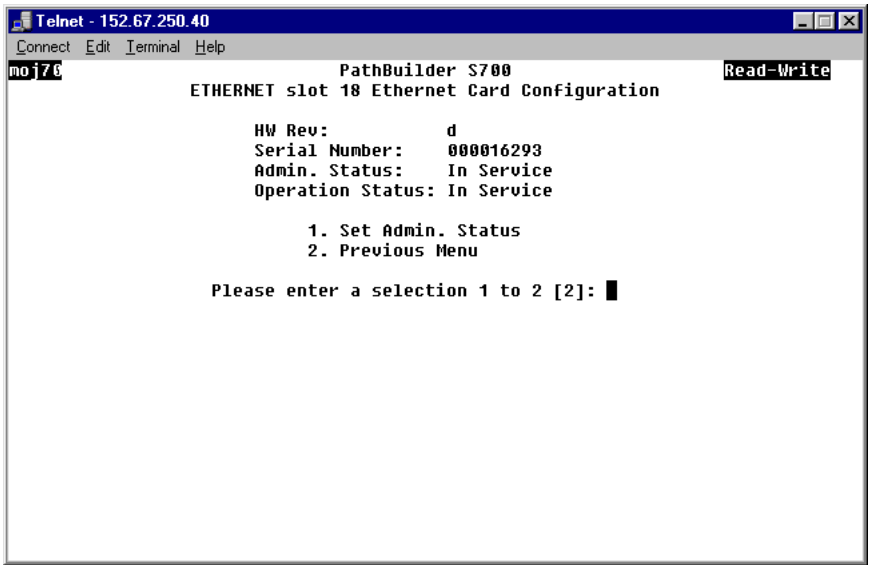
c Repeat steps a and b, selecting *[2] Port 2* in step a, to set the administrative status for Ethernet port #2.

d Select *[2] Previous Menu* to return to the Ethernet Configuration menu.

3 Set the administrative status of the Ethernet card (put it into service or take it out of service).

a From the Ethernet Configuration menu, select *[3] Card Information* to display the Ethernet Card Configuration menu, shown in Figure 115.

Figure 115 Ethernet Card Configuration Menu



b Select *[1] Set Admin. Status* and enter **2** to put the Ethernet card into service or **1** to take it out of service.

c Select *[2] Previous Menu* to return to the Ethernet Configuration menu.

4 Configure input shapers for the Ethernet card.

   a From the Ethernet Configuration menu, select *[4] Shaper Configuration* to display the Ethernet Shapers screen. This screen is the same as the MCPU Input Shapers screen, shown earlier in this chapter in Figure 88.

   b To enter a new shaper value, use the arrow keys on your keyboard to move to the cell in the shaper table that you want to change.

   You can set three input shaper parameters for the Ethernet card:

   - Peak Cell Rate (PCR)
   - Sustained Cell Rate (SCR)
   - Maximum Burst Size (MBS)

   For detailed instructions about configuring input shapers, see "Configuring Input Shapers" earlier in this chapter.

   c Press [Esc] to return to the Ethernet Configuration menu.

5 Configure virtual interfaces for the Ethernet card.

   a From the Ethernet Configuration menu, select *[5] Virtual Interfaces* to open the Virtual Interfaces Configuration menu. This menu is the same as the MCPU Virtual Interfaces Configuration menu, shown earlier in this chapter, in Figure 84.

   b Configure virtual interfaces as described under "Configuring Virtual Interfaces" earlier in this chapter. You configure virtual interfaces for the Ethernet card in the same way that you configure virtual interfaces for the MCPU card.

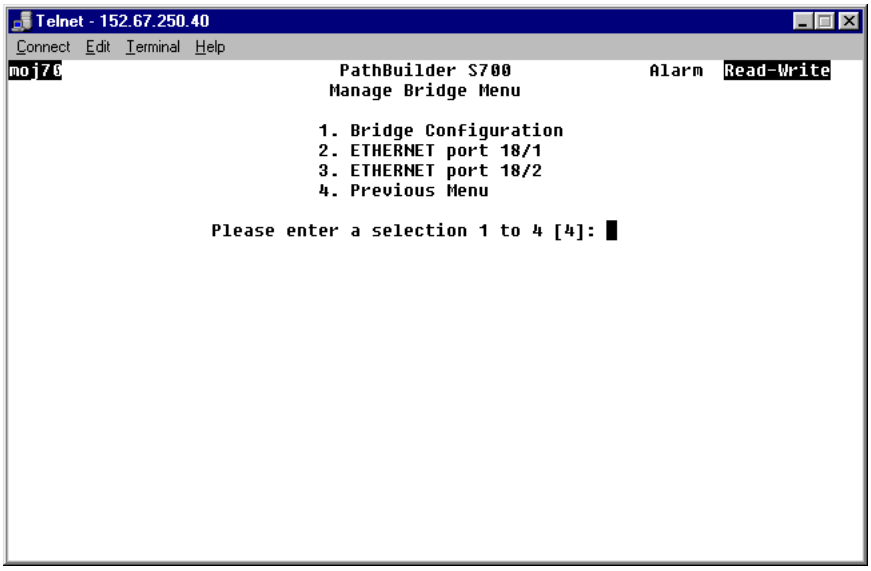
Configuring the Bridge

All of the virtual channels assigned to a particular slot and port form a network bridge. In order to enable the Ethernet port to operate, you must configure the bridge with the required user-filtering options and an aging timer value.

To configure the bridge, follow these steps:

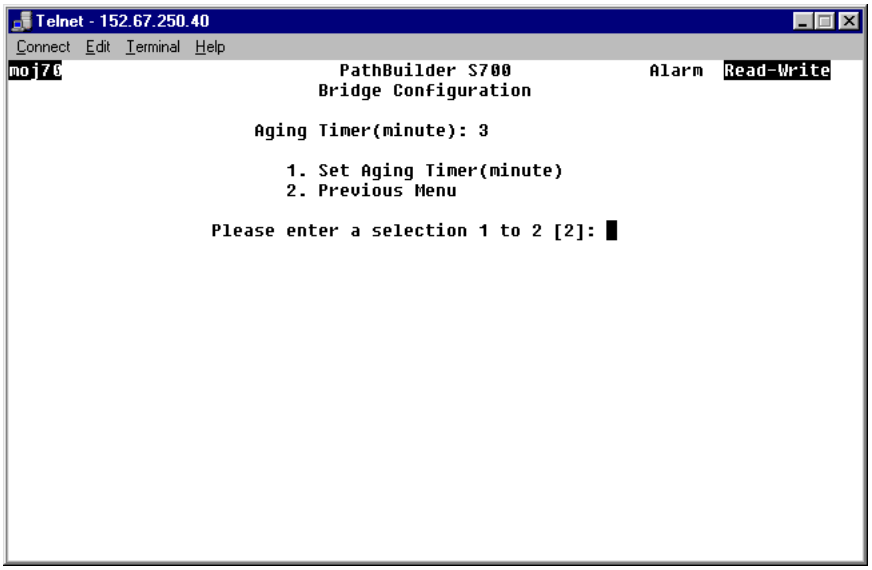
1 From the Configuration Management menu, shown earlier in Figure 80, select *[3] Manage Bridge* to display the Manage Bridge menu, shown in Figure 116.

Figure 116 Manage Bridge Menu



2 From the Manage Bridge menu, select *[1] Bridge Configuration* to display the Bridge Configuration menu, shown in Figure 117. The current aging timer setting is displayed below the menu title (3 minutes in the sample menu shown in the figure).

Figure 117 Bridge Configuration Menu



3 Select *[1] Set Aging Timer.* The following prompt appears at the bottom of the screen:

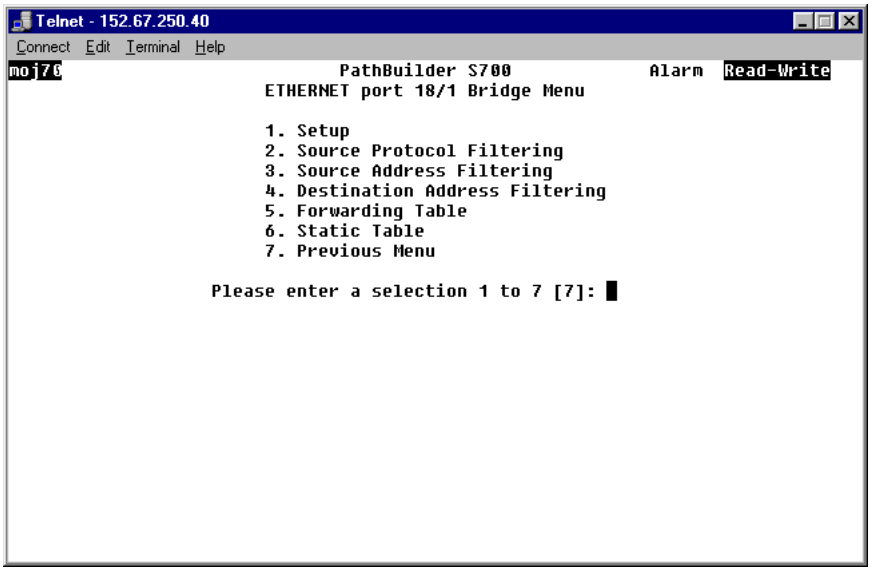
```
Enter Aging Timer (minute):
```

4 Enter the desired timer interval, in minutes.

5 Select *[2] Previous Menu* to return to the Manage Bridge menu.

6 From the Manage Bridge menu, select the number corresponding to the slot and port combination for which you want to configure a bridge. The Bridge Menu for the selected slot/port combination appears. Figure 118 shows a representative Bridge menu.

Figure 118 Bridge Menu



From the Bridge menu, you can:

- Configure source protocol filtering, source address filtering, and destination address filtering.
- Display the forwarding table for the bridge.
- Construct a static table (a table of source/destination pairs which you do not want to be aged out of the forwarding table) for the bridge.
- View and clear bridge statistics.

The following subsections tell you how to perform these operations.

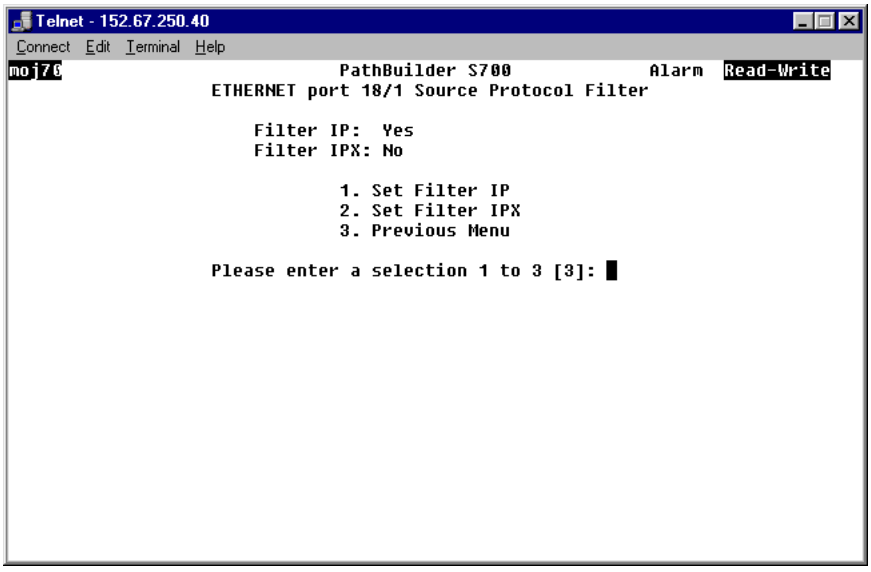
Configuring Source Protocol Filtering

Source protocol filtering allows the bridge to filter out packets with certain protocols. You can use this type of filtering to prevent certain type of protocol traffic from being bridged across the ATM network. Protocols such as IPX and Appletalk, for example, can be filtered on the sending end. This is useful in restricting your local Novell network or Appletalk data traffic from being transmitted on long distance ATM links, thereby saving bandwidth and providing security.

To configure source protocol filtering, follow these steps:

1 From the Bridge menu, select *[2] Source Protocol Filtering* to display the Source Protocol Filter menu, shown in Figure 119.

Figure 119 Source Protocol Filter Menu



The current statuses of the source protocol filters are listed at the top of the menu. *Yes* indicates that packets with that protocol will be rejected. *No* indicates that packets with that protocol will be transmitted across the bridge.

2 Change the filter settings as desired by entering the number corresponding to the filter you want to set and responding to the prompt that appears at the bottom of the screen. The list at the top of the menu is updated to reflect your change.

For example, if you want to configure an IP filter, select *[1] Set Filter IP.* The following prompt appears at the bottom of the screen:

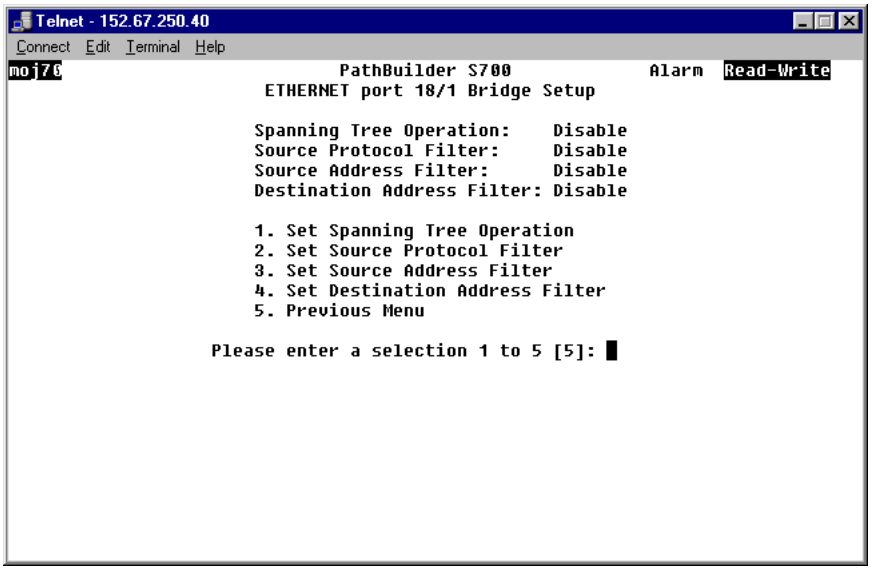
```
Enter Filter IP (1=No, 2=Yes):
```

Enter **2** to configure an IP filter; the bridge will reject packets with IP (Internet Protocol).

3 Select *[3] Previous Menu* to return to the Bridge menu.

4 Select *[1] Setup* to display the Bridge Setup menu, shown in Figure 120. This menu allows you to enable or disable the filters you have configured.

Figure 120 Bridge Setup Menu



5 Select *[2] Set Source Protocol Filter.* The following prompt appears at the bottom of the screen:

```
Enter Source Protocol Filter (1=Disable, 2=Enable)
```

6 Enter **2** to enable the source protocol filter.

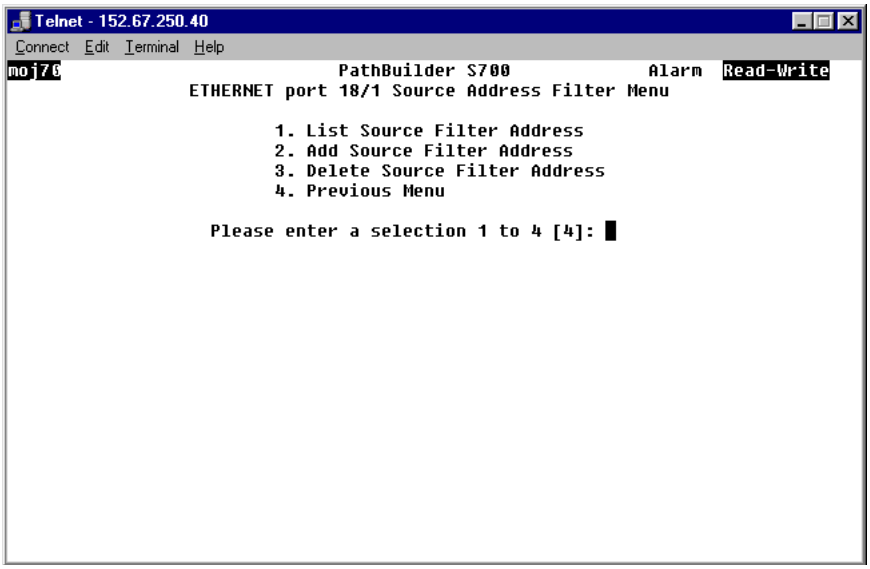
Configuring Source Address Filtering

Source address filtering allows the bridge to prevent packets containing a specific source address from traversing the bridge. You can use source address filtering to prevent some stations from transmitting on the ATM WAN link. This type of filtering is useful for preventing specific stations in a common protocol group on the Ethernet LAN from transmitting bursty and useless network data across the bridge and onto the WAN.

To configure source address filtering, follow these steps:

1 From the Bridge menu, select *[3] Source Address Filtering* to display the Source Address Filter menu, shown in Figure 121.

Figure 121 Source Address Filter Menu



2 Select *[2] Add Source Filter Address*. The Add Source Address Filter screen appears. This screen displays the following prompt:

```
Enter MAC Address (XX:XX:XX:XX:XX:XX or <CR>):
```

3 Enter the MAC address of the station from which you do not want packets to traverse the bridge. After you make your entry, you are returned to the Source Address Filter menu.

4 Repeat steps 2 and 3, as desired, to add more addresses to the source filter list.

- To view the current list, select *[1] List Source Filter Address* from the Source Filter Address menu.
- To change an address in the list, delete the incorrect address and add the correct address.
- To delete an address from the list, select *[3] Delete Source Filter Address* from the Source Filter Address menu and enter the number corresponding to the address you want to delete. Then enter **y** at the confirmation prompt to delete the selected address.

5 Select *[4] Previous Menu* to return to the Bridge menu

6 Select *[1] Setup* to display the Bridge Setup menu, shown earlier in Figure 120. This menu allows you to enable or disable the filters you have configured.

7 Select *[3] Set Source Address Filter.* The following prompt appears at the bottom of the screen:

```
Enter Source Address Filter (1=Disable, 2=Enable)
```

8 Enter **2** to enable the source address filter.

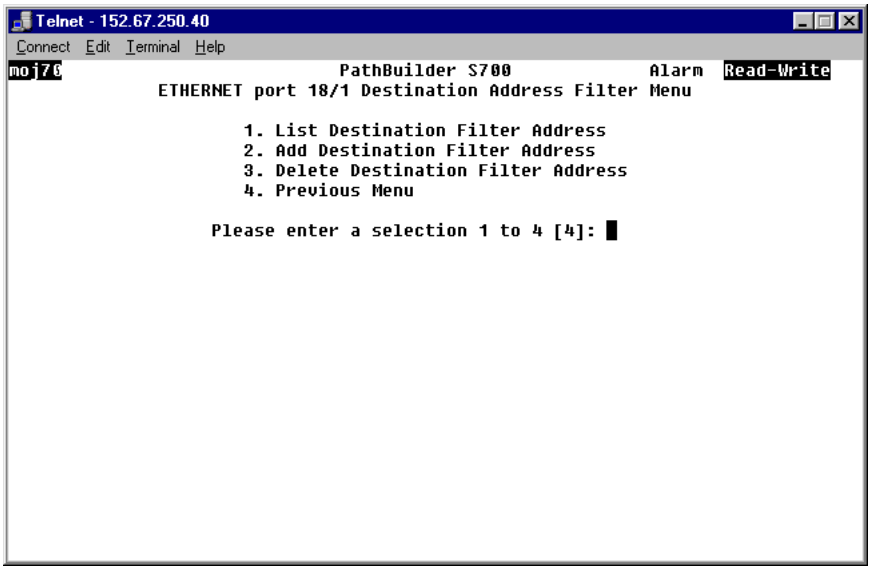
Configuring Destination Address Filtering

Destination address filtering prevents LAN packets with destination addresses specified in the filter from being sent to the WAN. You can use destination address filtering to prevent some stations from receiving data from the ATM WAN link. For example, you can save network-traffic-sensitive stations (such as local file servers and CAD servers) from unnecessary data coming from the WAN.

To configure destination address filtering, follow these steps:

1 From the Bridge menu, select *[4] Destination Address Filtering* to display the Destination Address Filter menu, shown in Figure 122.

Figure 122 Destination Address Filter Menu



2 Select *[2] Add Destination Filter Address*. The Add Destination Address Filter screen appears. This screen displays the following prompt:

```
Enter MAC Address (XX:XX:XX:XX:XX:XX or <CR>):
```

3 Enter the MAC address of the destination to which you do not want packets to be sent across the bridge. After you make your entry, you are returned to the Source Address Filter menu.

4 Repeat steps 2 and 3, as desired, to add more addresses to the destination filter list.

- To view the current list, select *[1] List Destination Filter Address* from the Destination Filter Address menu.
- To change an address in the list, delete the incorrect address and add the correct address.
- To delete an address from the list, select *[3] Delete Destination Filter Address* from the Destination Filter Address menu and enter the number corresponding to the address you want to delete. Then enter [2] at the confirmation prompt to delete the selected address.

5 Select *[4] Previous Menu* to return to the Bridge menu

6 Select *[1] Setup* to display the Bridge Setup menu, shown earlier in Figure 120. This menu allows you to enable or disable the filters you have configured.

7 Select *[4] Set Destination Address Filter.* The following prompt appears at the bottom of the screen:

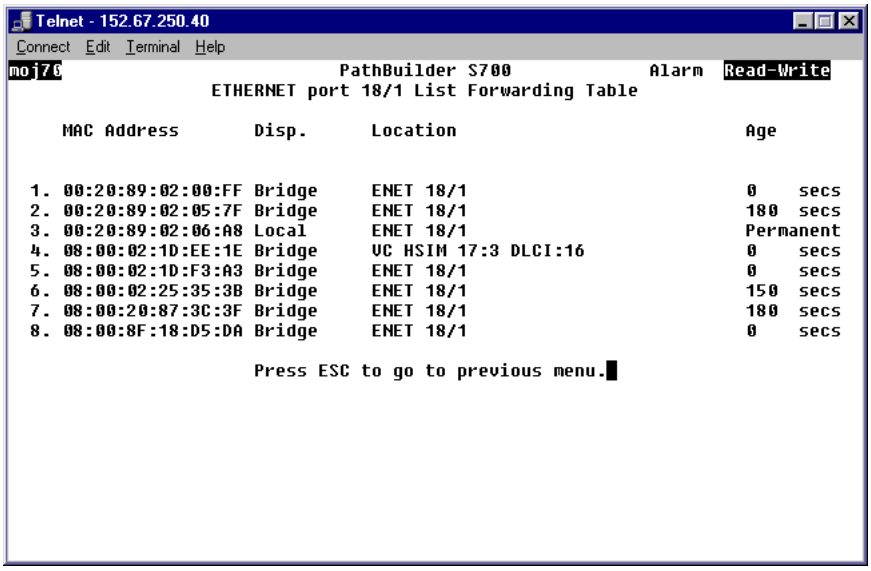
```
Enter Destination Address Filter (1=Disable, 2=Enable)
```

8 Enter **2** to enable the destination address filter.

Viewing the List Forwarding Table

The List Forwarding Table is a current forwarding table for the bridge. To display this table, select *[5] Forwarding Table* from the Bridge menu. Figure 123 shows a representative List Forwarding Table.

Figure 123 List Forwarding Table



The List Forwarding Table identifies the port on which a certain MAC address is located. This can be an Ethernet port or an ATM VC. Using the information in the List Forwarding table, the bridge knows where to send a MAC address when it receives one. If the Ethernet port receives a packet, and the destination MAC address is not in the List Forwarding table, the port broadcasts the packet—sends it to all VCs associated with that port.

The List Forwarding Table includes the following columns of information:

MAC Address—The destination MAC address.

Disp.—Disposition:

Bridge—The default disposition.

Flood—Flood the frame on all available VCs.

Filter—Drop this frame.

Accept—Accept this frame.

Static—Destination MAC address is in Bridge Static Table.

SRC_Address_Filtering—User-configured source address filter.

DEST_Address_Filtering—User-configured destination address filter.

Location—One of the following two types of entries:

ENET <slot/port>—Ethernet slot and port number. This type of entry is displayed when the MAC address is reached through that port.

VC <non-Ethernet side of VC data>—The card type, slot and port number, and other virtual circuit parameters, such as DLCI number, for the non-Ethernet side of the virtual circuit. This type of entry is displayed when the MAC address is reached through that virtual circuit.

Age—The age of the station address entry in the List Forwarding Table. You can set this parameter to *Permanent* or a specified number of seconds. The system uses the *Age* parameter to delete station address entries when they have had no traffic for the specified period of time.

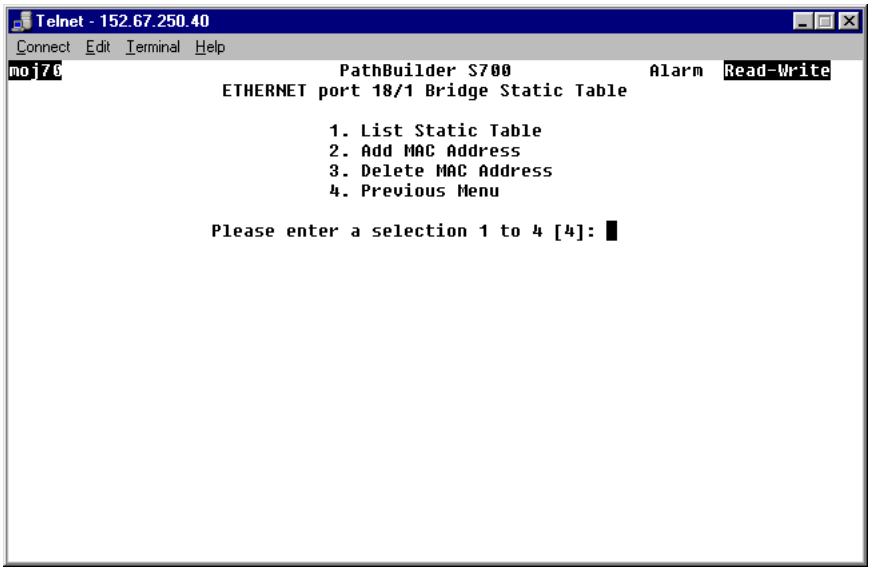
Constructing the Bridge Static Table

The Bridge Static Table is a list of destination MAC addresses that you want to maintain in the List Forwarding Table and do not want to be purged by the aging timer. The *Disp.* column for these addresses in the Forwarding Table reads *Static* to indicate that they will remain in the Forwarding Table until they are manually deleted from the Static Table.

To construct the Bridge Static Table, follow these steps:

1 From the Bridge menu, select *[6] Static Table* to display the Bridge Static Table menu, shown in Figure 124. From this menu, you can view the Static table and add and delete entries from it.

Figure 124 Bridge Static Table Menu



2 Select *[2] Add MAC Address*. The Add MAC address screen appears. This screen displays the following prompt:

```
Enter MAC Address (XX:XX:XX:XX:XX:XX or <CR>):
```

3 Enter the destination MAC address that you want to add to the Bridge Static Table. This address will not be purged when the List Forwarding Table is aged. The following prompt appears:

```
Attach MAC address to an existing VCC? (y/n [n]):
```

4 Enter **y** or **n**.

- If you enter **y**, a screen appears with a list of existing virtual circuits. Enter the number corresponding to the virtual circuit to which you want to attach the destination MAC address.
- If you enter **n**, the MAC address will be associated with this Ethernet port.

5 Repeat steps 2-4, as desired, to add more addresses to the Bridge Static Table.

- To view the current Bridge Static Table, select *[1] List Static Table* from the Bridge Static Table menu. The Bridge Static Table includes the following columns of information:

  MAC Address—The destination MAC address.

  Location—One of the following two types of entries:

  ENET <slot/port>—Ethernet slot and port number. This type of entry is displayed when the MAC address is reached through that port.

  VC <non-Ethernet side of VC data>—The card type, slot and port number, and other virtual circuit parameters, such as DLCI number, for the non-Ethernet side of the virtual circuit. This type of entry is displayed when the MAC address is reached through that virtual circuit.

- To delete an address from the table, select *[3] Delete MAC Address* from Bridge Static Table menu and enter the number corresponding to the address you want to delete. Then enter **y** at the confirmation prompt to delete the selected address from the Bridge Static Table.

Enabling and Disabling the Spanning Tree

Spanning Tree (IEEE 802.1d) is a technique that detects loops in a network and logically blocks the redundant paths, ensuring that only one route exists between any two LANs. It eliminates the duplication of packets and provides fault tolerance for resilient networks.

To enable or disable the Spanning Tree, follow these steps:

1 From the Configuration Management menu, select *[3] Manage Bridge* to display the Manage Bridge menu, shown earlier in Figure 116.

2 From the Manage Bridge menu, select the number corresponding to the slot and port combination for which you want to enable or disable the Spanning Tree. The Bridge Menu for the selected slot/port combination appears, as shown earlier in Figure 118.

3 Select *[1] Setup* to display the Bridge Setup menu, shown earlier in Figure 120.

4 Select *[1] Set Spanning Tree Operation*. The following prompt appears:

```
Enter Spanning Tree Operation Status (1=Disabled, 2=Enabled):
```

5 Enter **1** or **2** to disable or enable the Spanning Tree.

For further information on Spanning Tree and how it operates, see "Spanning Tree" in Chapter 4.

Configuring IP Over ATM

In addition to the standard bridging configuration described in the previous section, you can also configure IP over ATM for either of the PathBuilder S700's Ethernet ports. IP over ATM is a method to pass IP traffic across an ATM network; it follows RFC 1577.

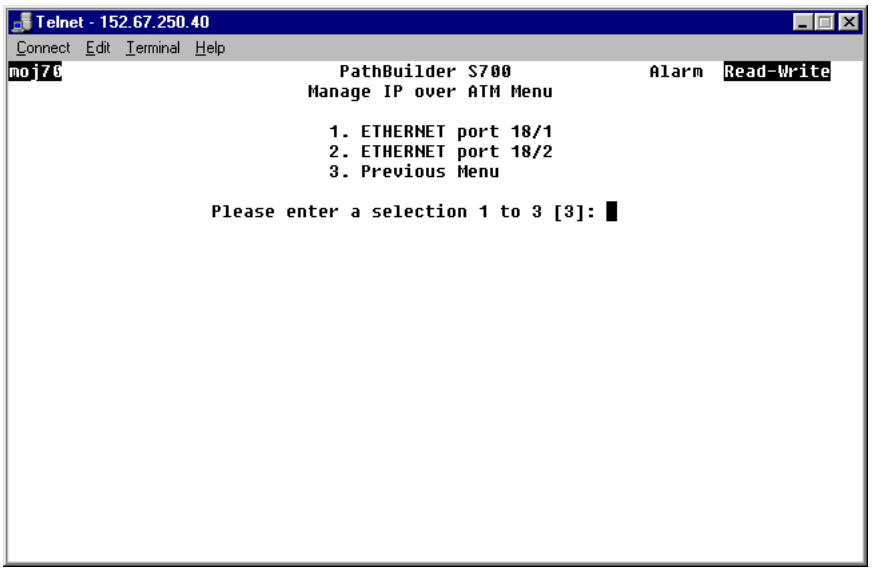
To configure IP over ATM for an Ethernet port, follow these steps:

1 Access the IP over ATM menu for the Ethernet port for which you want to configure IP over ATM.

   a From the main menu, select *[2] Configuration Management*.

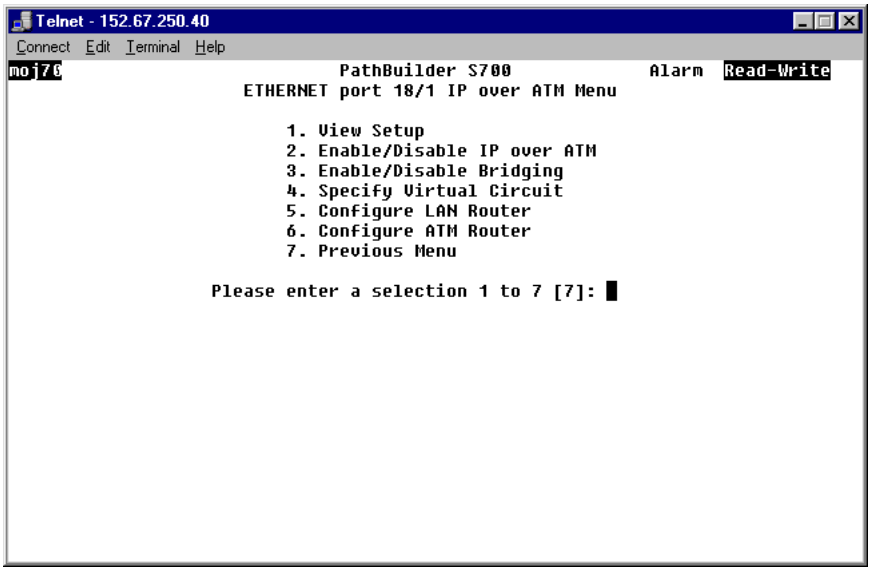
   b Select *[4] Manage IP over ATM*. The Manage IP over ATM port selection menu appears, as shown in Figure 125.

Figure 125 IP over ATM Port Selection Menu



   c Enter the number corresponding to the Ethernet port for which you want to configure IP over ATM. The IP over ATM menu for the selected port appears, as shown in Figure 126.

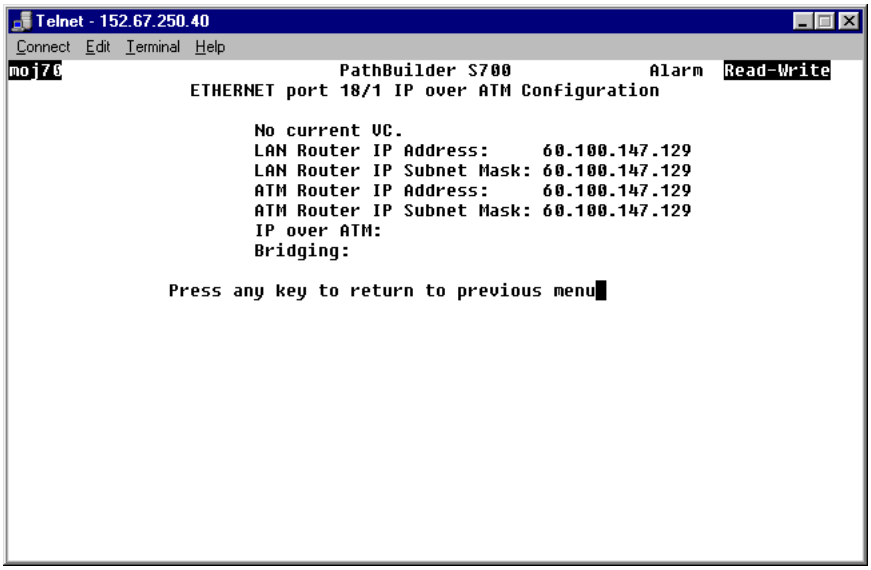
Figure 126 IP over ATM Menu



2 If desired, view the current IP over ATM configuration.

   a select *[1] View Setup*. Figure 127 shows a representative IP over ATM Setup screen.

Figure 127 IP over ATM Setup Screen

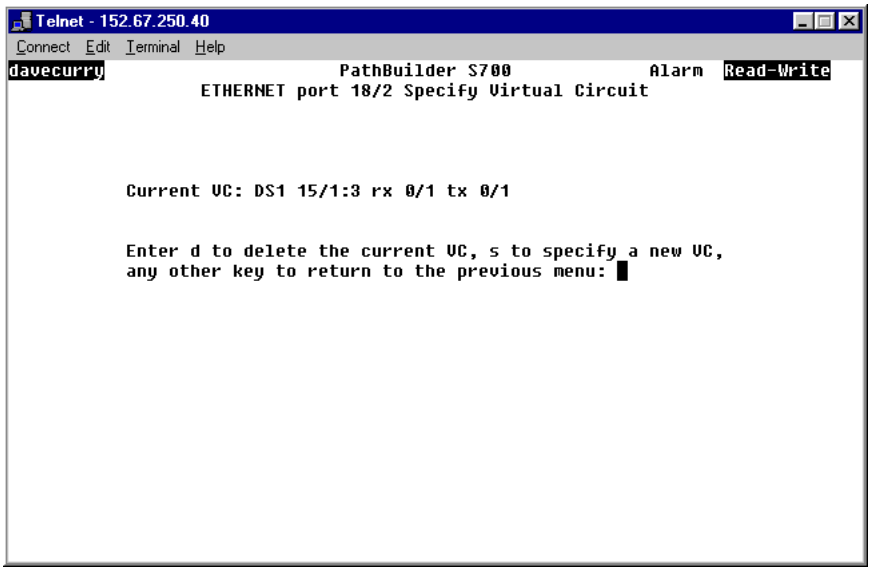


b Press any key to return to the IP over ATM menu.

3 View the virtual circuit that is currently specified to pass the IP traffic over the ATM network.

a Select *[4] Specify Virtual Circuit* to display the Specify Virtual Circuit menu, shown in Figure 128. This menu lists the virtual circuit that is currently selected to pass the IP traffic over the ATM network.

Figure 128 Specify Virtual Circuit Menu



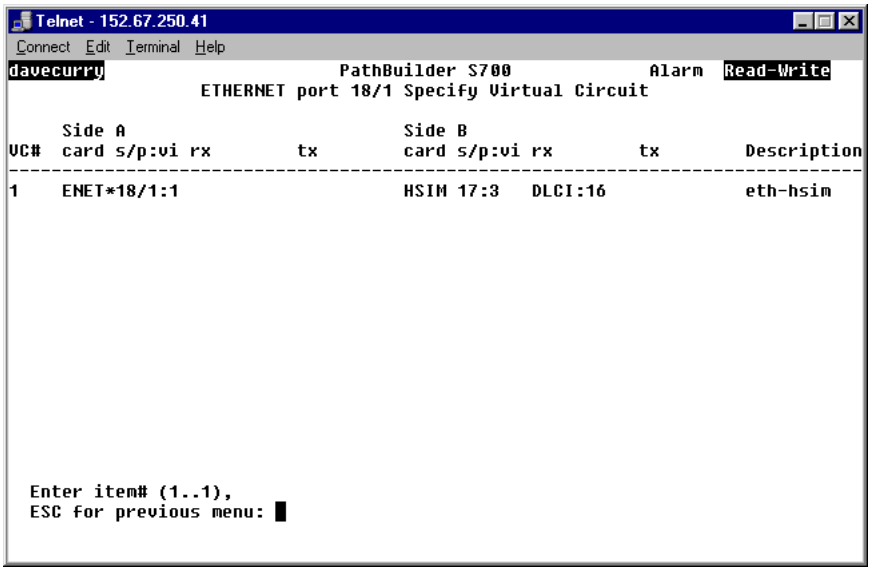
b Accept or delete the current virtual circuit (the one displayed on the Specify Virtual Circuit menu).

- If you want to use the current virtual circuit, press any key other than [s] or [d] to return to the previous menu and skip to step 5.
- If you want to specify a new virtual circuit, press [d] to delete the current virtual circuit and continue to step 4.

4 Specify a new virtual circuit to pass the IP traffic over the ATM network (if desired).

a From the Specify Virtual Circuit menu, shown earlier in Figure 128, press [s] to display a screen similar to the one shown in Figure 129. This screen lists the existing virtual circuits connected to the selected Ethernet port.

Figure 129 Specify Virtual Circuit Selection Screen

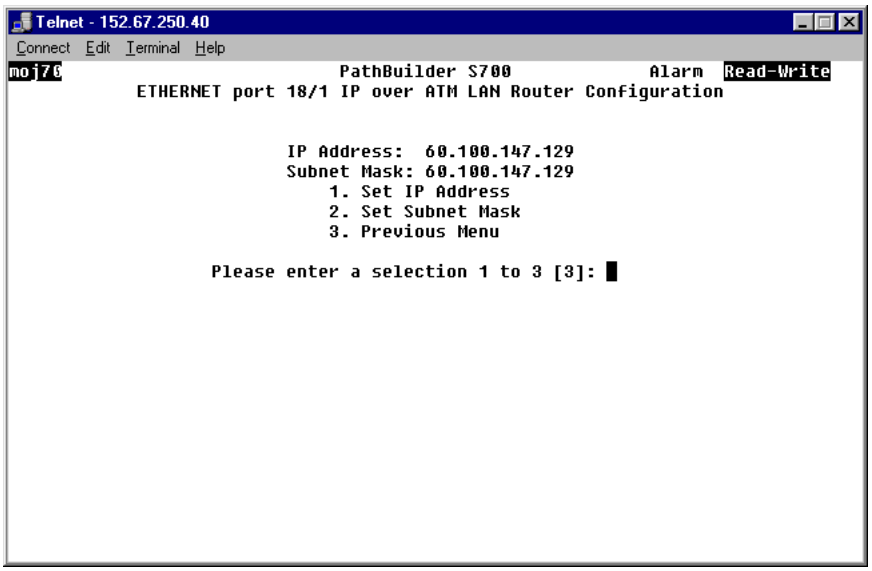


b Enter the number corresponding to the virtual circuit you want to use to pass the IP traffic over the ATM network. The circuit you select will now be listed on the Specify Virtual Circuit menu.

5 Configure the parameters for the LAN and ATM routers that will pass the IP traffic across the ATM network.

a Select *[5] Configure LAN Router* to display the IP over ATM LAN Router Configuration menu, shown in Figure 130.

Figure 130 IP over ATM LAN Router Configuration Menu



b Set the following parameters:

IP Address—The IP address of the LAN router that will pass the IP traffic across the ATM network.

Subnet Mask—The subnet mask of the LAN router that will pass the IP traffic across the ATM network.

c Select *[3] Previous Menu* to return to the IP over ATM menu.

d Select *[6] Configure ATM Router* to display the IP over ATM ATM Router Configuration menu. This menu is the same as the IP over ATM LAN Router Configuration menu, shown earlier in Figure 130, except that it displays and allows you to set parameters for the ATM router rather than the LAN router.

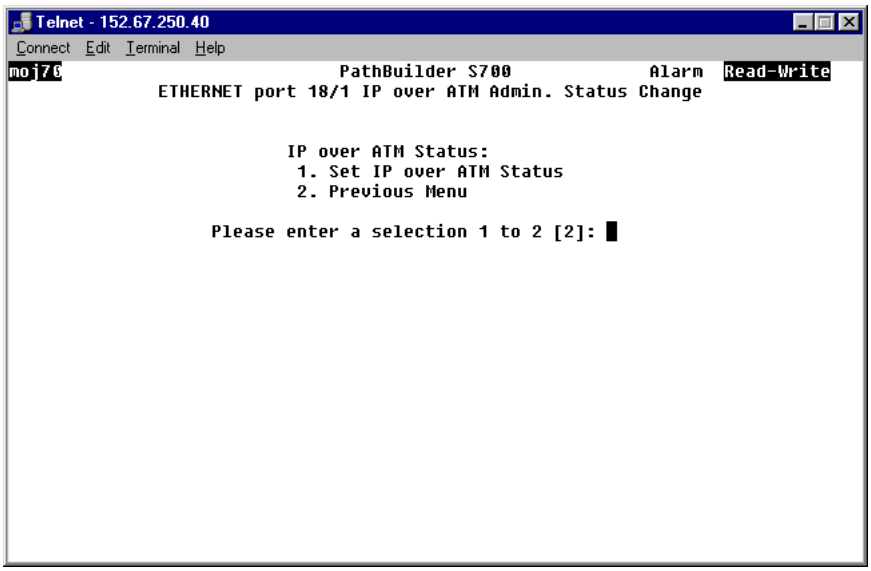
e Set the *IP Address* and *Subnet Mask* for the ATM router.

f Select *[3] Previous Menu* to return to the IP over ATM menu.

6 Enable or disable IP over ATM.

a Select *[2] Enable/Disable IP over ATM* to display the IP over ATM Admin. Status Change menu for IP over ATM status, shown in Figure 131.

Figure 131 IP over ATM Admin. Status Change Menu: for IP over ATM



b Select *[1] Set IP over ATM Status*. The following prompt appears:

```
Enter IP over ATM Status (1=Disabled, 2=Enabled):
```

c Enter **2** (to enable) or **1** (to disable) IP over ATM.

d Select *[2] Previous menu* to return to the IP over ATM menu.

7 Enable or disable Bridging.

a Select *[3] Enable/Disable Bridging* to display the IP over ATM Admin. Status Change menu for Bridging Control status. This menu is the same as the IP over ATM Admin. Status Change menu for IP over ATM status, except that it allows you to enable or disable bridging rather than IP over ATM.

b Select *[1] Set Bridging Control Status*. The following prompt appears:

```
Enter Bridging Status (1=Disabled, 2=Enabled):
```

c Enter **2** (to enable) or **1** (to disable) bridging control.

Configuring DSX-1 CBR or E1 CBR Modules

The PathBuilder S700 supports both a DSX-1 CBR module and a E1 CBR module. The configuration procedure is the same for both modules, but different parameters are available on the port configuration menu.

Configuring a CBR module involves the following tasks:

- Setting the administrative status of the card (putting it into service and taking it out of service)
- Configuring the ports
- Configuring the virtual interfaces

The DSX-1/E1 CBR ports support a "lite" RS-366 template. This feature works as follows:

- From the CBR DSX/E1 Port Configuration menu, you set an *Idle Timer* value. The CBR software starts an internal timer when no cell is being received. If the amount of time you specify as the *Idle Timer* expires before another cell is received, the software shuts off cell transmission and puts the virtual circuit into a listening mode.
- When you configure a virtual circuit for a DSX-1/E1 CBR port for which the *Port Mode* is set to *Struct Data*, the Add Virtual Circuit screen includes a *Mode* parameter. You can set the circuit *Mode* to *Normal*, *RS366*, or *DBA*.

For details about how to set to configure virtual circuits, see "Configuring Virtual Circuits" later in this chapter.

  - If you set the *Mode* to *Normal*, the circuit is configured as a standard PVC circuit and does not listen to video signals.
  - If you set the *Mode* to *RS366*, the circuit is put into an active listener mode; it listens for video signals from premises devices.
  - If you set the *Mode* to *DBA*, the circuit is configured to dynamically reassign the timeslot.

The CBR module supports two types of dynamic bandwidth allocation (DBA):

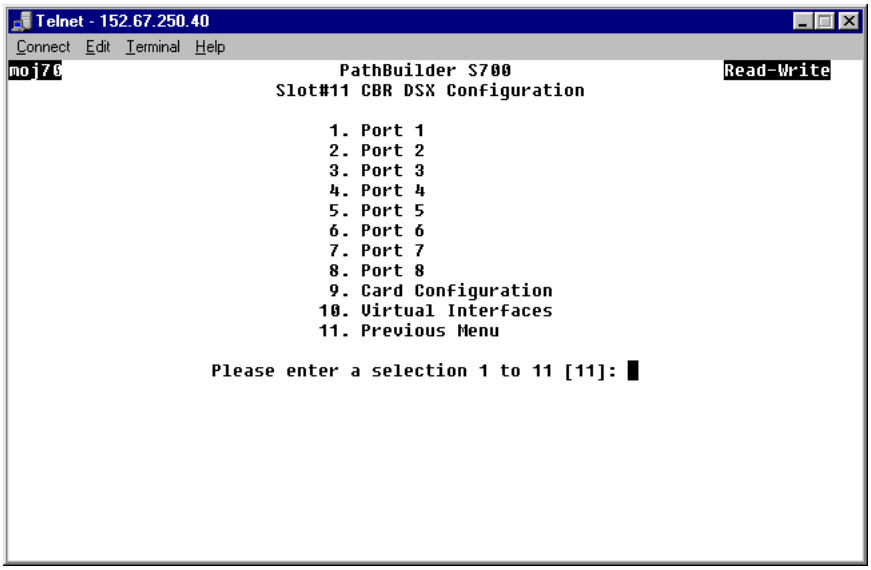
- Structured voice DBA—Stored signaling bits are checked and bandwidth is released when an on-hook (idle) condition is detected.
- Structured data DBA—DSO payload bytes are checked and bandwidth is released when an on-hook (idle) condition is detected.

For details about how DBA works, see "DS0 Signaling and Dynamic Bandwidth Allocation" in Chapter 4. For details about configuring CBR virtual circuits for DBA, see "Configuring CBR Virtual Circuits for DBA" later in this chapter.

To configure a DSX-1 CBR or E1 CBR module, follow these steps:

1 From the List Card menu, select the number corresponding to the slot in which the CBR module is installed. The CBR Configuration Port/Card Selection menu appears, as shown in Figure 132.

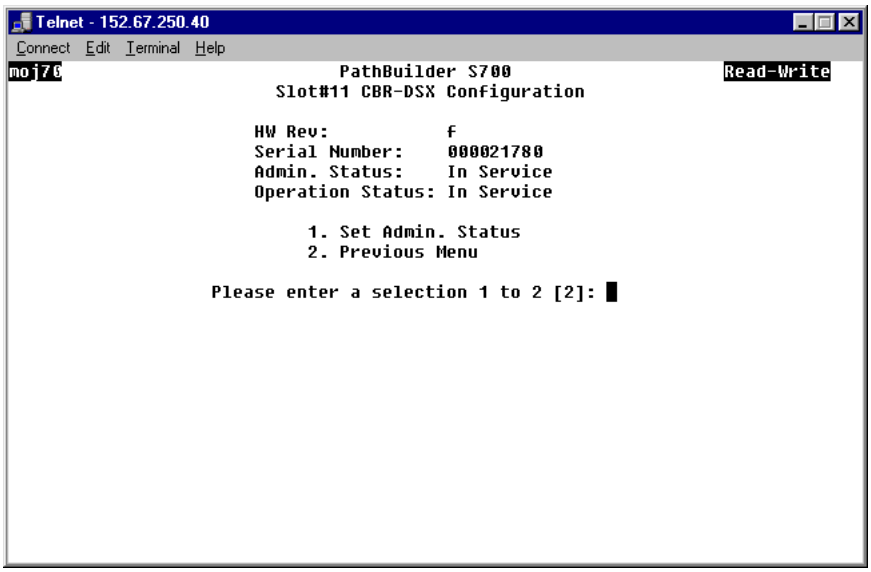
Figure 132 CBR Configuration Port/Card Selection Menu



2 Set the administrative status of the CBR card.

a Select *[5] Card Configuration* to display the CBR DSX or CBR E1 Card Configuration menu. Figure 133 shows the CBR DSX Card Configuration menu. The CBR E1 Card Configuration menu is similar.

Figure 133 CBR DSX Card Configuration Menu



b Select *[2] Set Admin Status* and enter **1** to take the card out of service or **2** to put it into service.

c Select *[2] Previous Menu* to return to the CBR Configuration menu.

3 Configure the CBR ports.

a From the CBR Configuration menu, select the number corresponding to the CBR port you want to configure to display the CBR DSX or CBR E1 Port Configuration menu for that port. The options available on this menu vary, depending whether the *Port Mode* is set to *Unstructured*, *Structured Voice*, or *Structured Data*.

Figure 135 shows a CBR DSX Port Configuration menu for an Unstructured port. shows a CBR DSX Port Configuration menu for a Structured Voice port. shows a CBR DSX Port Configuration menu for a Structured Data port. The CBR E1 Port Configuration menus are similar.

Figure 134 CBR DSX Port Configuration Menu (Unstructured Port

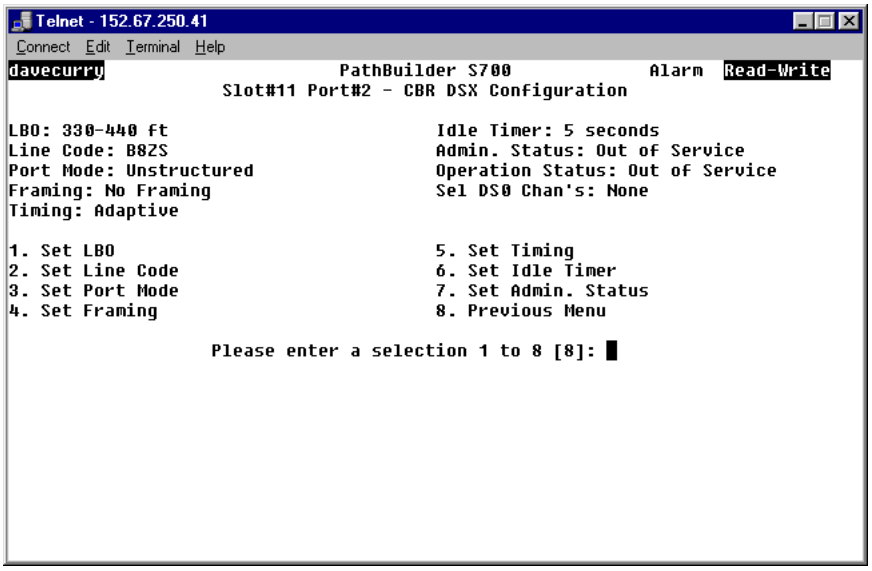


Figure 135 CBR DSX Port Configuration Menu (Structured Voice Port)

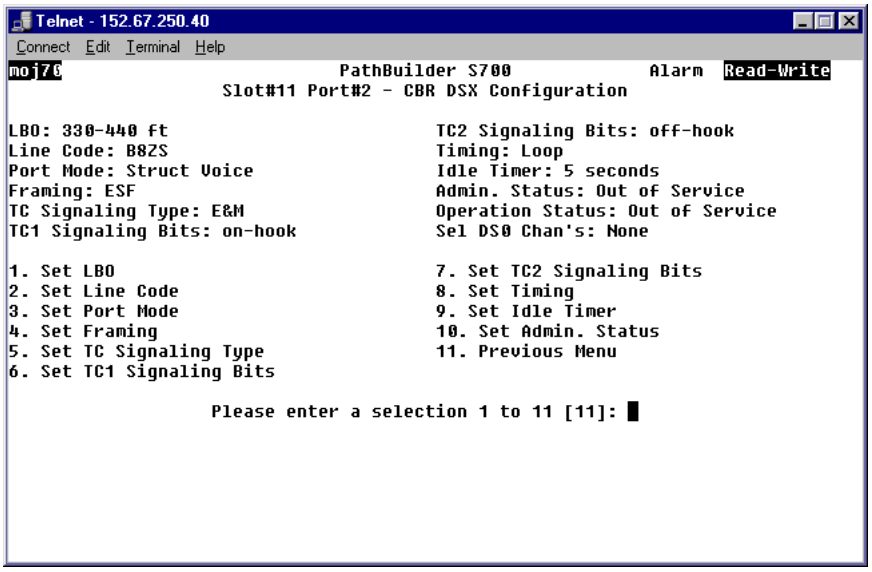
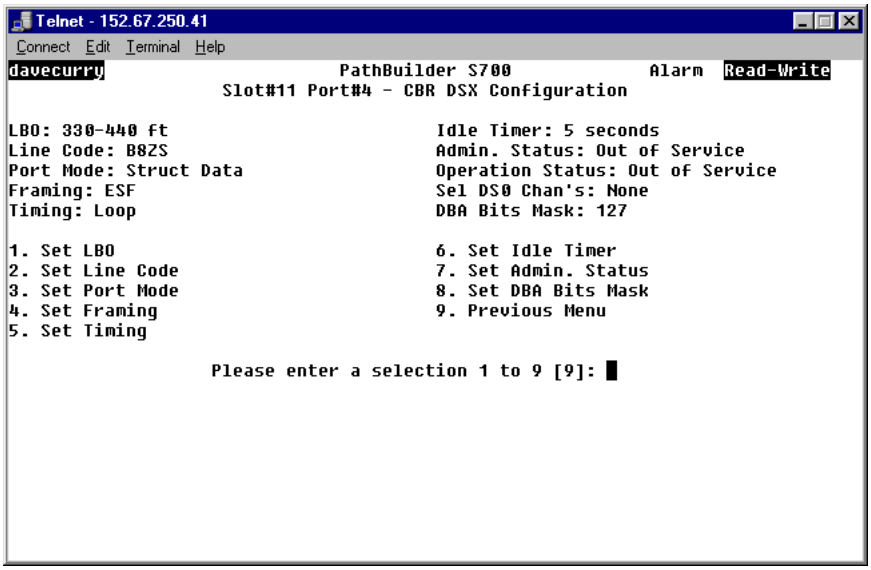


Figure 136 CBR DSX Port Configuration Menu (Structured Data Port)



b Set the following port configuration parameters, as desired.

DSO Channels *are not configurable from the CBR Port Configuration menu. You can assign DSO channels in structured voice or structured data mode only when you add a CBR virtual circuit. See "CBR Module Virtual Circuit Parameters" later in this chapter for details. All available DSO channels are automatically allocated in unstructured mode.*

LBO (DSX-1 CBR only)—Line Build Out. LBO refers to the signal generation/regeneration of the distance between the PathBuilder S700 and the next crossconnect of FOTs (Fiber Optic Terminal system), in feet: *1-100*, *100-200*, *200-300*, *300-400*, *400-500* or *500-600*.

Line Code (DSX-1 CBR only)—The zero code suppression technique configured to the DSX-1 CBR port. Set this parameter to match the service provider or device connection line coding. The default is *B8ZS*. The *Line Code* must match at local and remote ports.

AMI—Alternate mark inversion; a T1 (1.544 Mbps) carrier line coding format whereby successive ones (marks) are alternately inverted.

B8ZS—Binary 8 Zero Substitution; a T1 (1.544Mbps) carrier line coding format used to accommodate "ones density" for clear channel transmission.

Port Mode—The type of service configured to the specified port:

Both Structured Data *and* Structured Voice *modes allow end to end DSO connectivity.*

Structured Data—Structured service provides N x 64 kbit/second capability, where N ranges between 1 and the maximum number of available DSO channels. Structured data service passes traffic with signaling information disabled—it provides for DSO midspan carrier access *without* ABCD signaling bits terminating DS1 or E1 framing at the DSX-1 CBR or E1 CBR interface.

Bandwidth usage will be more efficient if traffic from T1 with ISDN PRI and E1 with common channel signaling (CCS) is carried on ports configured as Structured Data*. This is because when a CBR port is configured as* Structured Data*, only DS0 payload bytes are carried in AAL1 cells. Therefore, an activated CBR virtual circuit built on a port configured as* Structured Data *takes less bandwidth then a similar one built on a port configured as* Structured Voice*.*

Structured Voice—Structured service provides N x 56 kbit/second capability, where N ranges between 1 and the maximum number of available DSO channels. Structured voice service passes traffic with signaling information enabled—it provides for DSO midspan carrier access *with* ABCD signaling bits terminating DS1 or E1 framing at the DSX-1 CBR or E1 CBR interface.

Unstructured—Unstructured service provides DS1 or E1 frame tunneling; it allows the application to utilize the entire available bandwidth at a bit rate of 1.544 Mb/second. T1 framing is optional in this service mode.

Framing—The type of frame organization configured for the DS1 or E1 port interface: *D4* or *ESF* for the DSX-1 CBR module; *G.704* for the E1 CBR module. Set this parameter to match the service provider or device connection framing. The *Framing* must match at local and remote ports.

CAUTION: *A framing mismatch can cause LOF, OOF alarm conditions and result in traffic loss.*

TC Signaling Type (Structured Voice ports only)—This is the type of signaling done between PBXs. This also sets the signaling type used for each of the virtual circuits across this port. The values for TC Signaling are 1=PLAR, 2=E&M, 3=FXO-Loop Start, 4=FXS-Loop Start, 5=FXO-Ground Start, 6=FXS-Ground Start, 7=R2(E1)

For PRI signaling, you must set the TC Signaling Type to PLAR*.*

TC1 Signaling Bits / TC2 Signaling Bits (Structured Voice ports only)—Trunk condition 1 and trunk condition 2 signaling bits: *onhook* or *offhook*. The default for TC1 Signaling Bits is *onhook*, while the default for TC2 Signaling is *offhook*. The default values are usually suitable for PBX applications, but for channel bank applications you should set TC2 Signaling Bits to onhook.

Timing—The type of input clock service configured for the port interface. The default is *System*. The *SRTS* and *Adaptive* options are normally used for voice applications—*SRTS* for unstructured voice applications and *Adaptive* for unstructured voice or data applications.

System—Configures the port interface to use the internal clock as the timing source.

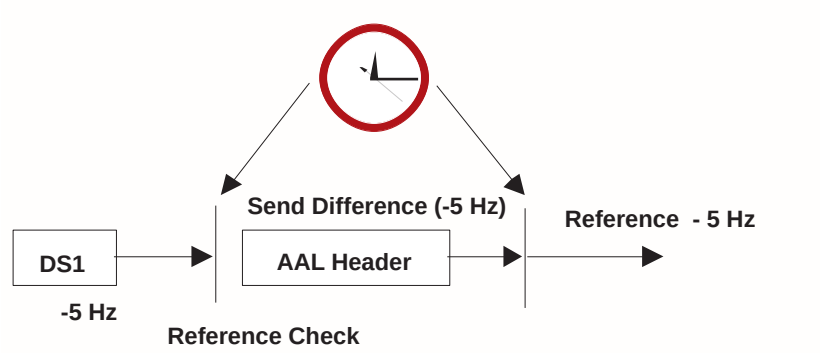
Loop—Configures the port interface to use the input port Rx clock as the timing source; timing is received from the service "loop." Select Loop if the T1 port is used for the network/carrier service termination, in which case the carrier (the service "loop") typically provides the timing source.

SRTS (Unstructured ports only)—Synchronous Residual Time Stamp; a means to measure the service clock frequency against a network-wide synchronization signal. SRTS measures input frequency against the master network clock source and adjusts the line rate by sending residual time stamps in the AAL1 header to the remote end.

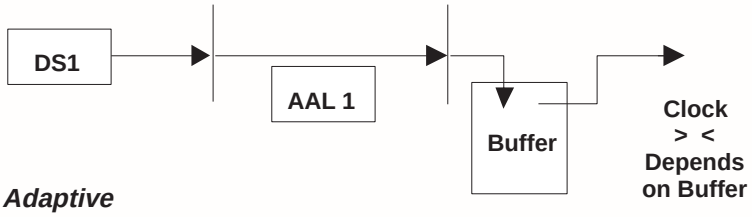
Adaptive (Unstructured ports only)—A non-required network-wide synchronization technique used to regenerate the input service clock. Adaptive timing uses a buffer depth indicator at the receiver to adjust the line rate: the fuller the buffer, the faster the line rate; the emptier the buffer, the slower the line rate.

Figure 137 illustrates the SRTS and Adaptive timing options.

Figure 137 DSX-1 CBR Timing Options



Synchronous Residual Time Stamp (SRTS)



Adaptive

Idle Timer—The length of time with no cells present after which the CBR software shuts off cell transmission and idles the other direction of the virtual circuit: *5*, *15*, *30*, *45*, or *60* seconds. This parameter pertains only to CBR virtual circuits on structured data ports for which the virtual circuit mode has been set to *RS366*. For details about setting the mode for CBR virtual circuits, see "CBR Module Virtual Circuit Parameters" later in this chapter.

DBA Bits Mask (Structured Data ports only)—Dynamic bandwidth allocation bits mask; a numeric code, in the range *1-255*, representing a mask that masks off bits that are not a portion of the idle code. When a DSX-1/E1 CBR port is configured as structured data, all virtual circuits in the port use a preselected *DBA Bits Mask*. The decimal number that represents the *DBA Bits Mask* corresponds to an internal 8-bit value. The default *DBA Bits Mask* is *127*.

The DBA Bits Mask *parameter is designed to accommodate situations in which the PathBuilder S700 must communicate with equipment that uses non-standard signalling patterns. In most cases you should leave this parameter set to its default value.*

CRC-4 (E1 CBR only)—Enables or disables Cyclic Redundancy Check 4 (CRC-4) information. CRC-4 is a framing option that checks for errors in data. It is a communication check for parity/framing and is used for performance monitoring in E1 networks. CRC4 can be enabled only in structured and multi-frame mode.

Admin Status—Administrative status: *Out of Service* or *In Service*.

c Return to the CBR Configuration menu.

d Repeat steps a and b for the other DSX-1 CBR or E1 CBR ports you want to configure.

e Return to the CBR Configuration menu.

4 Configure virtual interfaces for the CBR card.

a From the CBR DSX or CBR E1 Configuration menu, select *[6] Virtual Interfaces* to open the Virtual Interfaces Configuration menu. This menu is the same as the MCPU Virtual Interfaces Configuration menu, shown earlier in this chapter, in Figure 84.

b Configure virtual interfaces as described under "Configuring Virtual Interfaces" earlier in this chapter. You configure virtual interfaces for the CBR card in the same way that you configure virtual interfaces for the MCPU card.

Configuring QSIM/HSIM/FAM Modules

The PathBuilder S700 supports three frame relay modules: QSIM, HSIM, and FAM. The configuration procedure is the same for all three modules, but different parameters are available on the port configuration menu.

Configuring a QSIM, HSIM, or FAM involves the following tasks:

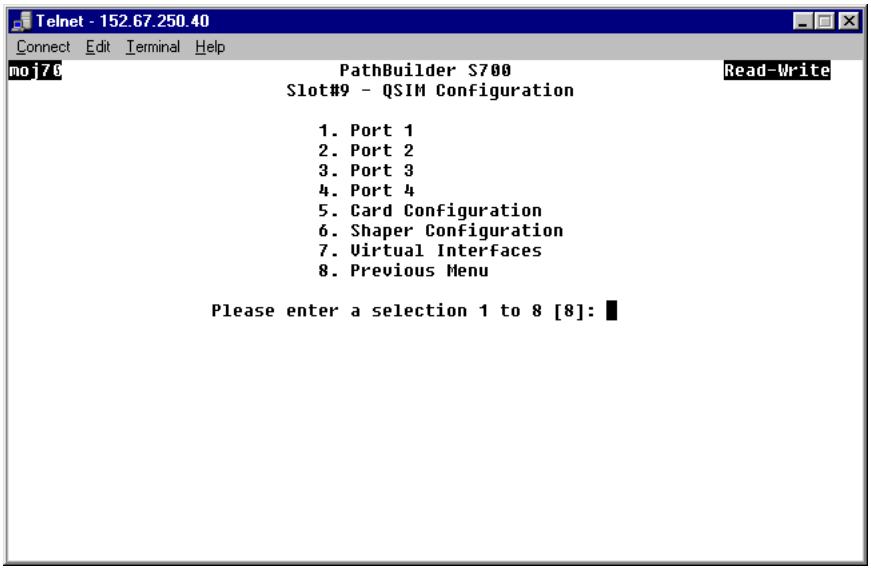
- Configuring individual QSIM/HSIM/FAM ports
- (For Frame Relay ports only) Configuring the QSIM/HSIM/FAM LMI (Local Management Interface)
- Configuring the QSIM/HSIM/FAM card and its input shapers and virtual interfaces

Configuring QSIM/HSIM/FAM Ports

To configure QSIM/HSIM/FAM ports, follow these steps:

1 From the List Card menu, select the number corresponding to the slot in which the QSIM, HSIM, or FAM is installed. The QSIM, HSIM, or FAM Configuration menu appears. Figure 138 shows the QSIM Configuration menu. The HSIM and FAM menus are similar, except that the HSIM Configuration menu lists one port and the FAM Configuration menu lists eight ports.

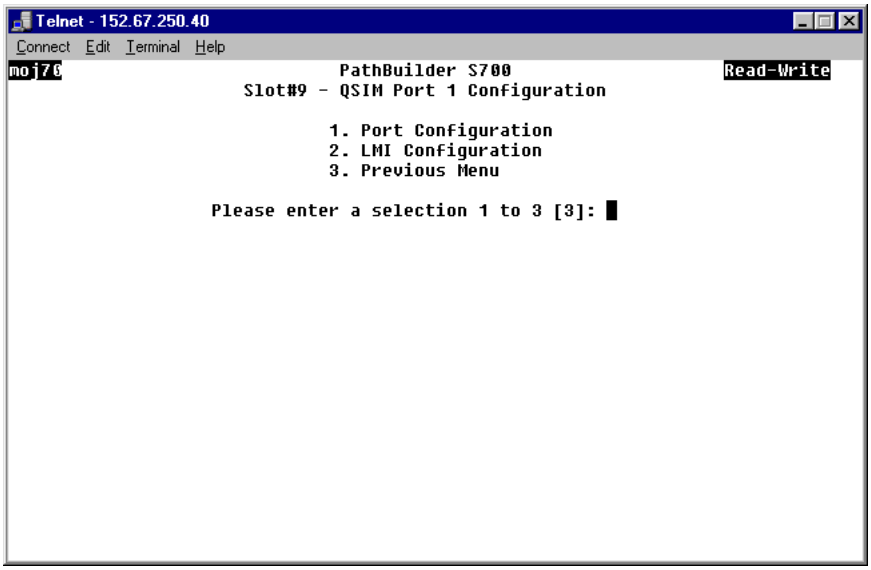
Figure 138 QSIM Configuration Menu



2 Enter the number corresponding to the port you want to configure: **1–8** for the QSIM; **1** for the HSIM; and **1–8** for the FAM. The QSIM, HSIM, or FAM Port Configuration Selection menu appears. This menu provides options that allow you to access menus for configuring port and (for Frame Relay ports) LMI (Local Management Interface) parameters.

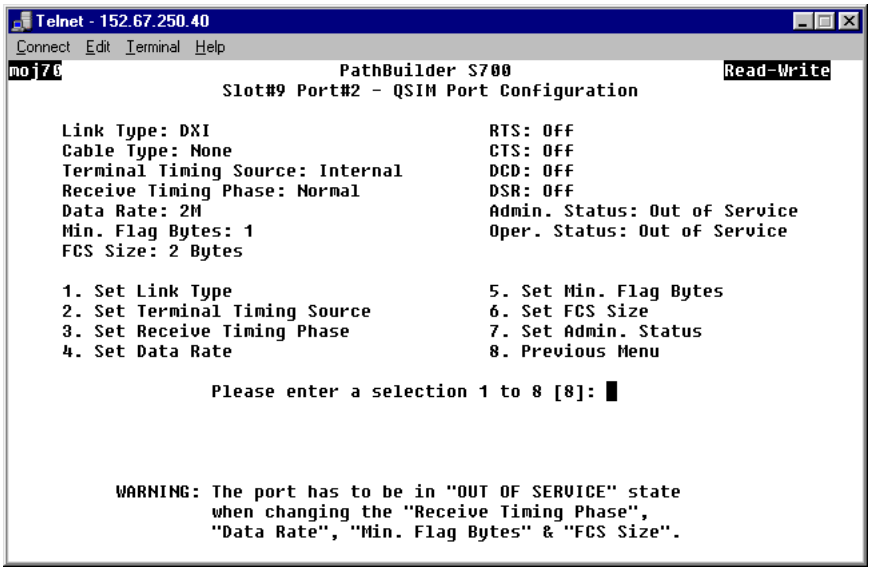
Figure 139 shows the QSIM Port Configuration Selection menu. The HSIM and FAM menus are the same.

Figure 139 QSIM Port Configuration Selection Menu



3 Select *[1] Port Configuration* to display the Port Configuration menu for the selected port. This menu displays the current serial port configuration and provides options that allow you to change certain parameters. It varies depending on the module (QSIM, HSIM, or FAM) and on whether the link type for the port is DXI, HDLC/SDLC, or Frame Relay. Figure 140 shows a QSIM Port Configuration menu for a Frame Relay port.

Figure 140 QSIM Port Configuration Menu (DXI Port)



4 Change the following parameters, as desired:

Link Type—The input/output protocol for encapsulation and SAR to AALS conversion.

DXI—ATM DXI Mode 1A

HDLC/SDLC—HDLC/SDLC frame pass-through

Frame Relay—Frame Relay Interworking (Frame Relay Forum Specification 5 and 8; modes 1 and 2).

DCE/DTE Mode (HSIM only)—The type of cable connected to the port: DCE or DTE. This parameter is configurable for HSIMs only. The QSIM Port Configuration menu displays the Cable Type as a read-only parameter derived automatically from the type of cable connected to the module.

LBO (DS1 FAM only)—Line Build Out. LBO refers to the signal generation/regeneration of the distance between the PathBuilder S700 and the next crossconnect of FOTs (Fiber Optic Terminal system), in feet: *1-100*, *100-200*, *200-300*, *300-400*, *400-500* or *500-600*.

Gain Limit (DS1 FAM only)**—**Setting for the receive signal level: *26* or *36 dB*.

Line Code (DS1 FAM only)—The zero code suppression technique configured to the FAM port. Set this parameter to match the service provider or device connection line coding. The default is *B8ZS*. The *Line Code* must match at local and remote ports.

Framing (DS1 FAM only)—The type of frame organization configured for the T1 port interface: *D4* or *ESF*. Set this parameter to match the service provider or device connection framing.

TDM Mode—*n x 56k* or *n x 64k* (clear channel), depending on the attached equipment.

Timing (DS1 FAM only)**—**The type of input clock service configured for the DS1 FAM module. Set the timing source to *system* if you are using the DS1 FAM module to connect to the network.

System—Configures the DS1 FAM module to use the internal clock as the timing source.

Loop—Configures the DS1 FAM module to use the input port Rx clock as the timing source; timing is received from the service "loop." Select Loop if the DS1 UNI module is used for the network/carrier service termination, in which case the carrier (the service "loop") typically provides the timing source.

Terminal Timing Source—This parameter applies only when the attached cable is DCE type cable. The setting for the Terminal Timing depends on the nature and speed of the device application, but the typical configuration is Internal—the PathBuilder S700 provides the clock for the device application. In any case, the Terminal Timing Source setting for the PathBuilder S700 QSIM port must be the opposite of that for the device. For example, if the Terminal Timing Source for the router is set to Internal, then you must set the Terminal Timing Source for the QSIM port to External.

Internal—The terminal receives clocking over DCE cable *from* the PathBuilder S700. In other words, the PathBuilder S700 provides the clock to clock in the data traffic from a router or other data device.

External—The terminal provides port clocking over the DCE cable *to* the PathBuilder S700. In other words, The PathBuilder S700 accepts the clock for data from the router or other data device.

Receive Timing Phase—Receive timing phase control. This parameter applies only when the attached cable is DCE type cable. Depending on the speed of the device application and the clock phases, particularly those of the return clock, you may have to set *Receive Timing Phase* to *Inverted* (invert the clock) to ensure correct clock and data phase. This option is used most often to correct for cable length delays when *Terminal Timing* is set to *Internal*.

Normal—The receive timing from the remote endpoint (node) is normal clocking.

Inverted—The receive timing from the remote endpoint (node) is inverted clocking.

Data Rate—The data rate supported by the port: *64K*, *128K*, *256K*, *512K*, *1M*, *6M*, or *8M* for the QSIM; *1.5M* to *20M* for the HSIM; *64K* to *1.5M* for the FAM. This parameter applies only when the attached cable is DCE type cable. The *Data Rate* setting also allows you to optimize the entire WAN ATM application by traffic engineering your ATM access applications so as to maintain traffic flow across the network.

Min. Flag Bytes—The minimum number of flag bytes required to distinguish a frame. Select *1* (1 byte) or *2* (2 bytes). This parameter is valid only for HDLC/SDLC data.

FCS Size—The number of bytes to use for FCS (Frame Check Sequence) calculation for each frame. FRC is the CRC remainder sent at the end of a frame. Select *1* (2 bytes) or *2* (4 bytes). This parameter is valid only for HDLC/SDLC data.

Admin Status—Administrative status: *Out of Service* or *In Service*.

QSIM/HSIM/FAM Performance at Small Frame Sizes

Note that this section pertains to QSIM, HSIM, and FAM performance with traffic running at small frame sizes. Table 37, Table 38, and Table 39 describe the configurations supported when the QSIM, HSIM, and FAM, respectively, are running at small frame sizes.

In general, the maximum total throughput for the QSIM/HSIM/FAM is 31250 packets per second (pps). This is for full duplex traffic. Cases involving small size frames requires high processing capacity when compared to that of large size frames. With small size frames, test results show the PPS performance listed in the following tables. Note that the maximum PPS is 31250.

Table 37 QSIM Performance at Small Frame Sizes

CLK rate (MHz)	Frame Size (Byte)	Data Rate for port (Mbps)	Max.Packet rate for port (pps)	number of active ports	packet rate for card (duplex) (pps)
2	64	2	3906	4	31248
4	64	4	7751	2	31004
	64	4	1504	4	12032
	128	4	635	4	5080
	256	4	830	4	6640
8	64	8	9435	1	18870
	64	8	1757	2	7028
	64	8	977	3	5862
	64	8	937	4	7496
	128	8	215	4	1720
	256	8	147	4	1176

Table 38 HSIM Performance at Small Frame Sizes

CLK rate (MHz)	Frame Size (Byte)	Data Rate for port (Mbps)	max.packet rate for port (pps)	number of loops	packet rate for card (duplex) (pps)
1	64	1	1938	1	3876
	64	1	1938	2	7752
	64	1	1938	3	11628
	64	1	1938	4	15504
	64	1	1938	5	19380
	128	1	985	1	1970
	128	1	985	3	5910
	128	1	985	5	9850
2	64	2	3875	1	7750
	64	2	3875	3	23250
	64	2	2247	5	22470
	128	2	1968	3	11808
	128	2	1348	5	13480
4	64	4	7751	1	15502
	64	4	1367	3	8202
	64	4	781	5	7810
	128	4	3937	1	7874
	128	4	3937	3	23622
	128	4	1270	5	12700
8	64	8	9402	1	18804
	64	8	605	5	6050
	128	8	7462	1	14924
	128	8	654	5	6540

Table 39 FAM Performance at Small Frame Sizes

Frame Size	Max. Frames per second on each port	Number of Active Ports	Total Packets on card (duplex)
64	2908	4	23264
	2908	5	23264
	2695	6	32340
	1796	7	25144
	1328	8	21248
128	1460	4	11680
	1460	6	17520
	1460	8	23360

Configuring the QSIM/HSIM/FAM Local Management Interface

To configure the QSIM/HSIM/FAM Local Management Interface (LMI), follow these steps:

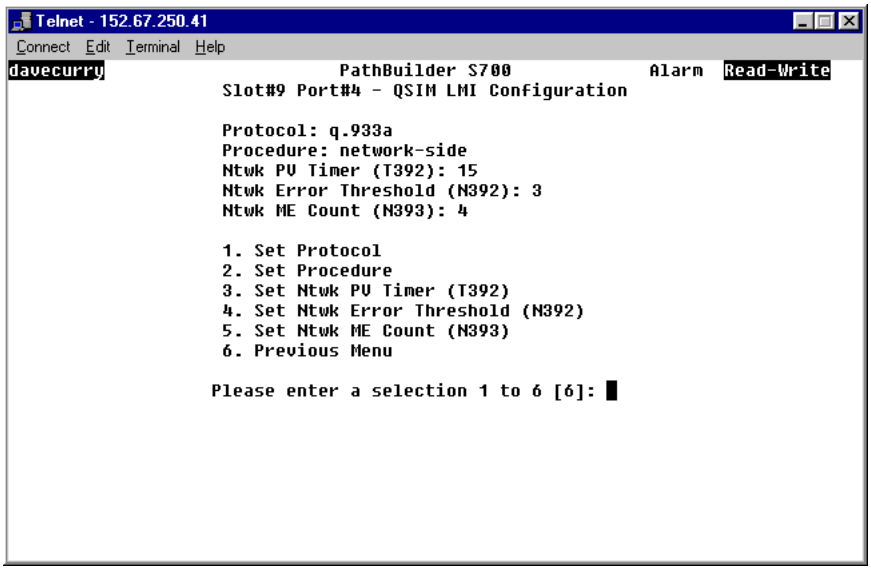
LMI configuration applies only to Frame Relay ports. The LMI Configuration menu is not available if the QSIM, HSIM, or FAM port is configured as a DXI or HDLC/SDLC port.

1. From the List Card menu, select the number corresponding to the slot in which the QSIM, HSIM, or FAM is installed. The QSIM, HSIM, or FAM Configuration Port/Card Selection menu appears, as shown earlier in Figure 138.
2. Select the number corresponding to the port you want to configure: **1–4** for the QSIM; **1** for the HSIM; **1–8** for the FAM. The QSIM, HSIM, or FAM Port Configuration Selection menu appears, as shown earlier in Figure 139.
3. Select *[2] LMI Configuration* to display the LMI Configuration menu for the selected port. This menu displays the LMI configuration and provides options that allow you to change certain parameters.

   LMI configuration relates to the periodic polling that is performed between pairs of Frame Relay devices to determine the status of PVC connections and to verify the link integrity. This polling is done through a procedure known as *Status Enquiry*. Two types are polling are performed: full status (FS) and link integrity verification (LIV). Full status polling also includes link integrity verification.

   Figure 141 shows the QSIM LMI Configuration menu. The HSIM and FAM LMI Configuration menus are similar.

Figure 141 QSIM LMI Configuration Menu



4 Change the following parameters, as desired:

Protocol—The protocol specified for the Status Enquiry procedure: *none*, *q.933a*, or *t1.617d*.

Procedure—Specifies whether the PathBuilder S700 will be designated as the user-side, the network-side, or bidirectional in the period polling performed between frame relay devices.

- If the PathBuilder S700 is configured as the network side unit, set the following additional parameters:

  Ntwk PV Timer (T392)—Network Polling Verification Timer. When the unit is configured as the network side unit, the user-side unit sends the Status Enquiry request. The Network Polling Verification acts on the user initiated-request and checks whether or not it has any new information to report, based on the specified timer.

  Ntwk Error Threshold (N392) / Ntwk ME Count (N393)—These parameters are related. The *Ntwk ME (Monitored Event) Count* is the threshold period that you set to determine a service-affecting condition. The unit monitors events—receipt STATUS ENQUIRY messages or expiration of polling timers—for the number of seconds (*3..10*) that you specify. Within this specified *Ntwk ME Count* period, if an error occurs within the number of seconds that you specify as the *Ntwk Error Threshold* (*3..10*), the system declares an error.

- If the PathBuilder S700 is configured as the user side unit, set the following additional parameters:

  User LIV Polling Timer (T391)—The time interval (in seconds) at which Status Enquiry occurs for link integrity verification (LIV) polling: *5..180*.

Set this parameter at a higher value than the Network PV Timer *parameter on the network side unit.*

User FS Polling Counter (N391)—The time interval (in seconds) at which Status Enquiry occurs for full status (FS) polling: *1..255*.

User Error Threshold (N392) / User ME Count (N393)—These parameters are related. The *User ME (Monitored Event) Count* is the threshold period that you set to determine a service-affecting condition. The unit monitors events—receipt STATUS ENQUIRY messages or expiration of polling timers—for the number of seconds (*3..10*) that you specify. Within this specified *User ME Count* period, if an error occurs within the number of seconds that you specify as the *User Error Threshold* (*3..10*), the system declares an error.

You must set the User Error Threshold *to a lower value than that of the* User ME Count.

Configuring QSIM/HSIM/FAM Cards

Configuring a QSIM/HSIM/FAM card involves the following tasks:

- Configuring the card itself
- Configuring input shapers
- Configuring virtual interfaces

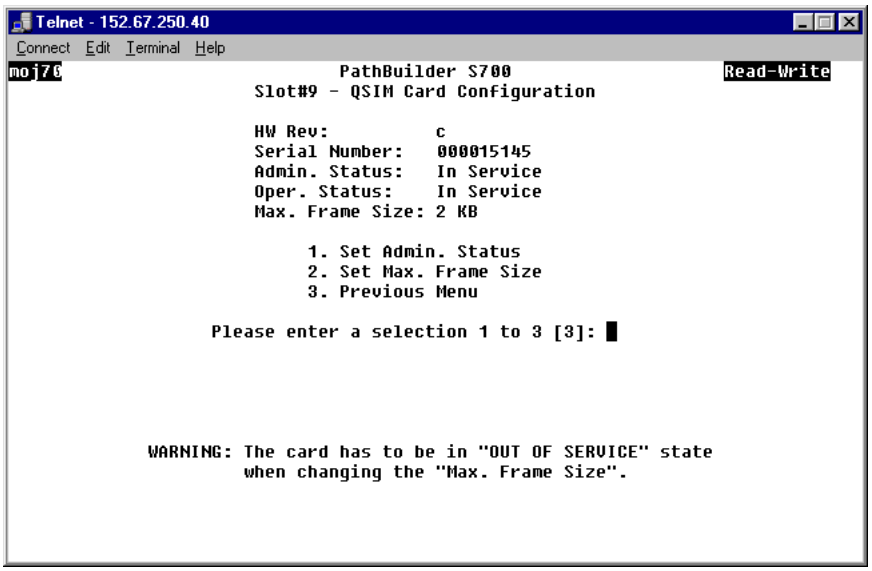
To configure the QSIM/HSIM/FAM card, follow these steps:

1 Configure the card itself.

a From the List Card menu, select the number corresponding to the slot in which the QSIM, HSIM, or FAM is installed: [4], [5], or [6]. The QSIM Configuration menu, shown earlier in Figure 138, appears.

b Select *[5] Card Configuration* (*[9] Card Configuration* on the FAM menu) to display the QSIM, HSIM, or FAM Card Configuration menu. Figure 142 shows the QSIM Card Configuration menu. The HSIM and FAM Card Configuration menus are the same. The QSIM, HSIM, and FAM Card Configuration menus display the current QSIM/HSIM/FAM card configuration and provide options that allow you to change certain parameters.

Figure 142 QSIM Card Configuration Menu



c If the *Admin Status* of the card is *In Service*, select *[1] Set Admin. Status* and enter *[1]* to take the serial card out of service.

You must take the card out of service before you can change any configuration settings.

d Set the following parameter as desired:

Max. Frame Size—The maximum frame size supported by the serial card: *2KB*, *4KB*, or *8KB*. This value must match the maximum frame size for the device interface to which the PathBuilder S700 is being connected. For example, if the maximum frame size being transmitted to the PathBuilder S700 QSIM from a Frame Relay Access Device (FRAD) is *4KB*, then you must set the *Maximum Frame Size* for the QSIM/HSIM card to *4KB*.

If you change the Max. Frame Size *setting, you will have to reset the card.*

For information about QSIM, HSIM, and FAM performance at small frame sizes, see "QSIM/HSIM/FAM Performance at Small Frame Sizes" earlier in this section.

e Return to the QSIM, HSIM, or FAM Configuration menu.

2 Configure input shapers for the QSIM/HSIM/FAM card.

a Select *[6] Shaper Configuration* (*[10] Shaper Configuration* on the FAM menu) to open the QSIM, HSIM, or FAM Shapers screen. This screen is the same as the MCPU Shapers screen, shown earlier in this chapter in Figure 88.

b Set the following input shaper parameters for the QSIM, HSIM, or FAM card:

- Peak Cell Rate (PCR)
- Sustained Cell Rate (SCR)
- Maximum Burst Size (MBS)

For detailed instructions about configuring input shapers, see "Configuring Input Shapers" earlier in this chapter.

c Return to the QSIM, HSIM, or FAM Configuration menu.

3 Configure virtual interfaces for the QSIM, HSIM, or FAM card.

a Select *[7] Virtual Interfaces* (*[11] Virtual Interfaces* on the FAM menu) to open the QSIM, HSIM, or FAM Virtual Interfaces Configuration menu. This menu is the same as the MCPU Virtual Interfaces menu, shown earlier in Figure 84.

b Configure virtual interfaces as described under "Configuring Virtual Interfaces" earlier in this chapter. You configure virtual interfaces for the QSIM, HSIM, or FAM card in the same way that you configure virtual interfaces for the MCPU card.

Configuring Virtual Circuits

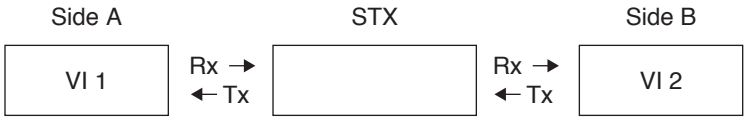
Once you have configured the PathBuilder S700's modules and ports, you can start setting up virtual circuits. A virtual circuit is a bidirectional path between data ports of connecting ATM units. You should have a circuit plan developed in advance.

The PathBuilder S700 supports both VPCs (virtual path connections) and VCCs (virtual channel connections). A virtual path is an aggregate collection of virtual channels for the purpose of assigning the channels to a single physical layer. A virtual channel is a connection between data ports.

- You define a VPC at the connecting units by assigning it a Virtual Path Identifier (VPI) for each direction of transmission.
- You define a VCC at the connecting units by assigning it a Virtual Path Identifier (VPI) and a Virtual Channel Identifier (VCI) for each direction of transmission. You can connect one or more virtual circuits to a data port by assigning each a different VPI and VCI. The VPI and VCI numbers are normally assigned as a pair: VPI/VCI.

You configure a virtual circuit between virtual interfaces from side A to side B, with all traffic passing through an STX, as shown in Figure 143.

Figure 143 Two Sides of a VC Configuration



Note that Receive (Rx) and Transmit (Tx) directions are from the perspective of the STX module. Assign the Rx and Tx VPI/VCI for Side A and Side B based on the diagram shown in Figure 143.

When you add a virtual circuit, you make a connection from the selected port to for traffic to flow through the PathBuilder S700 and across the ATM WAN service. Typically, the VPI and VCI numbers for one side of the circuit are assigned by the network service provider or local IS administrator—depending on whether your network is a public or private ATM network.

The port VPI/VCI ATM circuit designators must match the application being supported. For example, if an OC3/STM-1 multi-mode fiber module is installed in the Side B slot of the PathBuilder WAN Access Switch and is connected to a LAN ATM switch device, then the Rx VPI/VCI for the ATM LAN interface must match the Tx VPI/VCI for the OC3/STM-1 UNI module and vice versa. This ensures the first step in making the connection into the PathBuilder S700.

Summary of Supported VPI/VCI Ranges and Number of Connections

Table 40 lists the VPI and VCI ranges and number of connections for all supported card types.

The VPI/VCI ranges for the QSIM, HSIM, and FAM depend on the link type you have chosen (DXI, HDLC/SDLC, or Frame Relay).

Table 40 Summary of VPI/VCI Ranges and Supported Number of Connections

Card Type	VPI/VCI Range for VPC only (Rx = Tx)	VPI/VCI Range for VCC (Rx = Tx)	Supported Number of Connections per Module
DS3/E3/OC3/STM-1UNI	VPI = 0... 255	VPI = 0... 255 VCI = 1... N*	2048
DS1/E1 IMA UNI	VPI = 0... 31	VPI = 0...31 VCI = 1... K**	256 per IMA group
Ethernet/QSIM/HSIM/FAM		VPI = 0...255 VCI = 1... N	256
DSX-1 CBR		VPI = 0...255 VCI = 1... N	24 VCs per port (24 timeslots)
E1 CBR		VPI = 0...255 VCI = 1... N	32 VCs per port (32 timeslots)

* N = (2048 - #VPIs-for-VCC) / #VPIs-for-VCC = 2047 for the default 1 VPI-for-VCC
**K = (32 - #VPIs-for-VCC) / #VPIs-for-VCC = 31 for the default 1 VPI-for-VCC

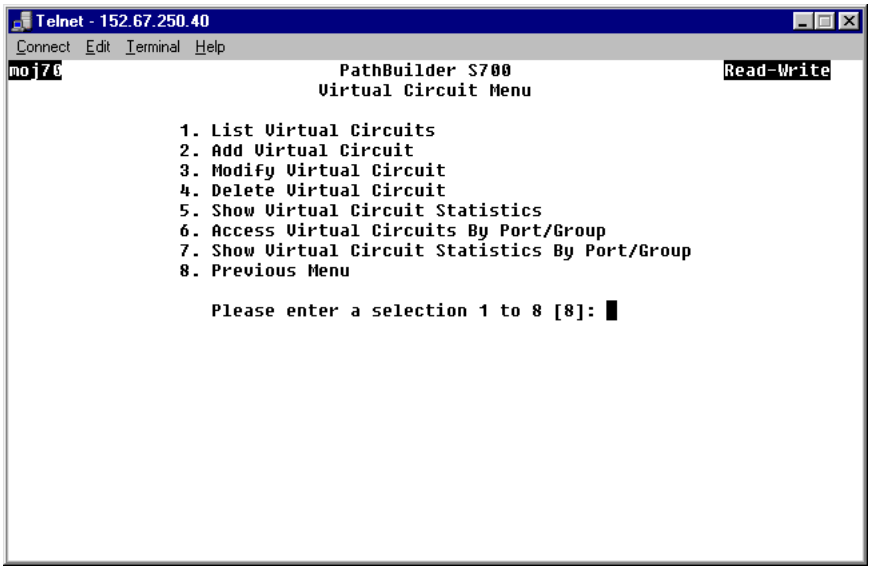
For specific information about the number of connections supported for each card, please see the PathBuilder S700 ATM WAN Access Switch Release Notes.

Adding Virtual Circuits

To define a new virtual circuit, follow these steps:

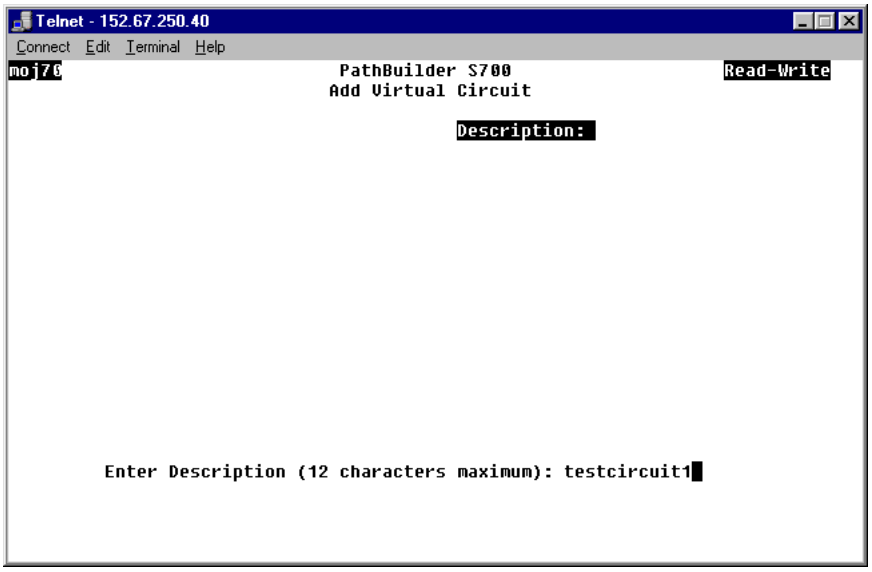
1 From the Configuration Management menu, select *[2] Manage Circuit* to display the Virtual Circuit Menu, shown in Figure 144.

Figure 144 Virtual Circuit Menu



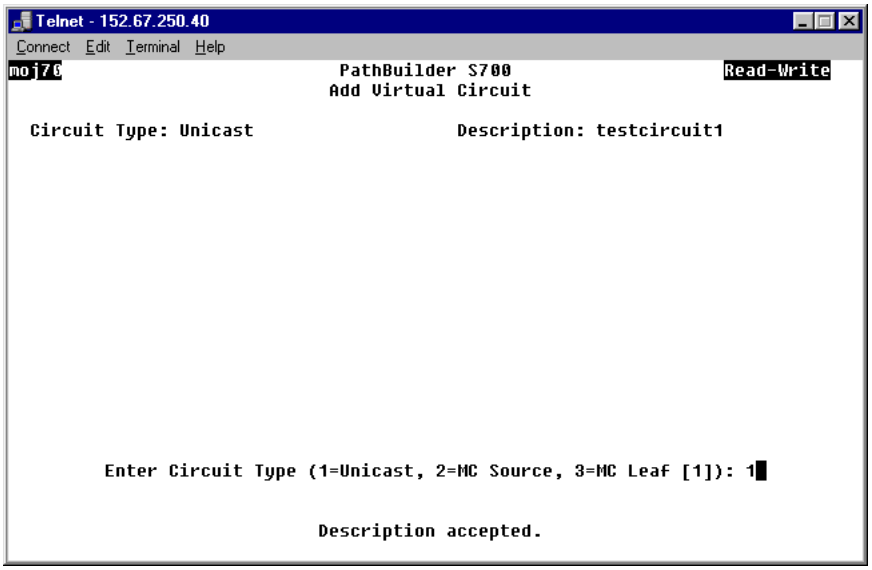
2 Select *[2] Add Virtual Circuit* to open the Add Virtual Circuit screen. As shown in Figure 145, this screen prompts you to enter a description for the circuit.

Figure 145 Initial Add Virtual Circuit Screen



3 Enter a description for the virtual circuit you are defining. After you enter a description, you are prompted to specify the circuit type, as shown in Figure 146.

Figure 146 Add Virtual Circuit Screen—Selecting the Circuit Type



4 Configure a *Unicast*, *MC Source*, or *MC Leaf* circuit, as described in the following subsections.

- A *Unicast* circuit is a bidirectional circuit.
- *MC Source* and *MC Leaf* circuits are both multicast circuits—circuits which are to be multicast over other virtual circuits.
  - A *MC Source* (multicast source) circuit indicates the source of the multicast.
  - A *MC Leaf* (multicast leaf) circuit indicates the replication destination. It is associated with a *MC Source* circuit.

Before you can configure a MC Leaf circuit, you must configure at least one MC Source circuit.

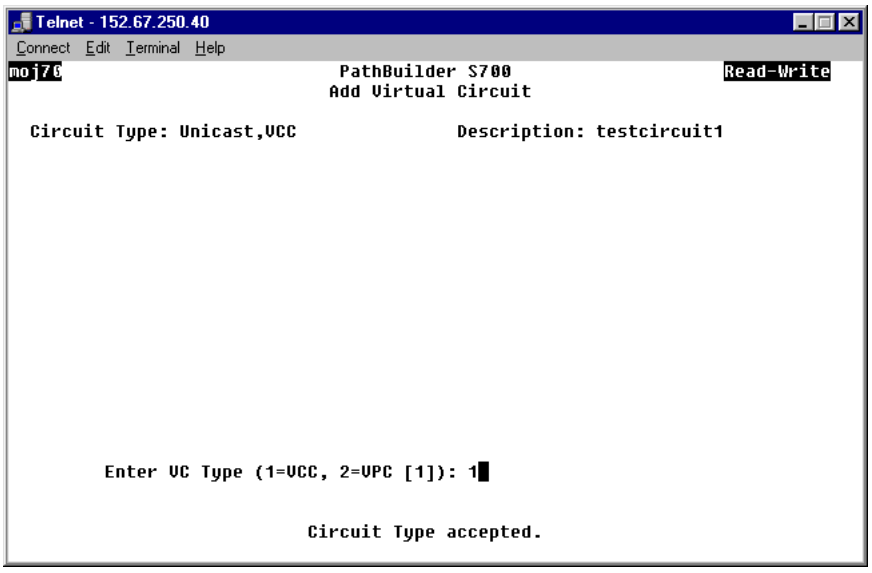
Configuring Unicast Virtual Circuits

To configure a unicast circuit, enter a circuit description, as described under "Adding Virtual Circuits" earlier in this section, then follow these steps from the Add Virtual Circuit screen shown in Figure 146:

1 Enter **1** to specify the circuit type as *Unicast*.

You are prompted to specify the VC connection type of the circuit you are configuring, as shown in Figure 147.

Figure 147 Add Virtual Circuit Screen—Selecting the VC Connection Type



2 Enter the number corresponding to the type of virtual circuit connection you want to configure: *VCC* or *VPC*. The connection type determines how the VPI and VCI are translated.

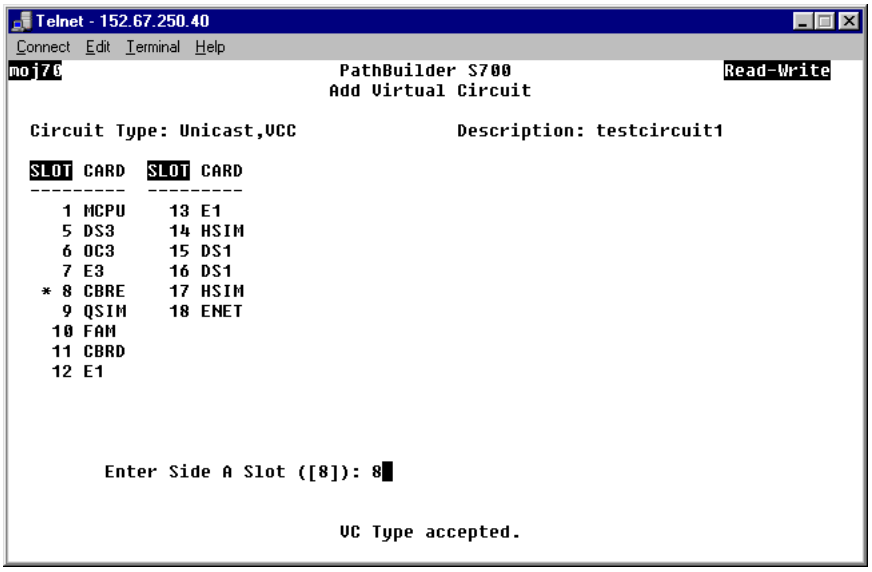
VCC (virtual channel connection)—You can use this connection type for circuit between non-UNI and UNI cards and between UNI and UNI cards; both the VPIs and the VCIs will be translated.

VPC (virtual path connection)—You can use this connection type only for circuits between UNI and UNI cards; only the VPIs will be translated.

To operate a circuit as a VP, set the connection type to VPC.

The Add Virtual Circuit Screen lists the cards available for side A of the circuit, by slot number, and prompts you to select a slot number, as shown in Figure 148.

Figure 148 Add Virtual Circuit Screen—Specifying the Slot # for Side A



3 Enter the slot number for the card that you want to define as side A of the virtual circuit. For example, from the Add Virtual Circuit screen show in Figure 148, if you wanted to select the E3 UNI card as side A, you would enter **7**.

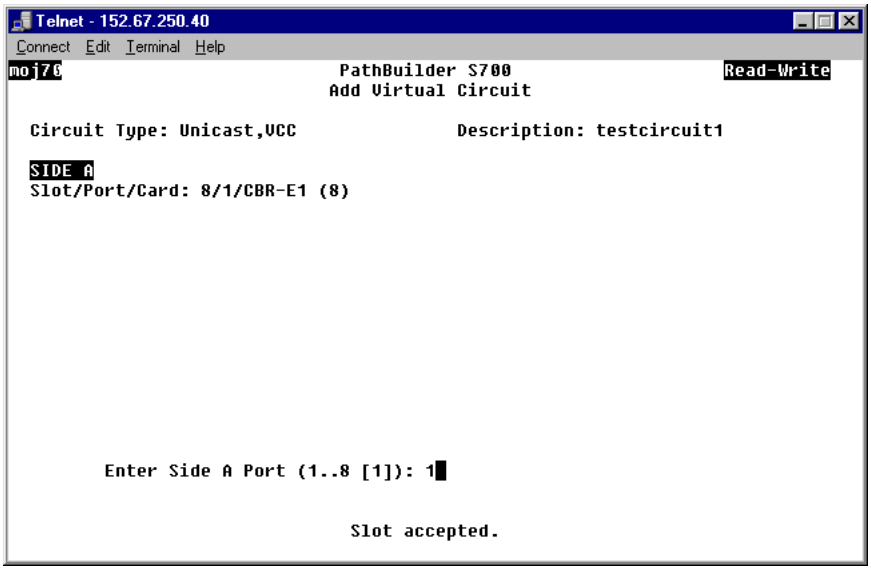
The default slot number is indicated by an asterisk. To select the default slot number, simply press [Enter].

You can also create an in-band circuit between two nodes by defining the PathBuilder S700 MCPU slot—with its own IP address—as one side of the virtual circuit. This enables you to manage a remote hub from a local network management station. See "Configuring In-band Management" in Chapter 3 for details.

After you enter the slot number, the Add Virtual Circuit screen displays the selected slot number and card type, lists the parameters you will enter for side A of the circuit, and prompts you to set the first parameter, as shown in Figure 149. For parameter descriptions, by card, see "Virtual Circuit Parameters" later in this chapter.

If the card you select has multiple ports, you are prompted to specify the port number as the first parameter for side A of the circuit.

Figure 149 Add Virtual Circuit Screen—Entering the First VC Parameter for Side A



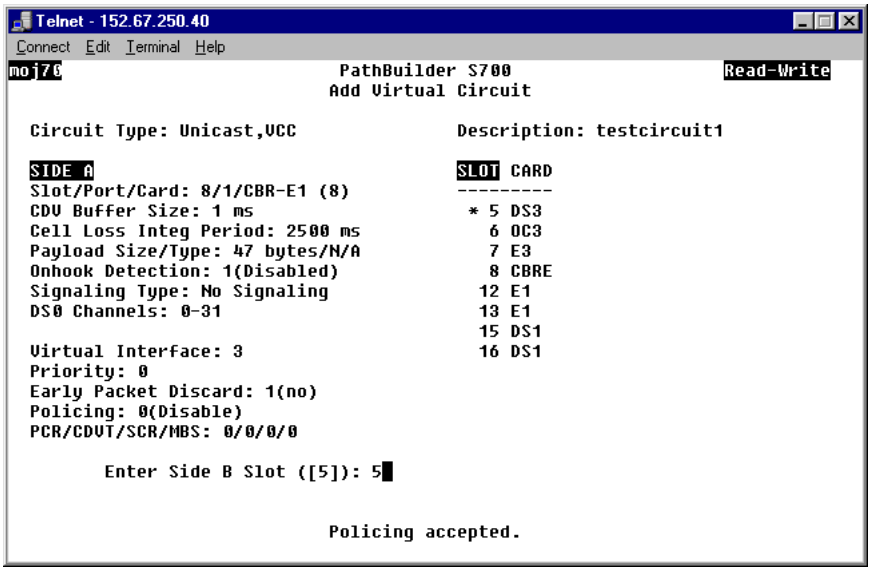
4 Follow the prompts that appear at the bottom of the screen, pressing [Enter] after each entry. Default values are listed in square brackets ([ ]) at the end of each prompt.

Your settings are added to the list of parameters at the top of the screen as you enter them. You must enter a setting for all the parameters for which you are prompted in order to add a circuit. Press [Delete] to back up to a previous selection.

Some parameters that appear on the Add Virtual Circuit screen may not apply to the particular circuit you are configuring. The system skips any non-applicable parameters and does not allow you to set them. In addition, certain parameters may be displayed for information only; you cannot change these read-only values.

When you have entered a setting for each parameter on side A of the circuit, the Add Virtual Circuit again displays the list of available PathBuilder S700 cards, by slot number, and prompts you to enter a slot number for side B of the circuit, as shown in Figure 150.

Figure 150 Add Virtual Circuit Screen—Selecting the Card for Side B of the Circuit



5 For side B of the circuit, select the slot number corresponding to the module through which you are connected to the network.

After you enter the last parameter for side B, the following prompt appears at the bottom of the screen:

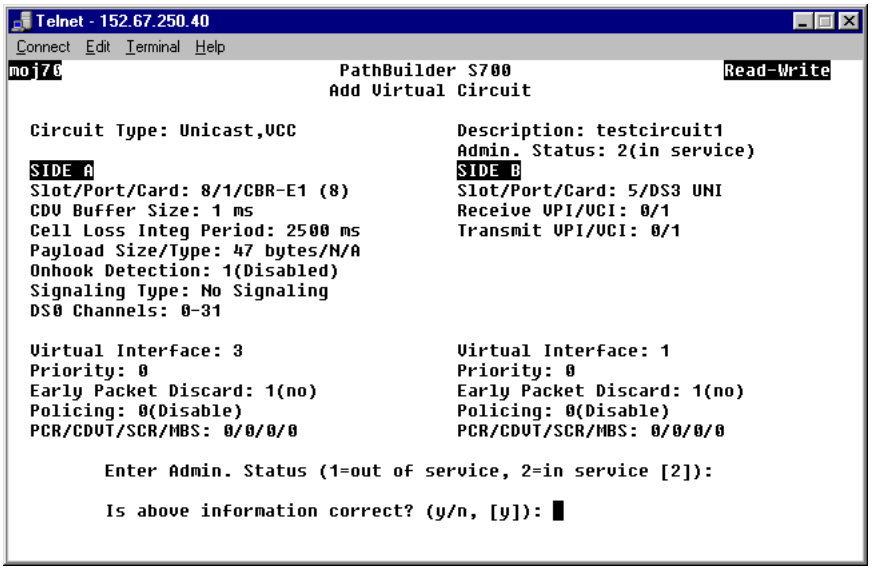
```
Enter Admin Status (1 = Out of Service, 2 = In Service)
```

6 Set the administrative status of the circuit as desired.

The following prompt appears at the bottom of the screen, as shown in Figure 151:

```
Is above information correct? (y/n, [y]):
```

Figure 151 Completed Unicast Virtual Circuit



7 Enter **y** to confirm your configuration. A message similar to the following appears at the bottom of the screen:

```
VC has been added
Press any key to continue
```

Configuring Multicast Source Virtual Circuits

To configure a multicast source circuit, enter a circuit description, as described under "Adding Virtual Circuits" earlier in this section, then follow these steps from the Add Virtual Circuit screen shown in Figure 146:

1. Enter **2** to specify the circuit type as *MC Source*.

   The Add Virtual Circuit Screen lists the cards available for side A of the circuit, by slot number, and prompts you to select a slot number, as shown earlier in Figure 148.

2. Enter the slot number for the card that you want to define as side A of the virtual circuit.

   The default slot number is indicated by an asterisk. To select the default slot number, simply press [Enter].

   After you enter the slot number, the Add Virtual Circuit screen displays the selected slot number and card type, lists the parameters you will enter for side A of the circuit, and prompts you to set the first parameter, as shown earlier in Figure 149. For parameter descriptions, by card, see "Virtual Circuit Parameters" later in this chapter.

   If the card you select has multiple ports, you are prompted to specify the port number as the first parameter for side A of the circuit.

3. Follow the prompts that appear at the bottom of the screen, pressing [Enter] after each entry. Default values are listed in square brackets ([ ]) at the end of each prompt.

   Your settings are added to the list of parameters at the top of the screen as you enter them. You must enter a setting for all the parameters for which you are prompted in order to add a circuit. Press [Delete] to back up to a previous selection.

   Some parameters that appear on the Add Virtual Circuit screen may not apply to the particular circuit you are configuring. The system skips any non-applicable parameters and does not allow you to set them. In addition, certain parameters may be displayed for information only; you cannot change these read-only values.

   After you enter the last parameter for side A, the following prompt appears at the bottom of the screen:

   ```
   Enter Admin Status (1 = Out of Service, 2 = In Service)
   ```

   A multicast source virtual circuit has no side B.

4. Set the administrative status of the circuit as desired.

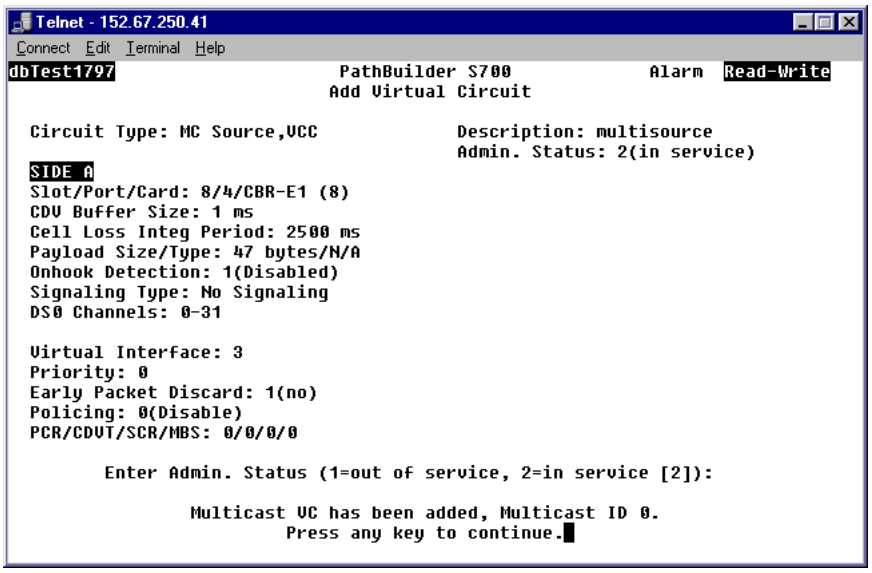
   The following prompt appears at the bottom of the screen:

   ```
   Is above information correct? (y/n, [y]):
   ```

5. Enter **y** to confirm your configuration.

   A message confirming that the circuit has been added appears at the bottom of the screen, as shown in Figure 152.

Figure 152 Completed Multicast Source Virtual Circuit



Configuring Multicast Leaf Virtual Circuits

To configure a multicast source circuit, enter a circuit description, as described under "Adding Virtual Circuits" earlier in this section, then follow these steps from the Add Virtual Circuit screen shown in Figure 146:

1 Enter **3** to specify the circuit type as *MC Leaf*.

Because each multicast leaf circuit is associated with a specific multicast source circuit, you must configure at least one multicast source circuit before you can configure a multicast leaf circuit.

You are prompted to enter the multicast ID of the multicast source circuit with which you want to associate the multicast leaf circuit.

If necessary, use the List Virtual Circuit screen—described under "Viewing Existing Virtual Circuits" later in this chapter—to determine the multicast ID of the desired multicast source circuit.

2 Enter the appropriate multicast ID.

The configuration parameters for the multicast source circuit you specified appear in the side A section of the Add Virtual Circuit screen, and you are prompted to enter a slot number for side B of the circuit.

3 Enter the slot number for the card that you want to define as side B of the virtual circuit.

The default slot number is indicated by an asterisk. To select the default slot number, simply press [Enter].

After you enter the slot number, the Add Virtual Circuit screen displays the selected slot number and card type, lists the parameters you will enter for side B of the circuit, and prompts you to set the first parameter. For parameter descriptions, by card, see "Virtual Circuit Parameters" later in this chapter.

If the card you select has multiple ports, you are prompted to specify the port number as the first parameter for side B of the circuit.

4 Follow the prompts that appear at the bottom of the screen, pressing [Enter] after each entry. Default values are listed in square brackets ([ ]) at the end of each prompt.

Your settings are added to the list of parameters at the top of the screen as you enter them. You must enter a setting for all the parameters for which you are prompted in order to add a circuit. Press [Delete] to back up to a previous selection.

Some parameters that appear on the Add Virtual Circuit screen may not apply to the particular circuit you are configuring. The system skips any non-applicable parameters and does not allow you to set them. In addition, certain parameters may be displayed for information only; you cannot change these read-only values.

After you enter the last parameter for side B, the following prompt appears at the bottom of the screen:

```
Enter Admin Status (1 = Out of Service, 2 = In Service)
```

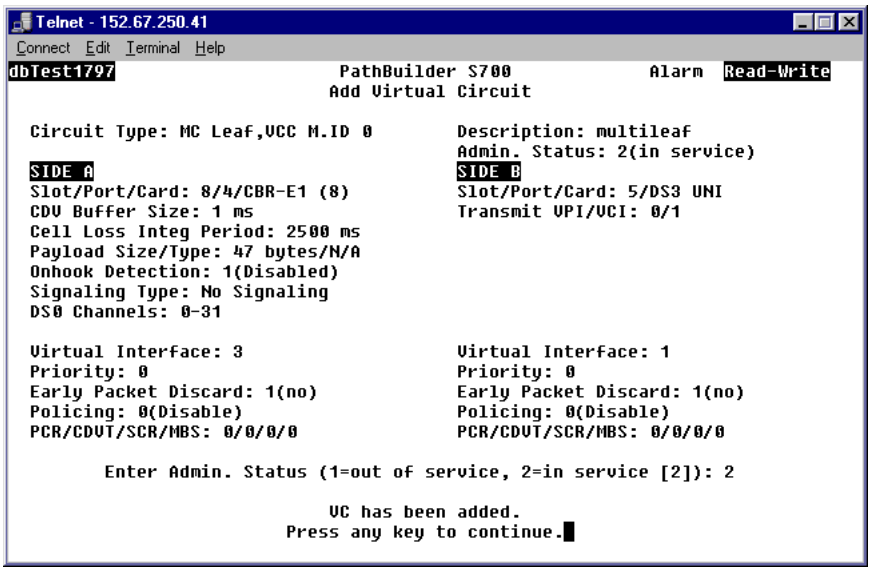
5 Set the administrative status of the circuit as desired.

The following prompt appears at the bottom of the screen.

```
Is above information correct? (y/n, [y]):
```

6 Enter **y** to confirm your configuration. A message confirming that the circuit has been added appears at the bottom of the screen, as shown in Figure 153.

Figure 153 Completed Multicast Leaf Virtual Circuit



Virtual Circuit Parameters

The following subsections describe the parameters you must enter when you configure virtual circuits for different card types.

The parameters that you will actually see during configuration will depend on the circuit type and the card type of your configuration. Also, some of the parameters will appear on either side A or side B.

Common Virtual Circuit Parameters

The following virtual circuit parameters are available for most PathBuilder S700 cards:

For descriptions of the virtual circuit parameters for the MCPU card, see "Configuring In-band Management" in Chapter 3.

Virtual Interface—Side A (or B) Virtual Interface number.

Priority—The priority for this circuit: *0*, *1*, 2, or *3*. The STX supports four priority queues per virtual interface, and each virtual circuit can be mapped to a priority queue. Priority *0* is the highest.

Early Packet Discard—Enable or disable early packet discard (EPD) for use with the Congestion On/Off setting. See "Configuring the STX Module" for details. For every connection where early packet discard is enabled, a status is kept when there is a partial packet for that connection in the queue. Once the queue cell level exceeds the congestion ON thresholds, only connections with partial packets already existing in the queue are allowed in. Cells from other connections are dropped.Once the congestion has subsided to the congestion OFF level, then all remaining connections are allowed.

Policing—Select [0] to *disable*, [1] to choose *Config. 1*, or [2] to choose *Config. 2*.

If you select Config. 1, the following occurs:

- For priority = 0 VCs, CLP=0 cells are policed and non-conforming CLP=0 cells are tagged. CLP=1 cells are not policed. The policing for CBR traffic is based on PCR and CDVT.
- For priority = 1-3 VCs, CLP=0 cells are policed, SCR is enforced, and non-conforming CLP=0 cells are tagged. Additionally, CLP=0+1 (all cells) are policed, and PCR is enforced such that any cells exceeding PCR are discarded. The policing for non-CBR traffic is based on PCR, SCR, and MBS.

If you select Config. 2, the following occurs:

- For priority = 0 VCs, CLP=0+1 cells are policed and non-conforming cells are dropped. The policing for CBR traffic is based on PCR and CDVT.
- For priority = 1-3 VCs, CLP=0 cells are policed and SCR is enforced such that non-conforming CLP=0 cells are tagged. Additionally, CLP=1 cells are policed and PCR is enforced such that non-conforming CLP=1 cells are discarded. The policing for non-CBR traffic is based on PCR, SCR, and MBS.

PCR/CDVT/SCR/MBS—Set the policing parameters.

PCR—Peak Cell Rate; the maximum cell rate which the source may never exceed. This is the interval from the first bit of one cell to the first bit of the next cell.

CDVT—Cell Delay Variation Tolerance; the acceptable tolerance of CDV. CDV is a Quality of Service parameter that measures the peak-to-peak cell delay through the network. It represents the difference between the worst case delay and the best case delay achievable on the VC.

SCR—Sustainable Cell Rate—the maximum average rate (in cells/sec) that a bursty on-off traffic source that can be sent at the peak rate.

MBS—Maximum Burst Size; *t*he maximum number of cells that can be sent at the peak rate.

ATM Module Virtual Circuit Parameters

The following virtual circuit parameters are specific to E3 UNI, DS3 UNI, OC3/STM-1 UNI, DS1 UNI with IMA, and E1 UNI with IMA cards.

Group—The IMA group number (if applicable).

Receive VPI—The VPI of cells received.

Receive VCI—The VCI of cells received.

Transmit VPI—The transmit VPI of cells transmitted.

Transmit VCI—The transmit VCI of cells transmitted.

The receive VPI/VCI and transmit VP/VCI numbers must be unique within their own card.

Ethernet Module Virtual Circuit Parameters

You build connections from the local Ethernet port to a remote Ethernet port by adding Permanent Virtual Circuits (PVCs). These connections allow the packets to be transmitted through the ATM network to the destination port.

The following virtual circuit parameters are specific to Ethernet cards:

Shaper—Select one of the 15 Shaper values that you configured under *Manage Card*. You assign the *Shaper* value to ensure adequate traffic flow to and through the ATM WAN. The *Shaper* parameter is key in ensuring that your traffic does not exceed the negotiated traffic contract as administered by the service department or IS department.

CBR Module Virtual Circuit Parameters

You set up an emulated circuit connection from the DSX-1 CBR or E1 CBR port to a remote DSX-1 CBR or E1 CBR port by mapping DS1 circuits to permanent virtual circuits (PVCs). These circuits are then transmitted through the ATM network to the destination port.

The following virtual circuit parameters are specific to CBR cards:

Mode (structured data ports only)**—**Virtual circuit mode: *Normal* (normal PVC mode), *RS366*, or *DBA*.

Normal—The circuit is configured as a standard PVC circuit and does not listen to video signals.

RS366—The circuit is put into an active listener mode; it listens for video signals from premises devices. This mode is typically used in RS-366 video session.s

DBA—The circuit is configured to dynamically reassign the timeslot. This mode supports dynamic bandwidth allocation.

CDV Buffer size—The Cell Delay Variation for the provisioned CBR circuit as indicated by the network (carrier) or external test measurement: *1-24 ms*.

Cell Loss Integration Period—The amount of time the system will wait before declaring cell loss state: *2000-65535 ms*.

Payload Size/Type (structured voice DSX-1 ports only)—Select *data* or *voice*. Select *voice* to configure a structured voice port for dynamic bandwidth allocation (DBA).

Onhook Detection—Enables or disables on-hook detection. When you enable on-hook detection, bandwidth is automatically reallocated based on detection of an on-hook condition, as specified by the signaling type.

Signaling Type—The signaling application type: *No Signaling*, *E&M/PLAR*, *FXO-LoopStart*, *FXS-LoopStart*, or *FXO-GroundStart* for DSX-1 CBR; *R2* for E1 CBR. You can only modify this field in structured voice mode. In this mode, you can select any signaling application type except *No Signaling*. If you try to set the *Signaling Type* to *No Signaling* in structured voice mode, you will get an error. In structured/unstructured data modes, the *Signaling Type* defaults to *No Signaling* and cannot be modified. Configured under *Manage Card*. Select *E&M/PLAR* to configure for dynamic bandwidth allocation (DBA) over ISDN PRI.

DS0 Channels—The associated DSOs which have been assigned to the specified ATM VC connection. All available DSO channels are automatically allocated in unstructured mode. In structured mode, the DSO channels are bit-coded, with each bit representing one DSO channel. You can assign DSO channels in structured mode only. Channel conflicts within a T1/E1 port interface will result in an error.

Configuring CBR Virtual Circuits for DBA The PathBuilder S700 supports two types of dynamic bandwidth allocation (DBA): structured voice DBA and structured data DBA. For details about how DBA works, see "DS0 Signaling and Dynamic Bandwidth Allocation" in Chapter 4.

In structured voice DBA, the CBR software reads the stored signaling bits and releases bandwidth when it detects an on-hook (idle) condition. To configure a CBR virtual circuit for structured voice DBA, follow these basic steps:

1. Configure the CBR Port as follows:
   - Set the CBR *Port Mode* to *Structured Voice*. See "Configuring DSX-1 CBR or E1 CBR Modules" earlier in this chapter for details about setting CBR port parameters.
2. Configure the virtual circuit as follows:
   - Set the *Mode* to *DBA*.
   - Set the *Payload Size/Type* to *Voice*.
   - Set *Onhook Detection* to *Enabled*.
   - Set the *Signaling Type* to *E&M/PLAR*,

In structured data DBA, the CBR software reads the DSO payload bytes and releases bandwidth when it detects an on-hook (idle) condition. To configure a CBR virtual circuit for structured data DBA, follow these basic steps:

1. Configure the CBR port as follows:
   - Set the *Port Mode* to *Structured Data*. See "Configuring DSX-1 CBR or E1 CBR Modules" earlier in this chapter for details about setting CBR port parameters.
   - Set the *DBA Bits Mask* to mask off bits that you do not want to include in the idle code.
2. Configure the virtual circuit as follows:
   - Set the *Mode* to *DBA*.
   - Set the *Payload Size/Type* to *Voice*.
   - Set *Onhook Detection* to *Enabled*.

Setting up a PRI PBX Tie Line PRI signaling is a type of CCS (common channel signaling) in which one channel (24) is used to signal for the other channels (1-23). This is in contrast to CAS (channel associated signaling) in which signaling is done on all channels.

You can set up a PRI PBX tie line that allows structured data to be passed across a structured data port. To do this, follow these basic steps:

1. Set the CBR *Port Mode* to *Structured Voice*. See "Configuring DSX-1 CBR or E1 CBR Modules" earlier in this chapter for details about setting CBR port parameters.
2. For channel 24, build a structured data virtual circuit with on-hook detection disabled.
3. For channels 1-23, build individual structured data virtual circuits for each DS0 you will actually use, with on-hook detection enabled.

QSIM/HSIM/FAM Virtual Circuit Parameters

The parameters that appear on the QSIM, HSIM, or FAM Add Virtual Circuit screen vary, depending on the configuration of the serial port that is being connected: Frame Relay, DXI, or HDLC/SDLC.

The following virtual circuit parameters are specific to QSIM/HSIM/FAM cards:

The configuration of the card you select on the List Card menu sets the attribute selection for the virtual circuit configuration parameters. If you configure a virtual circuit and then change serial port attributes—from DXI to Frame Relay or vice versa—the circuit will be deleted.

Frame Relay Virtual Circuit Parameters If the serial port is configured as a Frame Relay port, you must set the following virtual circuit parameters:

Interworking Mode—The Frame Relay/ATM interworking mode: *Network* or *Service*.

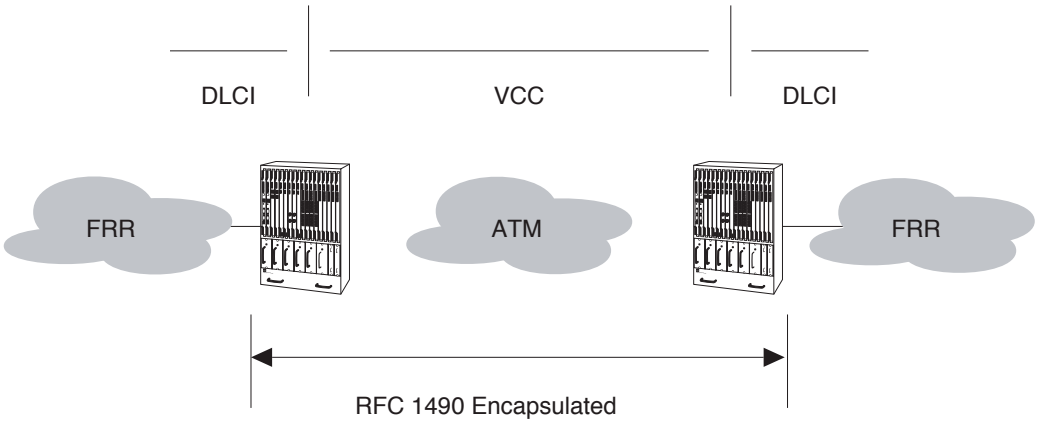
Start Frame Relay DLCI—The starting Frame Relay data link connection identifier: *16...991*. DLCI is used to identify a Frame Relay local connection. In Network interworking mode, contiguous values of DLCIs can be mapped to a VCI. Many DLCI to One VCI mapping is supported as well as One DLCI to One VCI mapping.

End Frame Relay DLCI—The ending Frame Relay data link connection identifier: *16...991*. DLCI is used to identify a Frame Relay local connection. In Network interworking mode, contiguous values of DLCIs can be mapped to a VCI.

Encapsulation Mode—The encapsulation data goes around the data packet and is used to identify the packet; select *1 (Transparent)* or *2 (Translation)*. This feature is offered only for Service interworking mode.

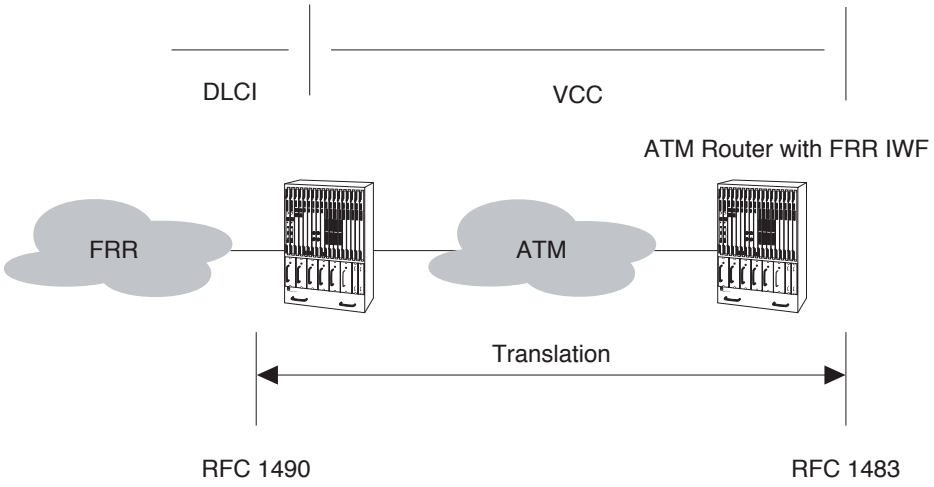
Transparent—Used for point-to-point frame relay interconnection. See Figure 154. Frame Relay Forum 8 (FRF.8) Service Interworking for this is being implemented. There are two modes at which FRF.8 specifies a mode which is transparent and is in fact 1490 over ATM.

Figure 154 FRF.8 Transparent Encapsulation Mode



Translation—Used in cases when you have ATM devices that do not support 1490 as a protocol across their ATM trunks; for example, when you have an PathBuilder S700 terminating the ATM network at one end and an ATM-ready device, such as a router with an OC-3 UNI, at the other end. Typically these ATM-ready devices do not support 1490 as a protocol across their ATM trunks, so you have to do LLC_SNAP (1483) per FRF.8. Mode 1F does 1490 to 1483 translation. See Figure 155.

Figure 155 Translation Encapsulation Mode



DE to CLP Mapping—Frame Relay Discard Eligibility field to Cell Loss Priority field mapping. This parameter defines the value to which CLP will be set in outgoing ATM cells. The available settings depend on what interworking mode you have selected: Network or Service.

The following settings are available for Network interworking mode:

Direct—Mode 1 mapping; matches DE value to CLP value. When the serial port is in this mode, it does not translate Frame Relay (NLPID) encapsulation, rather it sends it straight through the ATM network, possibly to a Frame Relay network or device.

None—No DE to CLP Mapping

The following settings are available for Service interworking mode:

Direct—Mode 1 mapping; matches DE value to CLP value. When the serial port is in this mode, it does not translate Frame Relay (NLPID) encapsulation, rather it sends it straight through the ATM network, possibly to a Frame Relay network or device.

Always-0—Mode 2 mapping, with the CLP field mapped to a constant value of 0. Mode 2 is an operational method for indicating data congestion to either the ATM or Frame Relay network. Mode 2 allows for translation between NLPID and LLC-SNAP encapsulation. It is used when connecting a Frame Relay device or network to a non-Frame Relay device or network. For example, if the PathBuilder S700 is connecting a router/FRAD over an ATM network (public or private) and at the other site a router with an ATM OC3 UNI is connected to the WAN network, typically the router OC3 UNI does not support NLPID and requires mode 2 mapping so that the packet can be encapsulated to LLC-SNAP.

Always-1—Mode 2 mapping, with the CLP field mapped to a constant value of 1. Mode 2 is an operational method for indicating data congestion to either the ATM or Frame Relay network. Mode 2 allows for translation between NLPID and LLC-SNAP encapsulation. It is used when connecting a Frame Relay device or network to a non-Frame Relay device or network. For example, if the PathBuilder S700 is connecting a router/FRAD over an ATM network (public or private) and at the other site a router with an ATM OC3 UNI is connected to the WAN network, typically the router OC3 UNI does not support NLPID and requires mode 2 mapping so that the packet can be encapsulated to LLC-SNAP.

CLP to DE Mapping—Cell Loss Priority field to Frame Relay Discard Eligibility field mapping. This parameter defines the value to which DE will be set from incoming ATM cells in outgoing Frame Relay frames. The available settings depend on what interworking mode you have selected: Network or Service.

- The following settings are available for Network interworking mode:

  Direct—Mode 1 mapping; matches CLP value to DE value. When the serial port is in this mode, it does not translate Frame Relay (NLPID) encapsulation, rather it sends it straight through the ATM network, possibly to a Frame Relay network or device.

  None—No CLP to DE mapping.

- The following settings are available for Service interworking mode:

  Direct—Mode 1 mapping; matches CLP value to DE value. When the serial port is in this mode, it does not translate Frame Relay (NLPID) encapsulation, rather it sends it straight through the ATM network, possibly to a Frame Relay network or device.

  Always-0—Mode 2 mapping, with the DE field mapped to a constant value of 0. Mode 2 is an operational method for indicating data congestion to either the ATM or Frame Relay network. Mode 2 allows for translation between NLPID and LLC-SNAP encapsulation. It is used when connecting a Frame Relay device or network to a non-Frame Relay device or network. For example, if the PathBuilder S700 is connecting a router/FRAD over an ATM network (public or private) and at the other site a router with an ATM OC3 UNI is connected to the WAN network, typically the router OC3 UNI does not support NLPID and requires mode 2 mapping so that the packet can be encapsulated to LLC-SNAP.

Always-1—Mode 2 mapping, with the DE field mapped to a constant value of 1. Mode 2 is an operational method for indicating data congestion to either the ATM or Frame Relay network. Mode 2 allows for translation between NLPID and LLC-SNAP encapsulation. It is used when connecting a Frame Relay device or network to a non-Frame Relay device or network. For example, if the PathBuilder S700 is connecting a router/FRAD over an ATM network (public or private) and at the other site a router with an ATM OC3 UNI is connected to the WAN network, typically the router OC3 UNI does not support NLPID and requires mode 2 mapping so that the packet can be encapsulated to LLC-SNAP.

Start FR-SSCS DLCI—The starting Frame Relay data link connection identifier of the remote ATM Frame Relay host: *16...991*. This parameter applies only to Network interworking model. In Network interworking mode, contiguous values of SSCS can be mapped to a VCI.

End FR-SSCS DLCI—The ending Frame Relay data link connection identifier of the remote ATM Frame Relay host: *16...991*. This parameter applies only to Network interworking model. In Network interworking mode, contiguous values of SSCS can be mapped to a VCI.

FECN to EFCI Mapping—Forward Explicit Congestion Notification to Explicit Forward Congestion Indication mapping. This parameter defines the mapping of FECN incoming on Frame Relay to the outgoing ATM cell PTI congestion indicator. It applies only to Service interworking mode.

Direct—Mode 1 mapping; matches FECN to the PTI CN bit. When the serial port is in this mode, it does not translate Frame Relay (NLPID) encapsulation, rather it sends it straight through the ATM network, possibly to a Frame Relay network or device.

Always-0—Mode 2 mapping. This option sets the EFCI field to 'congestion not experienced.' Mode 2 is an operational method for indicating data congestion to either the ATM or Frame Relay network. Mode 2 allows for translation between NLPID and LLC-SNAP encapsulation. It is used when connecting a Frame Relay device or network to a non-Frame Relay device or network. For example, if the PathBuilder S700 is connecting a router/FRAD over an ATM network (public or private) and at the other site a router with an ATM OC3 UNI is connected to the WAN network, typically the router OC3 UNI does not support NLPID and requires mode 2 mapping so that the packet can be encapsulated to LLC-SNAP.

Shaper Number—Select one of the 15 Shaper values that you configured under *Manage Card*. You assign the *Shaper* value to ensure adequate traffic flow to and through the ATM WAN. The *Shaper* parameter is key in ensuring that your traffic does not exceed the negotiated traffic contract as administered by the service department or IS department.

DXI Virtual Circuit Parameters If the serial port is configured as a DXI port, you must set the following virtual circuit parameters:

(DFA) VPI—The virtual path indicator (VPI) number corresponding to the DFA field: *0...15*. This parameter defines the selected VPI for Mapping to/from the Port card (Router) to the trunk.

(DFA) VCI—The virtual channel indicator (VCI) number corresponding to the DFA field: *0...63*. This parameter defines the selected VPI for Mapping to/from the Port card (Router) to the trunk.

(DFA) VCI Range—The DXI virtual channel indicator range: *1...64*. If you set this parameter to a value other than 1, the system adds the specified number of VCs and increments the DFA VCI and the other side's DFA or ATM VCIs in parallel.

Shaper Number—Select one of the 15 Shaper values that you configured under *Manage Card*. You assign the *Shaper* value to ensure adequate traffic flow to and through the ATM WAN. The *Shaper* parameter is key in ensuring that your traffic does not exceed the negotiated traffic contract as administered by the service department or IS department.

Early Packet Discard—Enables or disables early packet discard. For every connection where early packet discard is enabled, a status is kept when there is a partial packet for that connection in the queue. Once the queue cell level exceeds the congestion ON thresholds, only connections with partial packets already existing in the queue are allowed in. Cells from other connections are dropped.

HDLC/SDLC Virtual Circuit Parameters If the serial port is configured as a HDLC/SDLC port, you must set the following virtual circuit parameter:

Shaper Number—Select one of the 15 Shaper values that you configured under *Manage Card*. You assign the *Shaper* value to ensure adequate traffic flow to and through the ATM WAN. The *Shaper* parameter is key in ensuring that your traffic does not exceed the negotiated traffic contract as administered by the service department or IS department.

Viewing Existing Virtual Circuits

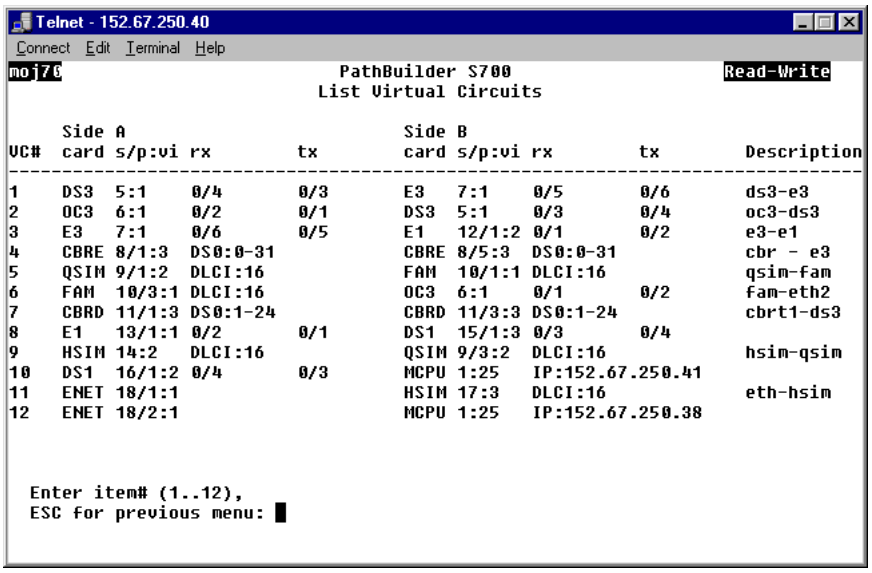
You can view summaries of existing virtual circuits for the entire chassis or by port or group.

Viewing Virtual Circuits for the Entire Chassis

To view a summary of existing virtual circuits for the entire chassis, follow these steps:

1. From the Configuration Management menu, select *[2] Manage Circuit* to open the Virtual Circuit menu, shown earlier in Figure 144
2. From the Virtual Circuit menu, select *[1] List Virtual Circuits* to open the List Virtual Circuit Summary screen, shown in Figure 156.

Figure 156 List Virtual Circuit Summary Screen



The List Virtual Circuit Summary Screen shows a summary of all virtual circuits, with a virtual circuit number (VC#) assigned to each. It displays the following information:

card—Card type. For multicast source circuits, this column lists the notation `MC <ID> Source`, where <ID> is the multicast ID number.

s/p:vi—Slot, port, and virtual interface numbers (for side A and side B of the circuit)

Rx/Tx—Virtual circuit information specific to the card type. For example, for UNI cards, these columns list the receive/transmit VPI/VCI (for side A and side B of the circuit), while for CBR cards these columns list the DS0 channels.

Description—The description entered when the circuit was configured.

3 To view more detailed information about a specific virtual circuit enter the VC# of the circuit you want to view from the List Virtual Circuit Summary screen to open the List Virtual Circuit Detail screen. This screen displays the complete list of parameters for both sides of the selected circuit.

Figure 157 shows a representative List Virtual Circuit detail screen for an E1 UNI card. Figure 158 shows a representative List Virtual Circuit Detail Screen for a CBR card.

Figure 157 List Virtual Circuit Detail Screen - E1 UNI

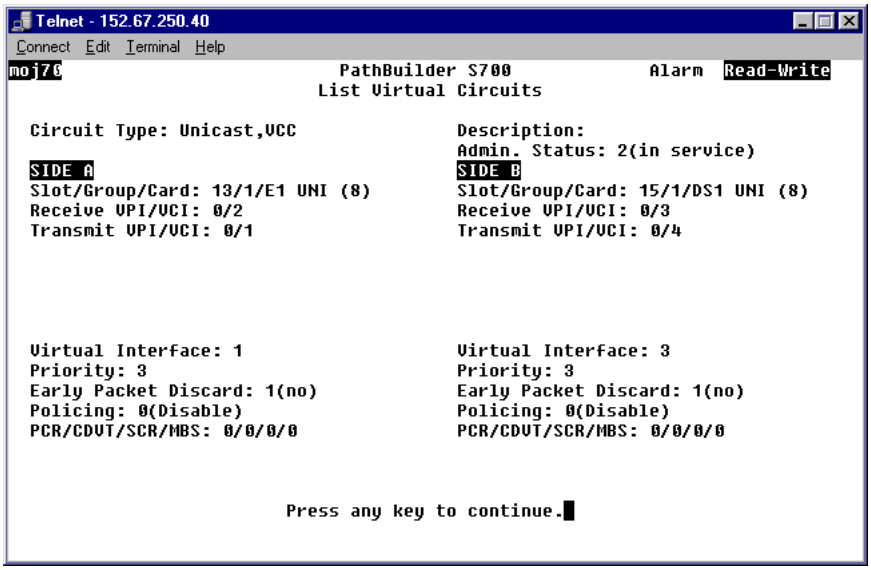
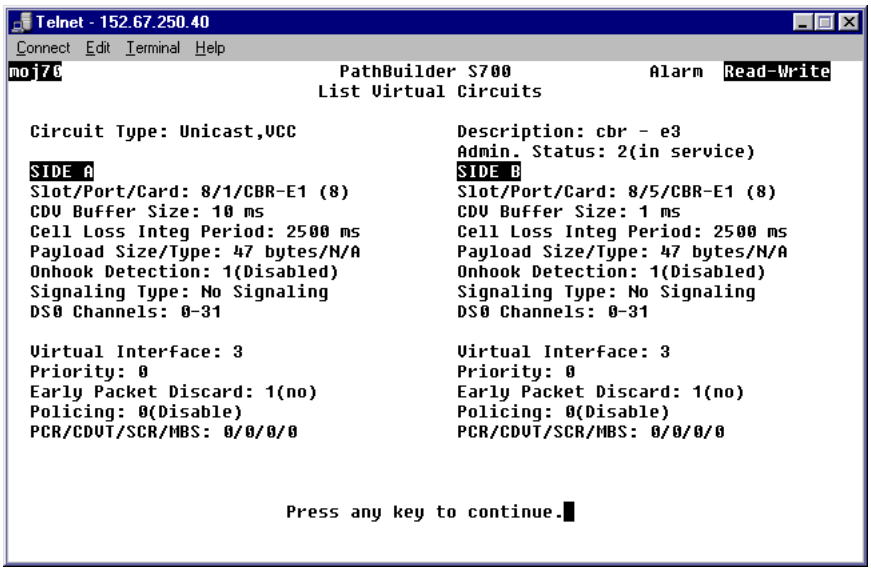


Figure 158 List Virtual Circuit Detail Screen - CBR



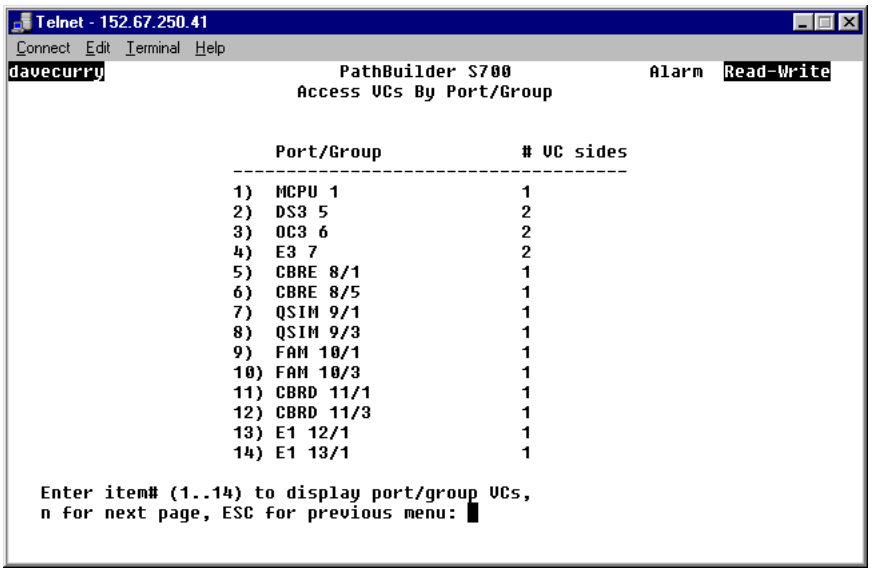
Viewing Virtual Circuits by Port or Group

To view a summary of existing virtual circuits for a selected port or group, follow these steps:

1 From the Configuration Management menu, select *[2] Manage Circuit* to open the Virtual Circuit menu, shown earlier in Figure 144

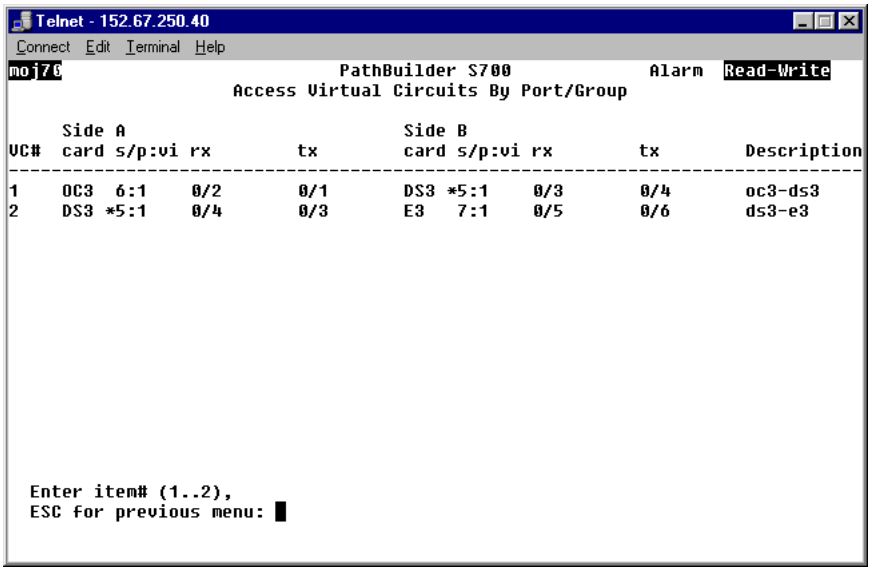
2 From the Virtual Circuit menu, select *[6] Access Virtual Circuits by Port/Group* to open the Access VCs by Port/Group Selection menu, shown in Figure 159. This menu lists the ports and groups on the chassis for which virtual circuits have been defined and the number of VC sides associated with each port/group.

Figure 159 Access VCs by Port/Group Selection Menu



3 Enter the number corresponding to the port or group for which you want to view virtual circuits to open the Access Virtual Circuits by Port/Group screen, shown in Figure 160.

Figure 160 Access Virtual Circuits by Port/Group Screen



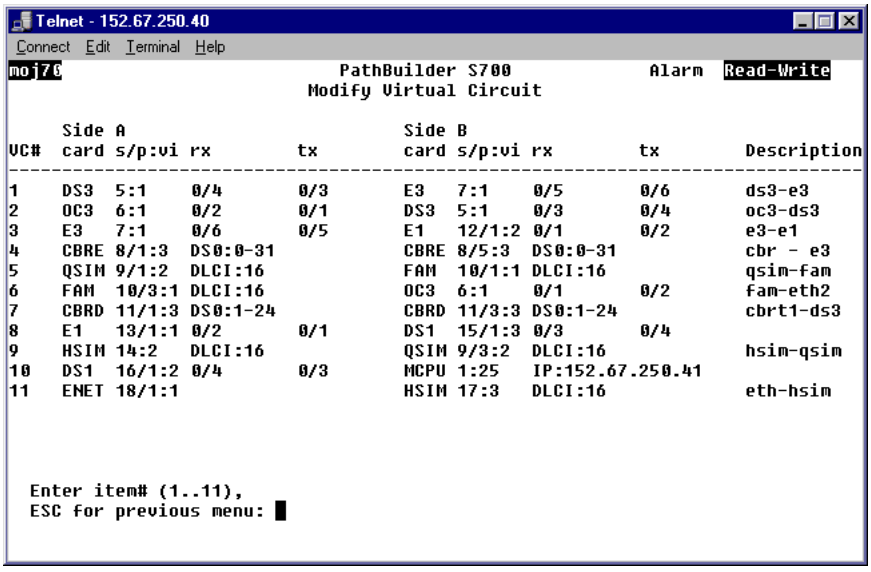
The Access Virtual Circuits by Port/Group screen provides the same information as the List Virtual Circuit screen. See "Viewing Virtual Circuits for the Entire Chassis" earlier in this section for details.

Modifying Virtual Circuits

To modify an existing virtual circuit, follow these steps:

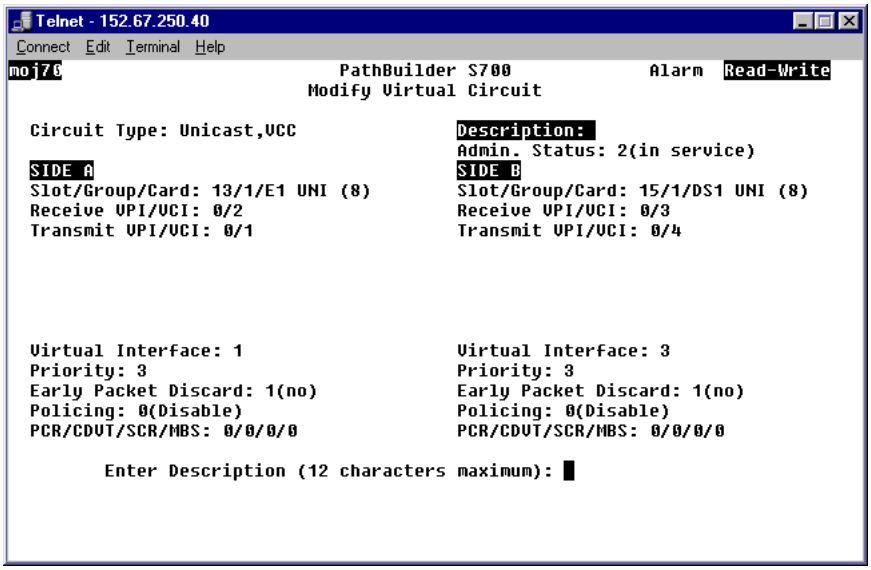
1 From the Virtual Circuit menu, select *[3] Modify Virtual Circuit* to open the Modify Virtual Circuit menu, shown in Figure 161. This menu displays a list of existing virtual circuits.

Figure 161 Modify Virtual Circuit Configuration Screen



2 Enter the *VC#* of the circuit you want to modify to open the Modify Virtual Circuit Configuration menu for that circuit. Figure 162 shows a representative Modify Virtual Circuit Configuration menu.

Figure 162 Modify Virtual Circuit Configuration Menu



3 Modify the virtual circuit by setting parameters in the same way that you did when you configured the circuit, See "Adding Virtual Circuits" earlier in this chapter, for details.

Deleting Virtual Circuits

To delete an existing virtual circuit, follow these steps:

1. From the Virtual Circuit menu, select *[4] Delete Virtual Circuit*. The Delete Virtual Circuit screen appears. This screen displays a list of existing virtual circuits.
2. Enter the *VC#* of the circuit you want to delete.
3. Enter **`y`** in response to the confirmation prompt to delete the circuit.

Viewing Virtual Circuit Statistics

You can view the following types of virtual circuit statistics—either by circuit or by port/group:

- A summary of statistics for all virtual circuits
- A detailed list of statistics for a specific circuit

To view virtual circuit statistics, follow these steps:

From the Virtual Circuit menu, select either *[5] Show Virtual Circuit Statistics* or [*6] View Virtual Circuit Statistics by Port/group*.

For details about the statistics listed on the virtual circuit statistics screens, see "Viewing Virtual Circuit Statistics" in Chapter 6.

6 PathBuilder S700 Diagnostics and Performance Monitoring

This chapter tells you how to access and manage the alarms supported by the PathBuilder S700 WAN access switch (PathBuilder S700), how to set loopbacks, and how to view performance statistics. The chapter also lists the supported alarms, loopbacks, and statistics that are available for specific modules. It contains the following sections:

- Managing System Alarms
- Using Loopbacks
- Viewing Statistics

Managing System Alarms

The PathBuilder S700 detects certain events and reports corresponding alarms to the NMS station(s). These events are categorized as major alarms, minor alarms, and information. When an alarm occurs, an alarm indicator is displayed in the upper right corner of the current menu or display, as described under "Alarm Indicator" in Chapter 3.

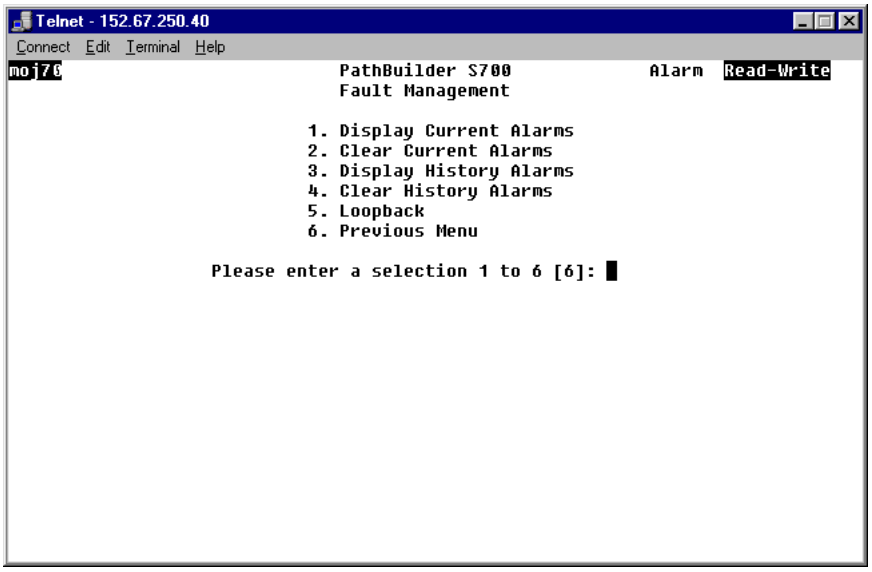
The PathBuilder S700 also utilizes an alarm task to relay the alarm from other tasks to the MCPU. This task is designed particularly for off-loading the data transport task. When the data transport task detects an error which has to be reported, it sends a message to the Alarm task. In this way, the data transport task can continue the system-critical task of processing traffic.

Viewing and Clearing Current Alarms

To view a list of current alarms, follow these steps:

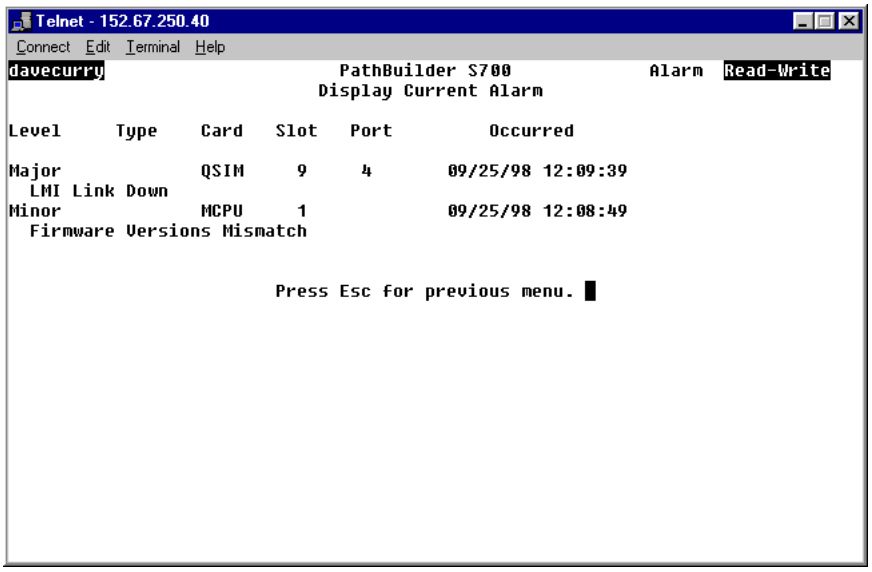
1 From the Main menu, select *[3] Fault Management* to display the Fault Management menu shown in Figure 163.

Figure 163 Fault Management Menu



2 Select *[1] Display Current Alarms* to view the Display Current Alarm screen, shown in Figure 164.

Figure 164 Display Current Alarm Screen



To clear the current alarms, follow these steps:

1 From the Display Current Alarm screen, press [Esc] to return to the Fault Management menu.

2 Select *[2] Clear Current Alarms*. The following prompt appears:

```
Do you want to clear current alarms (Y/N) [N]?
```

3 Enter **y** to clear the current alarms.

PathBuilder S700 Alarm Messages

This section lists the alarm messages, meanings of the alarm messages, and troubleshooting tips for the major errors reported from each of the PathBuilder S700 interfaces. It contains the following subsections:

- MCPU and STX Module (System) Alarms
- Alarms Common to Several Modules
- DS1/E1 UNI Module Alarms
- DSX-1/E1 CBR Module Alarms
- QSIM/FAM Alarms

MCPU and STX Module (System) Alarms

Table 41 describes the Critical and Major Alarms associated with the CPU Module.

Table 41 MCPU and STX Module (System) Alarms

Alarm	Meaning	Troubleshooting Steps
A card is removed from a card slot	A card has been removed from the shelf.	Install the card.
Alarms Cleared	Current alarms have been cleared by user.	Information only.
ALM Dest Slot Overrun	The destination slot has failed and is not taking cells from the STX card.	Find and replace the defective card.
ALM Ext SRAM Parity Er	STX hardware failure.	Replace the STX card.
ALM Ingress FIFO Overflow	STX hardware failure.	Replace the STX card.
ALM Ingress Sync Error	STX hardware failure.	Replace the STX card.
ALM Ingress VCI Out of Range	The cells received by the STX have a VCI that is out of range.	Verify the integrity of the incoming traffic, checking to see if the traffic matches the assigned VPIs. Replace the port card. Replace the STX card.
ALM Ingress VPI Over 255	The cells received by the STX have an improper VPI value.	Verify the integrity of the incoming traffic, checking to see if the traffic matches the assigned VPIs. Replace the port card. Replace the STX card.
ALM Parity Error Egress/QCX	STX hardware failure	Replace the STX card.
ALM Parity Error Ingress/CB	STX hardware failure	Replace the STX card.
BITS reference clock failure	Enabled when the BITS clock is selected as the timing source but has failed.	Check the BITs clock source for other alarms.
Bus A Parity Error	STX hardware failure.	Replace the STX card.
Bus B Parity Error	STX hardware failure.	Replace the STX card.
Bus C Parity Error	STX hardware failure.	Replace the STX card.
Bus D Parity Error	STX hardware failure.	Replace the STX card.
Bus E Parity Error	STX hardware failure.	Replace the STX card.
Bus F Parity Error	STX hardware failure.	Replace the STX card.

(continued)

Table 41 MCPU and STX Module (System) Alarms (continued)

Alarm	Meaning	Troubleshooting Steps
Card Config Failed	Cannot upload configuration data to a card.	Information only. Could indicate a potential problem. You may need to reset the card.
Card initialized.	Card initialized.	Information only.
Card not installed	The required card is physically not present. (STX)	Install the card.
Card Reconfig Failed	Reconfiguration of the card failed	Information only. Could indicate a potential problem. You may need to reset the card.
Card Reconfigured	Card is reconfigured.	Information only. Could occur when the card is plugged in or the system is powered up.
Cardtype Invalid	An unknown card type is detected in a card slot.	Information only.
Cardtype mismatched	The card type of a card slot in the database does not match the card type of the same card slot in the shelf.	Information only.
Communication Failed	Error during communication between MCPU and a slot.	Reseat the non-CPU slot. Replace the MCPU if no improvement.
DS3/E3/OC3/CBR/ IMA/FAM Ref Clk Failed	Interface clock has been designated as the system clock, and the interface clock has failed.	Check the physical connection. Check for other alarms such as LOS/LOF/LOCD. Check the physical connection.
Fan #1 failed	Fan #1 failed	Replace the fan tray.
Fan #2 failed	Fan #2 failed	Replace the fan tray.
Fan #3 failed	Fan #3 failed	Replace the fan tray.
Firmware Versions Mismatch	The firmware versions in the active and standby flash image are not the same.	Information only.
History Overflowed	Alarm history table has overflowed. Alarms will continue to be recorded but will displace oldest alarms.	Clear the history alarms table through NMS or Telnet.
Id Prom Checksum Error	The internal checksum on the idprom of the indicated card is incorrect.	Have the idprom replaced with the correct version. The system takes no action if it recognizes the proper card ID.
Invalid DB Cardtype	An unknown card type is found in the database	Information only.
Login Failure	Failed log -in. Someone failed to log in to the shelf three successive times.	Information only.
Loss 8KHz Ref Clock	The system reference clock was lost.	Try reassigning the clock—especially to *internal*. This alarm may also indicate an STX backplane problem.
Loss 25MHz ATM Clock	STX hardware failure	Replace the STX card.
Loss BITS Input Signal	The system BITS clock has failed.	Correct the BITS clock input.

(continued)

Table 41 MCPU and STX Module (System) Alarms (continued)

Alarm	Meaning	Troubleshooting Steps
New Card Configured	Configuration data for a new card is uploaded.	Information only. The card was not stored in the database.
No Upload Image Found	Cannot find card image to upload. Bad code image. (STX)	Download a new code image.
PWR Supply 1 Absent	Power supply #1 is missing or has failed.	Be sure power supply #1 is plugged in. Replace the power supply with an operating unit.
PWR Supply 2 Absent	Power supply #2 is missing or has failed.	Be sure power supply #2 is plugged in. Replace the power supply with an operating unit.
PWR Supply 3 Absent	Power supply #3 is missing or has failed.	Be sure power supply #3 is plugged in. Replace the power supply with an operating unit.
PWR Supply 4 Absent	Power supply #4 is missing or has failed.	Be sure power supply #4 is plugged in. Replace the power supply with an operating unit.
PWR Supply 5 Absent	Power supply #5 is missing or has failed.	Be sure power supply #5 is plugged in. Replace the power supply with an operating unit.
PWR Supply 6 Absent	Power supply #6 is missing or has failed.	Be sure power supply #6 is plugged in. Replace the power supply with an operating unit.
Queue 0 Over Threshold	The congestion threshold for Queue 0 was exceeded.	Check and correct VC connections. Check and adjust VI shaper values. Check and adjust incoming traffic volume. Check for faulty IMA links which may reduce traffic handling for a group.
Queue 1 Over Threshold	The congestion threshold for Queue 1was exceeded.	Check and correct VC connections. Check and adjust VI shaper values. Check and adjust incoming traffic volume. Check for faulty IMA links which may reduce traffic handling for a group.
Queue 2 Over Threshold	The congestion threshold for Queue 2was exceeded.	Check and correct VC connections. Check and adjust VI shaper values. Check and adjust incoming traffic volume. Check for faulty IMA links which may reduce traffic handling for a group.
Queue 3 Over Threshold	The congestion threshold for Queue 3 was exceeded.	Check and correct VC connections. Check and adjust VI shaper values. Check and adjust incoming traffic volume. Check for faulty IMA links which may reduce traffic handling for a group.
Received External Alarm 1	User defined.	The leads connected to external alarm 1 have changed from the normal setting.
Received External Alarm 2	User defined.	The leads connected to external alarm 2 have changed from the normal setting.
Received External Alarm 3	User defined.	The leads connected to external alarm 3 have changed from the normal setting.

(continued)

Table 41 MCPU and STX Module (System) Alarms (continued)

Alarm	Meaning	Troubleshooting Steps
Relay Power Fuse Failed	Fuse for external alarm relay is blown, preventing external alarms from being generated.	Replace the module, or operate with no external alarm capability.
SAR Initialize Failure	Problem with the SAR chip on the MCPU. MCPU SAR failed initialization.	Replace the MCPU card.
Shelf Mismatch	The MCPU is not in the same shelf as it was the last time it was powered up.	Information only.
System Clock Reverted	The system clock has reverted to a higher priority clock.	Information only. This alarm occurs only if the *Clock Mode* is set to *Revertive* on the System Clock Configuration menu.
System power up	System is powered up.	Information only.
Write Session Taken by Super User	A super user has changed a read-only session to read-write.	Information only.
Wrong slot for card	The card is not in the correct slot.	Insert the card into the correct slot.

Alarms Common to Several Modules

Table 42 describes major alarms common to several PathBuilder S700 modules.

Table 42 Alarms Common to Several Modules

Alarm	Meaning	Troubleshooting Steps
Alarm Indication Signal(AIS)	An incoming alarm indication signal (AIS) indicates a LOS problem is occurring on the line upstream of the equipment connected to this port.	Check your locally connected DS3/E3/OC3 equipment, or ask your service provider to trace the source of the AIS signal.
Far End Receive Failure	The far end equipment has a problem with the signal it is receiving from the PathBuilder device.	Check for a defective cable between the PathBuilder device network interface port and your service provider's network interface unit. An open transmit line can cause this condition. Check the LBO setting of the port.
FEAC Loopback	A DS3 overhead function that allows the system to be enabled or disabled for responding to Far End Alarm Condition commands from the central office. When enabled, the DS3 line loopback is put up upon instruction from the central office. The system removes the loopback upon instruction or after 15 minutes.	Check with your service provider to determine the reason for the loopback.
Idle Signal	The line has not been provisioned for service. No data will pass on a line with an idle signal.	Check the configuration of the terminal equipment, or have your service provider check their equipment and make sure it is provisioned for service.
In Band Loopback	A loopback is configured on the port. Loopbacks are for troubleshooting only and should not be present under normal operating conditions.	If you are not troubleshooting the port, turn off the loopback.
Link Down	Summary informational alarm to indicate one or more alarms on this link are active.	Information only.
Link Up	Summary informational alarm to indicate all alarms on the physical link are cleared.	Information only.
Local Card Loopback	A loopback is configured on the port. Loopbacks are for troubleshooting only and should not be present under normal operating conditions.	If you are not troubleshooting the port, turn off the loopback.
Loss of Cell Delineation(LOCD)	Loss of cell delineation—possibly a framing or timing problem.	Check the reference clock source. Compare parameters between local and service provider end. Check the physical layer.

(continued)

Table 42 Alarms Common to Several Modules (continued)

Alarm	Meaning	Troubleshooting Steps
Loss of Signal(LOS)	Cannot detect a signal at a configured port. This alarm is applicable to DS3 UNI, E3 UNI, OC3/STM-1 UNI, DS1 IMA UNI, and E1 IMA UNI ports.	Check the cable between the interface port and the service provider's equipment/terminal equipment. Check cable connections. Check transmit and receive pairs for proper connection. Check terminating equipment. Call your service provider.
Network Card Loopback	A loopback is configured on the port. Loopbacks are for troubleshooting only and should not be present under normal operating conditions.	If you are not troubleshooting the port, turn off the loopback.
Network Line Loopback	A loopback is configured on the port. Loopbacks are for troubleshooting only and should not be present under normal operating conditions.	If you are not troubleshooting the port, turn off the loopback.
Out of Frame(OOF)	AIS alarm is detected. The configuration settings on the port are not correct for the line, or the port configuration is correct, but the line is experiencing errors that result in an alarm.	Verify that the framing format configured on the port matches the framing format on the line. Check the port's statistics report for evidence of a bad line; bursts of LCVs could indicate a timing problem. If connected to local DS3/E3/OC3 equipment, check that equipment's output level to make sure it is not overdriving the input.

DS1/E1 UNI Module Alarms

Table 43 describes the alarms specific to the DS1 UNI and E1 UNI modules.

ATM Forum required alarms are indicated by the notation ATM Forum (R-xxx)*, where xxx is the required alarm number.*

Table 43 DS1/E1 UNI Module Alarms

Alarm	Meaning	Troubleshooting Steps
AFA Link Removal	Automatic Frequency Adjustment - Link removed from physical line group due to error rate in CRC check of T1/E1 exceeding user specified rate for a given period of time.	Check the removed link for the CRC errors.
Bad IMA ID	A link within the group has received an IMA ID from the far end that is different than when the group was initialized (and from the other links in the group). The link with the bad IMA ID is probably misconnected.	Check the links for proper connection. Reconnect if necessary.
Bad Link ID	Each IMA group assigns a unique Transmit link ID to each link in the group. This link ID should match the Receive link ID of the remote end IMA device. This alarm means that a link was operating correctly, but then received a Transmit link ID already assigned to a previous link. A Tx Misconnected alarm is also generated.	Check the links for proper connection. Reconnect if necessary.
Bad M	The far end frame size M has changed in an IMA link. The maximum value for the frame size on the local device's serial card must match the maximum value for the frame size of the connected device. The link with the BAD M is probably misconnected.	Check to make sure the maximum frame size is set to the same value on the local and remote ends.
Bad Offset	Far end ICP cell offset has changed in an IMA link. Each IMA group assigns a unique Transmit offset to each link in the group. This alarm means that a link was operating correctly, but then received a Transmit offset already assigned to a previous link. A Tx Misconnected alarm is also generated.	Check the links for proper connection. Reconnect if necessary.

(continued)

Table 43 DS1/E1 UNI Module Alarms (continued)

Alarm	Meaning	Troubleshooting Steps
BAD SCCI (3Com Patent Pending)	Status and Change Control Indication – the content of the ICP cells has changed. The far end ICP cell SCCI in this link does not agree with the SCCI of the other links in the group.	Check the links for proper connection. Reconnect if necessary.
Bad Symmetry	The far end group symmetry has changed in an IMA link.	Remove the link and stop Tx and Rx data.
Duplicated IMA ID	An IMA group has received an IMA ID that has been received by a previous group. The second group must have a unique IMA ID.	Check for loops and check the IMA group configuration.
Duplicated Link ID	Duplicated far end logical link ID in this IMA group for this IMA link. Each IMA group assigns a unique Transmit link ID to each link in the group. This link ID should match the Receive link ID of the remote end IMA device. This alarm means that a link received a Transmit link ID already assigned to a previous link.	Check the links for proper connection. Reconnect if necessary.
Duplicated Offset	Duplicated far end ICP cell offset in this IMA group in an IMA link. Each IMA group assigns a unique Transmit offset to each link in the group. This alarm means that a link received a Transmit offset already assigned to a previous link. Some of the links are probably misconnected.	Check the links for proper connection. Reconnect if necessary.
Excessive Link Delay	The link has exceeded the user-selectable value for acceptable link delay. The link is removed from the group.	Check the links for proper connection. Reconnect if necessary. Also try adjusting the link delay parameter for the IMA group.
Group [n] Abort Symmetry	Generated when *Group [n] Config. Abort* is generated, due to group symmetry problem	Check and correct near end symmetry. Only symmetric operation is supported in PathBuilder products.
Group [n] Config Abort *ATM Forum (R-128)*	The near end node rejects the far end IMA parameters.	Check and correct the near end and far end parameters for compatibility.
Group [n] Degraded Service	The IMA group is passing data with less than the number of IMA links you configured.	Continue passing data. Correct faulty links or adjust IMA group configuration.

(continued)

Table 43 DS1/E1 UNI Module Alarms (continued)

Alarm	Meaning	Troubleshooting Steps
Group [n] Dup. IMA ID	The same group IMA ID has been received on links belonging to different IMA groups in the same card.	Correct link or group configuration.
Group [n] FE Abort Symmetry	The far end rejects the symmetry sent by the near end.	Check and correct near end symmetry. Only symmetric operation is supported in PathBuilder products.
Group [n] FE Blocked	The far end reports it is not passing data.	Check and repair link facilities. Verify configuration.
ATM Forum (R-132)		
Group [n] FE Config Abort	The far end rejects the M value used by the near end.	Configure both ends to the same M value. NOTE: This alarm should not occur if both ends are PathBuilder S310, S330, S600, or S700 products.
Group [n] FE Start Up	The far end is coming up (starting IMA).	Information about far end state.
ATM Forum (R-127)		
Group [n] FE Insufficient Links	The far end node is reporting an insufficient number of links.	Check and repair link facilities. Verify configuration.
ATM Forum (R-131)		
Group [n] Insufficient Links	The near end finds not enough available links.	Check and correct any faulty IMA links. Check and correct IMA minimum links parameter.
ATM Forum (R-130)	This occurs when the near end has completed parameter negotiation with the far end, but is neither passing data nor blocked.	
Group [n] Lack of Link	The near end is idling because it does not have enough links in an IMA group. This occurs only after group parameters are negotiated. When this occurs, the "NE Insufficient Links" alarm is also reported.	Take the group down, and stop passing data in all links.
Group [n] Link Down	Summary information alarm to indicate one or more alarms on this IMA group are active.	Information only.
Group [n] Link Up	Summary informational alarm to indicate all alarms on the IMA group are cleared.	Information only.
Group [n] N<P	There are fewer configured links than IMA links required to make an IMA group active.	Continue passing data.
Group [n] No Link	The near end has lost all its links in an IMA group because these links have AFA, LOS, AIS, OOF, LCD, or missing ICP cells. This invalidates all the far end identity.	If one or more links comes back, re-identify the link(s) and renegotiate parameters with the far end group.

(continued)

Table 43 DS1/E1 UNI Module Alarms (continued)

Alarm	Meaning	Troubleshooting Steps
Group [n] Multi IMA ID	Different group IMA ID received on different links in an IMA group.	Correct link connections and/or IMA group configuration.
Group [n] Multi Test *ATM Forum (R-138)*	Different test procedure request from different links in an IMA group from the far end.	Use the test procedure from the lowest logical link and ignore the other test procedures.
Group [n] Multiple M	Different frame lengths received on different links in an IMA group.	Make sure that the IMA frame length is set to the same value for all links.
Group [n] Multiple Symmetry	Different group symmetry received on different links in an IMA group (symmetrical versus asymmetrical operation).	Configure the group to be symmetric. 3Com PathBuilder products do not support asymmetric bandwidth for IMA.
Group [n] Time Sync Fail	The far end transmit clocking mode does not match the near end transmit clocking mode	Check configuration. Only CTC (Common Transfer Clock) is supported. If the far end transport clocking is set to ITC (Independent Transfer Clock), change it to CTC.
IMA Protocol Mismatch	IMA label is not ATM Forum 1.0.	Near end and far end IMA protocol versions do no match. Check and correct incompatibility.
IMA Remote Loopback	Far end loopback detected, external cable loopback or crosstalk.	Remove loopback condition.
IMA Tx Misconnected *ATM Forum (R-123)*	The near end IMA networking Tx or Rx link state machine detects the link is not connected to the correct FE Tx or Rx links.	Remove the link and stop Tx and Rx data.
Loss of Differential Synchronization (LODS) *ATM Forum (R-122)*	Relative time difference between individual T1s/E1s in the IMA group is out of range. LODS is declared after the Rx IMA fails to synchronize the IMA link(s) in an IMA group within some time limit.	Have your carrier verify the time synch and routing of individual T1s/E1s in the group. Check the IMA group configuration to ensure consistency on the local and remote ends.
Loss of IMA Frame (LIF) *ATM Forum (R-121*)	Loss of IMA Frame is detected in the Rx direction for an IMA link UP. There is an IMA frame size mismatch between two ends of the circuit. This can be caused by missing ICP cells (ATM cells that carry protocol information), bad IMA ID, bad sequence number, bad M, bad offset HEC error or CRC error in ICP cells. This problem may occur if the link gets noisy and there is no AFA to prevent the ICP from getting corrupted. It is detected in hardware and may or may not cause an operational problem.	Check the IMA group configuration to ensure consistent frame size on the local and remote ends. Check links for evidence of noise. Check to be sure that AFA is enabled.

(continued)

Table 43 DS1/E1 UNI Module Alarms (continued)

Alarm	Meaning	Troubleshooting Steps
Port Missing ICP Cells	Two consecutive ICP cells missing from the IMA frame.	See also *Loss of IMA Frame (LIF)*. This is a specific cause of that alarm and will also be reported.
RFI IMA *ATM Forum (R-121)*	Remote Failure Indication: Far end IMA Rx networking link state machines detected LOS, OOF, AIS. LCD, LIF or LODS.	Correct T1 or E1 facilities error.
Test Pattern Failed	An 8-bit pattern is sent to the remote node which must then echo it back on all ports. The local node checks the echoed pattern and reports an alarm if cells from one or more of the links fail to arrive. This alarm is declared on all links which do not reply or reply incorrectly.	Make sure that the same number of links are configured and enabled on both ends of the IMA configuration. Make sure that the configuration of both groups is the same. For instance, make sure that the payload scrambling setting is the same on both ends.
Yellow Alarm	OOF alarm is detected. A received remote alarm indication means that the far end equipment has a problem with the signal it is receiving from the PathBuilder device.	Connect an external loopback cable to the port. If there are no alarms, the problem is elsewhere. Check for an open, short, or wiring error in the cable between the PathBuilder network interface port and your service provider's network interface unit, or the terminal equipment. An open transmit pair can cause this condition

DSX-1/E1 CBR Module Alarms

Table 44 describes the alarms specific to DSX-1 and E1 CBR modules.

Table 44 DSX-1/E1 CBR Module Alarms

Alarm	Meaning	Troubleshooting Steps
Cellbus parity	Parity error on cells received from cell bus.	Check VC and port configuration.
E1 Loss of CAS Multiframe	E1 signaling multiframe alignment has been lost.	Check the physical connection and the carrier for configuration problems.
E1 Time Channel 16 AIS Rcv	All 1s in E1 time slot 16 for 2 consecutive frames.	Make sure both the local device and the far end device are configured for Time Slot 16 framing. If both devices are correctly configured, there may be a hardware problem in either device.
Far End E1 Loss of CAS	The far end device has lost Channel Associated Signalling.	Check the E1 configuration of the far end device.
HP cellbus congested	High priority cell bus congested. The cell port has been configured to pass more CBR traffic than it can physically handle. The aggregate bandwidth of the CBR connections exceeds the total bandwidth of the port. This alarm indicates that you either mistakenly oversubscribed the cell port with CBR connections, or more connections than expected are simultaneously active. When this condition exists on the HP cell bus, lower priority cell busses will not be able to pass traffic out.	Remove high priority connections until the configured bandwidth is less than or equal to the total bandwidth on the port. If you have over-subscribed the port and all high priority devices are using the connections, turn off some devices.
LP cellbus congested	Low priority cell bus congested.	Remove low priority connections until the configured bandwidth is less than or equal to the total bandwidth on the port. If you have over-subscribed the port and all low priority devices are using the connections, turn off some devices.
MP cellbus congested	Medium priority cell bus congested.	Remove medium priority connections until the configured bandwidth is less than or equal to the total bandwidth on the port. If you have over-subscribed the port and all medium priority devices are using the connections, turn off some devices.
Receive FIFO Overflow	Cells are being received from the cell bus faster than the CBR can process them.	Reconfigure the CBR connection so that it has adequate bandwidth.
SAR SRAM failure	SAR SRAM failure (applicable to CBR)	Replace the STX card.

(continued)

Table 44 DSX-1/E1 CBR Module Alarms (continued)

Transmit FIFO Overflow	The cell bus is congested, and cells are backed up on the CBR. Traffic at the output side of the CBR port is being transmitted more slowly than it is being received from the cell bus. As a result, the output buffer is overflowing. In general, the problem is that the CBR connection is not synchronized end-to-end. The clock rate of the output port does not match the clock rate of the device from which the traffic originated.	The entire CBR connection must be synchronous end-to-end. Make sure the clock rates of the devices at either end of the connection match each other and match the transmit clock rate of the CBR ports on the PathBuilder device.
VC RDI Receive	VC RDI (Remote Defect Indication) OAM received in the connection. The far end equipment has a problem with the signal it is receiving, indicating that the problem lies between the network provider and the far end terminal equipment for this connection.	Check for a defective cable between the far end interface port and your service provider's network interface unit. An open transmit line can cause this condition.

QSIM/FAM Alarms

Table 45 describes the alarms specific to QSIMs and FAMs

Table 45 QSIM Alarms

Alarm	Meaning	Troubleshooting Steps
LMI Link Down	The Local Management Interface has taken the link down.	Check the LMI protocol configuration for the port.

Working with History Alarms

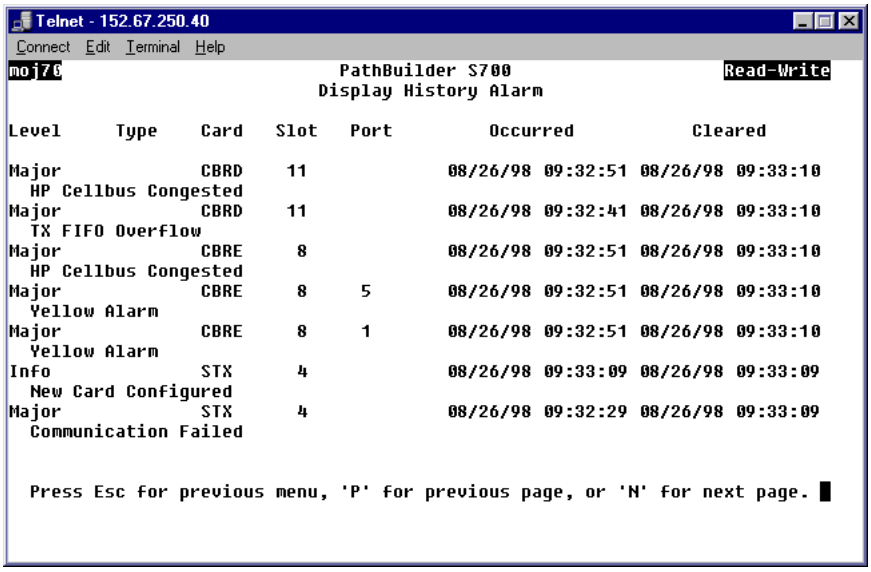
The PathBuilder S700 captures all alarms and information events and keeps them in an alarm history file. This file can hold up to 300 events; it fills on a first-in/first-out basis. We recommend that you routinely view the alarm history file before events are lost. We also recommend that you print the file for comparison with previous history files and entry into your maintenance log.

Viewing and Printing History Alarms

To view and print an alarm history, follow these steps:

1. From the Main menu, select *[3] Fault Management* to display the Fault Management menu shown earlier in Figure 163.
2. Select *[3] Display History Alarms* to view the alarm history. Figure 165 shows a representative Display History Alarm screen.

Figure 165 Display History Alarm Screen



If the history file cannot be displayed on one page, the Display History Alarm screen will include a prompt to press [N] for the next page and press [P] for the previous page.

3 Use the print screen or other printing feature of your NMS station to print out each page of the history file.

4 Compare the printouts to your most previous records to see if there are any obvious trends, such as more frequent alarms of a certain type, which might require troubleshooting.

Clearing History Alarms

After you have printed the alarm history, you should clear the alarms so that they will no longer take up space in the alarm history file. To do this, follow these steps:

1 Return to the Fault Management menu.

2 Select *[4] Clear History Alarms*. The following prompt appears:

```
Do you want to clear history alarms (Y/N) [N]?
```

3 Enter **y** to clear the history alarms.

Using Loopbacks

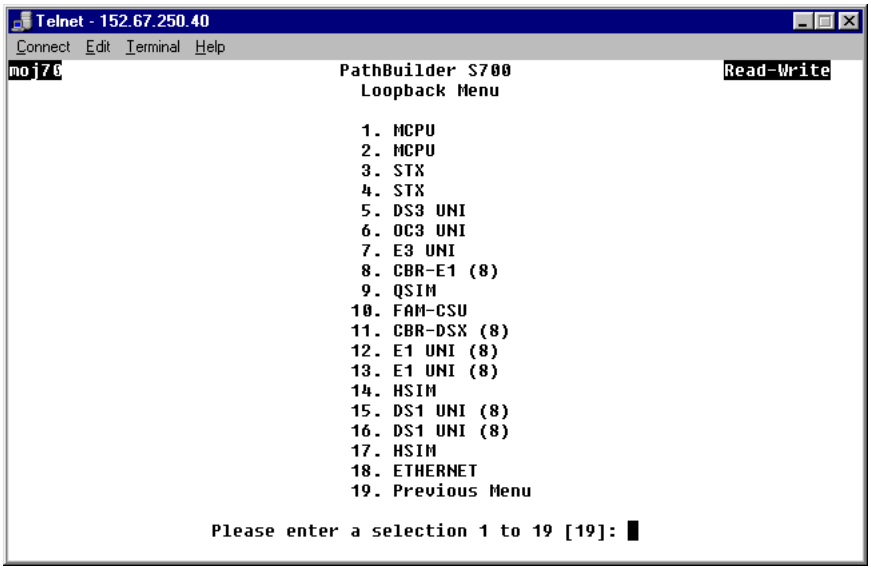
Loopbacks allow you to check circuit continuity between one point and another. You should use the PathBuilder loopback feature to check continuity to the nearest point first, and if the circuit is valid to that point, then loop to the next point. If a circuit has been compromised, isolating the problem between two points should help you identify and resolve the problem.

To access the loopback modes supported by the PathBuilder S700, follow these steps:

1 From the Main menu, select *[3] Fault Management* to display the Fault Management menu shown earlier in Figure 163.

2 Select *[5] Loopback* from the Fault Management menu to display the Loopback menu, shown in Figure 166.

Figure 166 Loopback Menu



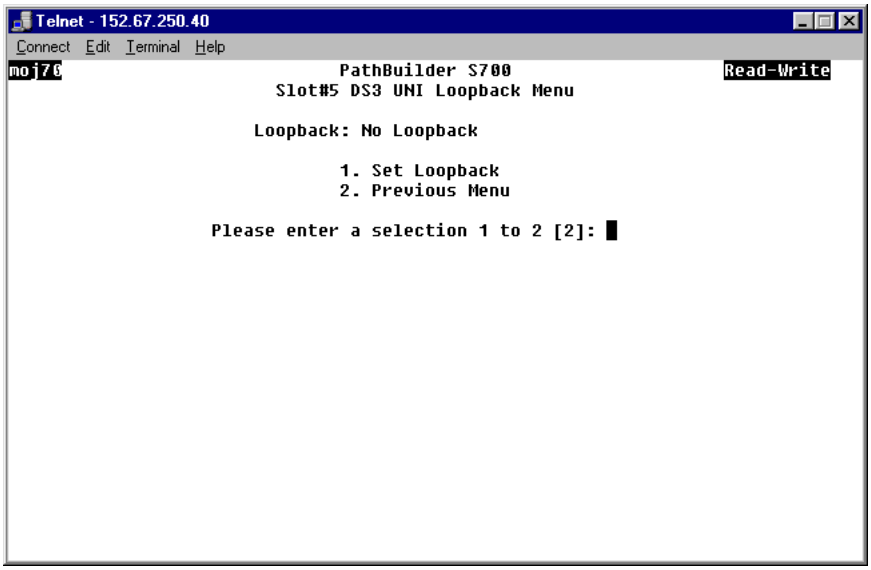
3 Select the card type for which you want to conduct the loopback.

If you select a DS1/E1 UNI or a DSX-1/E1 CBR card, you must configure the loopback on a per-port basis. After you select the card type, a port selection menu appears. In order to access the Loopback menu for that card, you must select a port from this menu

The Loopback menu for the selected card appears. Figure 167 shows the Loopback menu for the DS3 UNI card.

If you select a card type for which the PathBuilder S700 does not support loopbacks, a message appears, informing you that no loopback feature is available for that card type.

Figure 167 DS3 UNI Loopback Menu



4 Select *[1] Set Loopback*. A prompt listing the loopback choices for the selected port appears at the bottom of the screen.

5 Enter the number corresponding to the type of loopback you want to configure. The Loopback menu for the selected card type now lists the type of loopback you have selected.

The following subsections describe the available loopbacks for each of the PathBuilder S70000 interfaces.

DS3 UNI Module Loopbacks

The DS3 UNI module supports the following loopbacks:

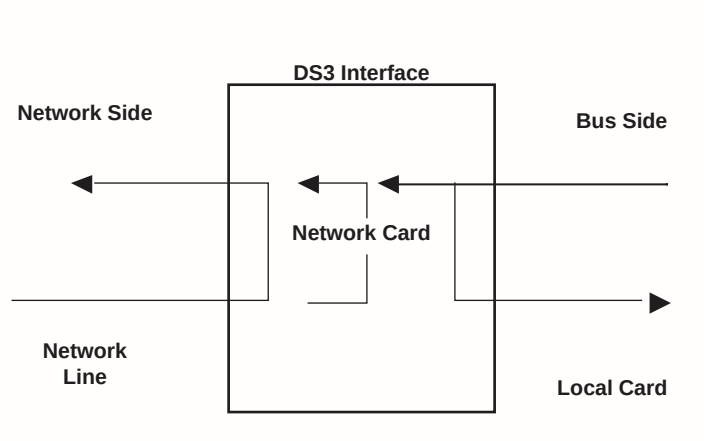
Local Card—Loops the transmit DS3 output on the receive side. All cells coming from the DS3 card are looped through the backplane and back to the DS3 card. The transmitted data will continue to go on the output.

Network Line—Loops the DS3 received data back on the output side after the digital data has been recovered.

Network Card—Loops the DS3 received cell payload back toward the line output.

Figure 168 illustrates the DS3 loopback options.

Figure 168 DS3 UNI Loopback Options



E3 UNI Module Loopbacks

The E3 UNI module supports the following loopbacks:

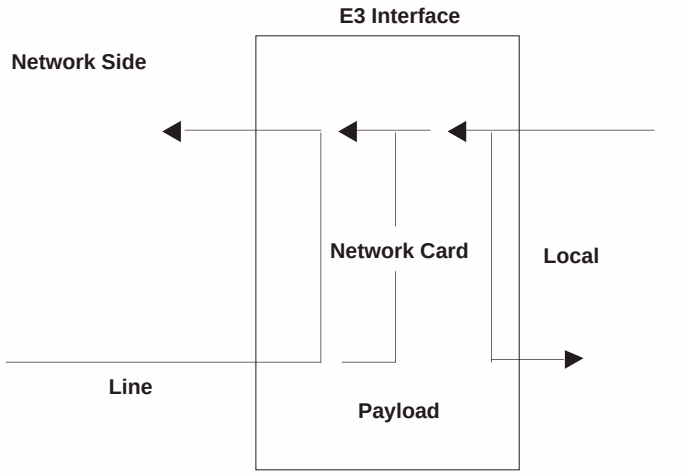
Local Card—Loops the transmit E3 output on the receive side. All cells coming from the E3 port card are looped through the backplane and back to the E3 port card. The transmitted data will continue to go on the output.

Network Line—Loops the E3 received data back on the output side after the digital data has been recovered.

Network Card—Loops the E3 received cell payload back toward the line output.

Figure 169 illustrates the loopbacks for the E3 module.

Figure 169 E3 Loopback Options



OC3/STM-1 UNI Module Loopbacks

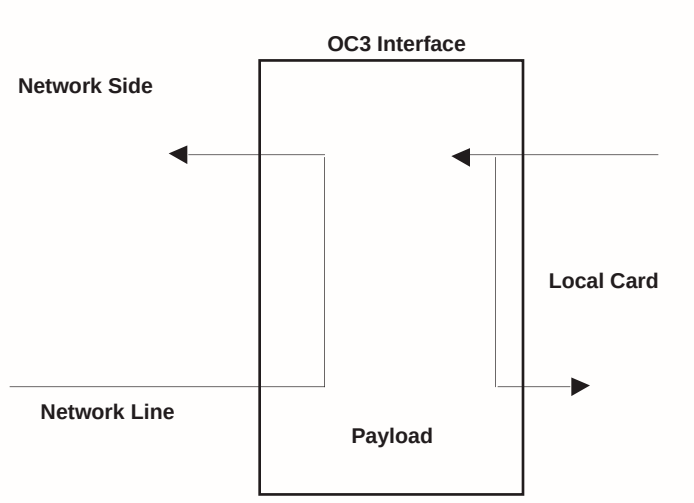
The OC3/STM-1 UNI module supports the following loopbacks:

Local Card—Loops the transmit OC3/STM-1 output on the receive side. All cells coming from the OC3/STM-1 port card are looped through the backplane and back to the OC3/STM-1 port card. The transmitted data will continue to go on the output.

Network Line—Loops the OC3/STM-1 received data back on the output side after the digital data has been recovered.

Figure 170 illustrates the loopbacks for OC3.

Figure 170 OC3/STM-1 Loopback Options



DSX-1 CBR Module Loopbacks

The DSX-1 CBR module supports the following loopbacks:

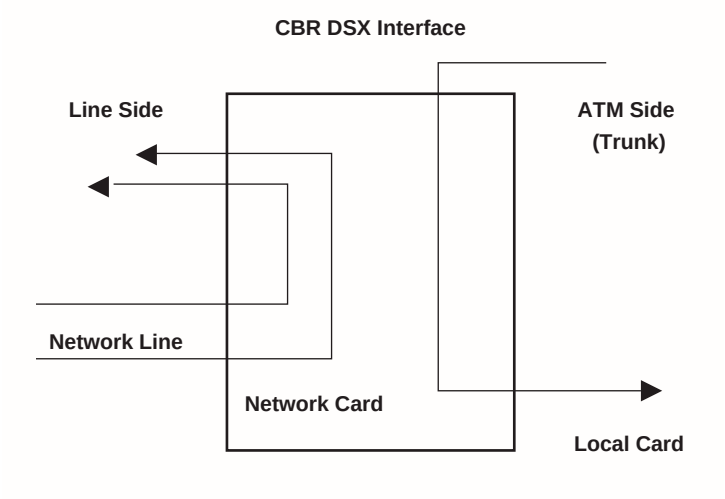
Local Card—Loops the transmit DSX-1 output on the receive side. All cells coming from the DSX-1 CBR port card are looped through the backplane and back to the DSX-1 CBR port card. The transmitted data will continue to go on the output towards the trunk card.

Network Line—Loops the DSX-1 received data back on the output side after the digital data has been recovered.

Network Card—Loops the DSX-1 received payload back toward the line output.

Figure 171 illustrates the DSX-1 CBR loopback options.

Figure 171 DSX-1 CBR Loopback Options



FAM Loopbacks

The FAM module supports the following loopbacks:

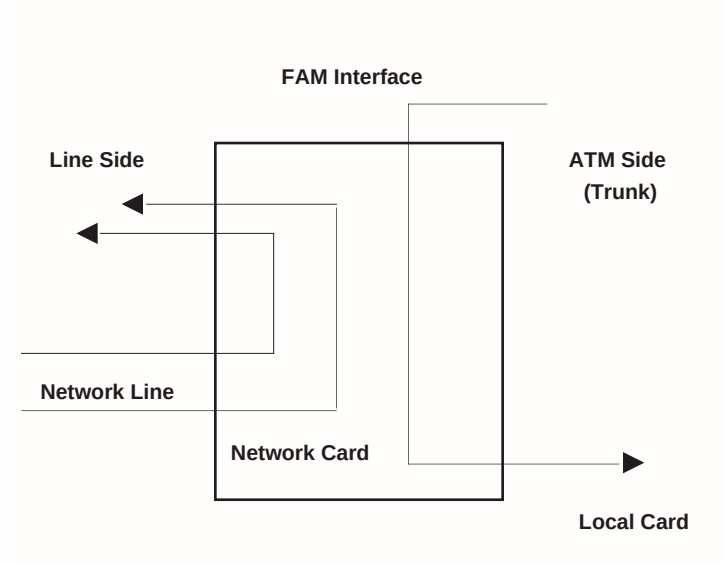
Local Card—Loops the transmit FAM output on the receive side. All cells coming from the FAM port card are looped through the backplane and back to the FAM port card. The transmitted data will continue to go on the output towards the trunk card.

Network Line—Loops the DS1 received data back on the output side after the digital data has been recovered.

Network Card—Loops the DS1 received payload back toward the line output.

Figure 172 illustrates the FAM loopback options.

Figure 172 FAM Loopback Options



DS1/E1 UNI with IMA Module Loopbacks

The DS1 UNI and E1 UNI with IMA modules supports the following loopbacks:

Network Line—The DS1 framer loops back all the bits received from the network.

Network Card—The DS1 framer loops back the payload from the network.

Local Card—The DS1 framer loops back the payload to the local cell bus.

Viewing Statistics

You can view two basics types of statistics for the various cards installed in the PathBuilder S700 shelf:

- Card statistics
- Virtual circuit statistics

This section gives you an overview of these types of statistics, tells you how to view the statistics screens, and defines the statistics listed on each of the statistics screens.

Card Statistics Overview

The PathBuilder S700 supports two types of card statistics:

- Performance statistics
- ATM statistics

Performance Statistics Overview

Performance monitoring screens list statistics that reflect the physical monitoring of the line. You can view the following types of performance monitoring statistics for each card:

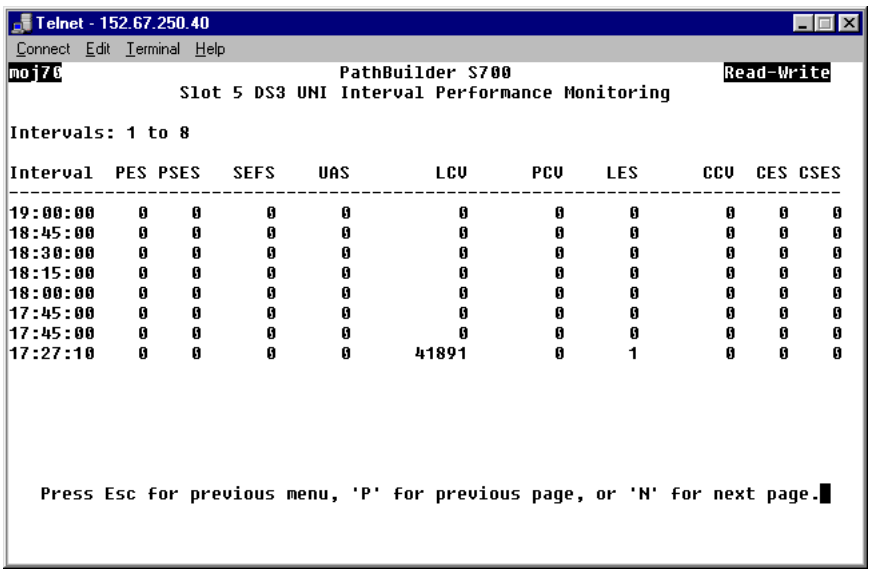
Current—The statistics being collected for the current 15-minute interval.

Interval—The statistics collected over the previous 24 hours of operation, broken into 96 completed 15-minute intervals. The intervals are numbered, and, if available, statistics are listed for each of the 96 intervals.

Total—The cumulative sum of the various statistics for the 24-hour period preceding the current 15-minute interval.

Figure 173 shows a representative performance monitoring screen.

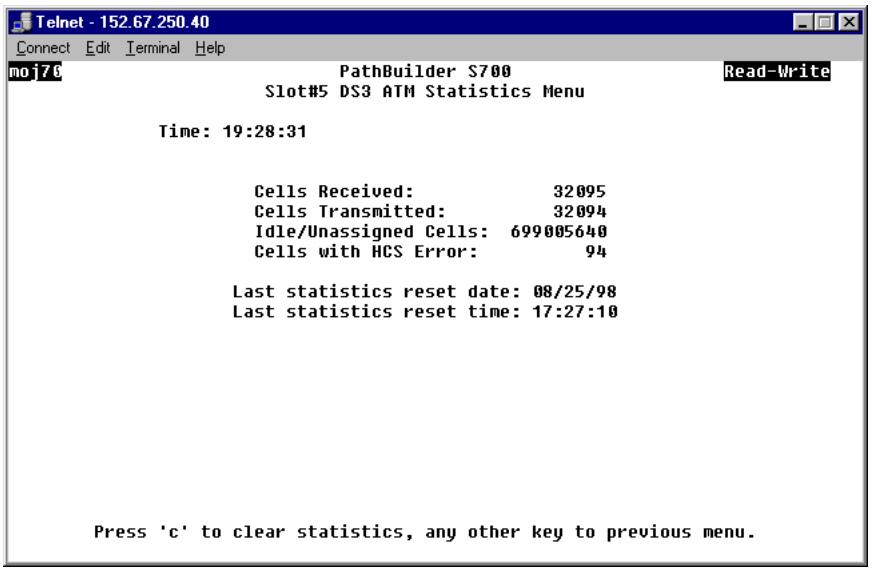
Figure 173 DS3 UNI Interval Performance Monitoring Screen



ATM Statistics Overview

ATM screens list statistics that monitor the ATM payload. ATM cell statistics are cell counts since the last counter reset. On the ATM Statistics screen, you can reset the counter by entering [c]. ATM statistics are displayed as a list rather than a table. Figure 174 shows a representative ATM statistics screen.

Figure 174 DS3 UNI ATM Statistics Screen



Virtual Circuit Statistics Overview

You can view the following types of virtual circuit statistics—either by circuit or by port/group:

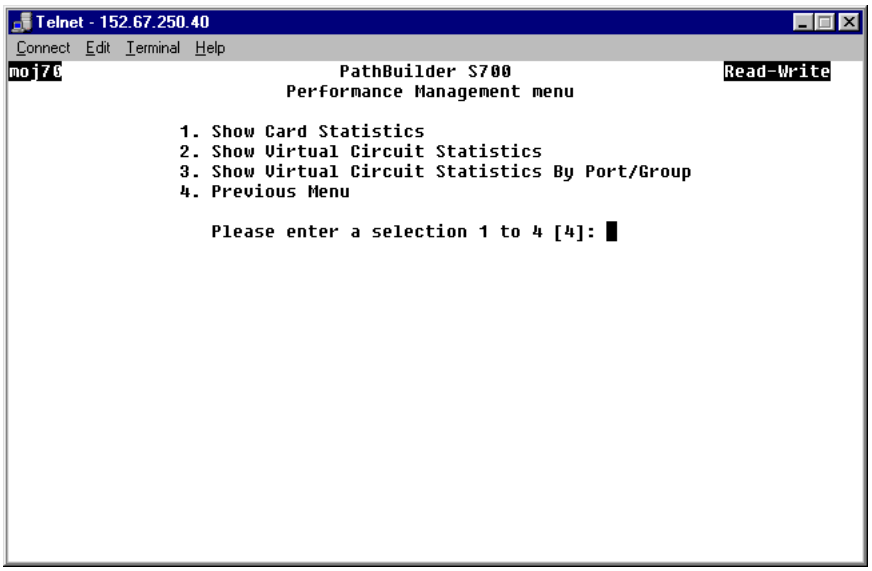
- A summary of statistics for all virtual circuits
- A detailed list of statistics for a specific circuit

Viewing Card Statistics

To view card statistics, follow these steps:

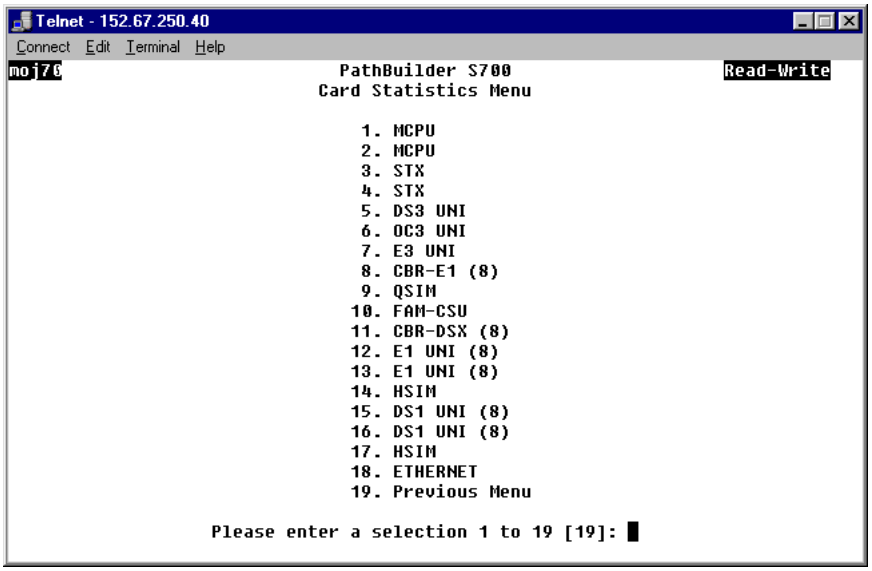
1 From the Main menu, select *[4] Performance Management* to open the Performance Management menu, shown in Figure 175.

Figure 175 Performance Management Menu



2 Select *[1] Show Card Statistics* to open the Card statistics menu, shown in Figure 176.

Figure 176 Card Statistics Menu

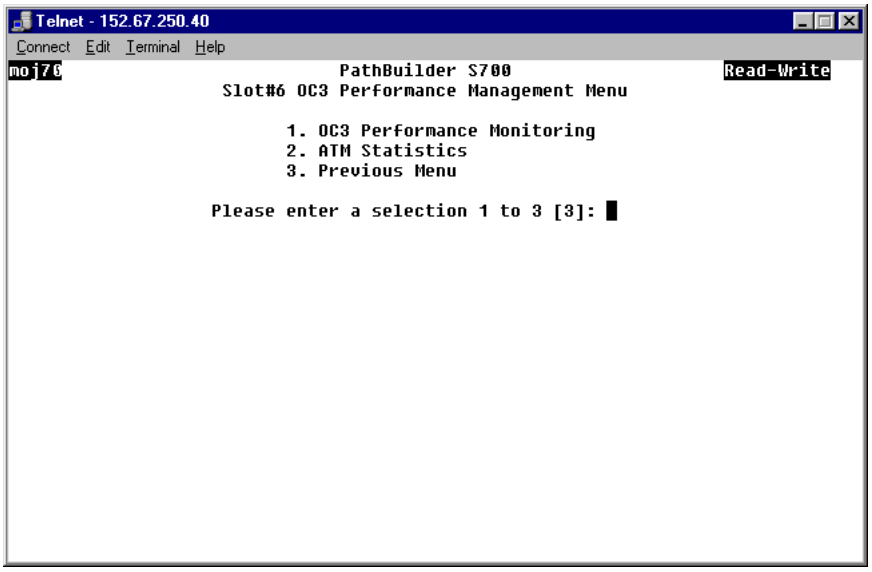


3 Enter the number corresponding to the card for which you want to view statistics to open the Performance Management menu for that card. Figure 177 shows the OS3/STM-1 UNI Performance Management menu.

If you select a card with multiple ports, you must also select the port for which you want to view statistics. After you select the card type, a port selection menu appears. In order to access the Performance Management menu for that card, you must select a port from this menu.

If you select a for which no performance statistics are available, you will get a message to that effect.

Figure 177 OC3/STM-1 UNI Performance Management Menu



4 Enter the number corresponding to the type of statistics you want to view to open the corresponding statistics screen. The available statistics vary, depending on the card type.

If you select a performance monitoring option instep 4, the Performance Monitoring menu appears. Enter the number corresponding to the type of data you want to view: current, interval, or total. You can also select [4] Clear All PM Data *from the Performance Monitoring menu to clear all the performance monitoring data.*

For descriptions of the statistics available on specific PathBuilder S700 card statistics screens, see the following subsections.

Viewing DS3 UNI Module Statistics

You can view the following types of statistics for the DS3 UNI Module:

- DS3 UNI Performance Monitoring (physical monitoring of the line)
- ATM Statistics (monitoring of the ATM payload)

DS3 UNI Performance Monitoring The DS3 Performance Monitoring screen displays the following statistics:

PES—The number of P-bit errored seconds (PESs) encountered by the DS3 interface.

PSES—The number of P-bit severely errored seconds (PSESs) encountered by the DS3 interface.

SEFS—The number of severely errored framing seconds (SEFSs) encountered by the DS3 interface.

UAS—The number of unavailable seconds (UASs) encountered by the DS3 interface.

LCV—The number of line coding violations (LCVs) encountered by the DS3 interface.

PCV—The number of path coding violations (PCVs) encountered by the DS3 interface.

LES—The number of line errored seconds (LESs) encountered by the DS3 interface.

CCV—The number of C-bit coding violations (CCVs) encountered by the DS3 interface.

CES—The number of C-bit errored seconds (CESs) encountered by the DS3 interface.

CSES—The number of C-bit severely errored seconds (CSESs) encountered by the DS3 interface.

DS3 ATM Statistics The DS3 UNI ATM Statistics screen displays the following statistics:

Cells Received—The number of ATM cells received on the DS3 since the last user reset of this counter.

Cells transmitted—The number of ATM cells transmitted on the DS3 since the last user reset of this counter.

Cells dropped—The number of idle/unassigned cells encountered and dropped on the interface.

Cells with HCS errors—The number of header check sequence (HCS) errored cells encountered on the ATM interface.

Viewing E3 UNI Module Statistics

You can view the following types of statistics for the E3 UNI Module:

- E3 UNI Performance Monitoring (physical monitoring of the line)
- ATM Statistics (monitoring of the ATM payload)

E3 UNI Performance Monitoring The E3 Performance Monitoring screen displays the following statistics:

SEFS—The number of severely errored framing seconds (SEFSs) encountered by the E3 interface.

LCV—The number of line coding violations (LCVs) encountered by the E3 interface.

LES—The number of line errored seconds (LESs) encountered by the E3 interface.

E3 ATM Statistics ATM cell statistics are cell counts since the last counter reset. On the ATM Statistics screen, you can reset the counter by entering [c]. ATM statistics are displayed as a list rather than a table, as shown earlier in Figure 174.

The E3 UNI ATM Statistics screen displays the following statistics:

Cells Received—The number of ATM cells received on the E3 since the last user reset of this counter.

Cells transmitted—The number of ATM cells transmitted on the E3 since the last user reset of this counter.

Cells dropped—The number of idle/unassigned cells encountered and dropped on the interface.

Cells with HCS errors—The number of header check sequence (HCS) errored cells encountered on the ATM interface.

Viewing OC3/STM-1 UNI Module Statistics

You can view the following types of statistics for the OC3/STM-1 UNI Module:

- OC3/STM-1 UNI Performance Monitoring (physical monitoring of the line)
- ATM Statistics (monitoring of the ATM payload)

OC3/STM-1 UNI Performance Statistics You can view the following types of OC3/STM-1 performance statistics:

- section
- line
- far line
- path
- far path

OC3/STM-1 UNI Section Performance Monitoring

ES—The number of errored seconds (ESs) encountered by the OC3/STM-1 section.

SES—The number of severely-errored seconds (SESs) encountered by the OC3/STM-1 section.

SEFS—The number of severely errored framing seconds (SEFSs) encountered by the OC3/STM-1 section.

CVS—The number of coding violations (CVs) encountered by the OC3/STM-1 section.

LOS—The number of Loss of Signal (LOS) conditions encountered by the OC3/STM-1 section.

LOF—The number of Loss of Frame (LOF) conditions encountered by the OC3/STM-1 section.

OC3/STM-1 UNJ Line Performance Monitoring

ES—The number of errored seconds (ESs) encountered by the OC3/STM-1 line.

SES—The number of severely-errored seconds (SESs) encountered by the OC3/STM-1 line.

UAS—The number of unavailable seconds (UASs) encountered by the OC3/STM-1 line.

CVS—The number of coding violations (CVs) encountered by the OC3/STM-1 line.

AIS—The number of Alarm Indicator Signal (AIS) conditions encountered by the OC3/STM-1 line.

RDI—The number of Remote Defect Indication (RDI) conditions encountered by the OC3/STM-1 interface. Also known as FERF (Far End Receive Failure). This is the alarm that is generated when a far end AIS or LOP defect is detected.

OC3/STM-1 UNI Far Line Performance Monitoring

ES—The number of far end errored seconds (ESs) encountered by the OC3/STM-1 interface.

SES—The number of far end severely-errored seconds (SESs) encountered by the OC3/STM-1 interface.

UAS—The number of far end unavailable seconds (UASs) encountered by the OC3/STM-1 interface.

CVS—The number of far end coding violations (CVs) encountered by the OC3/STM-1 interface.

OC3/STM-1 UNI Path Performance Monitoring

ES—The number of errored seconds (ESs) encountered by the OC3/STM-1 path interface.

SES—The number of severely-errored seconds (SESs) encountered by the OC3/STM-1 path interface.

UAS—The number of unavailable seconds (UASs) encountered by the OC3/STM-1 path interface.

CVS—The number of coding violations (CVs) encountered by the OC3/STM-1 path interface.

LOP—The number of Loss of Pointer (LOP) conditions encountered by the OC3/STM-1 path interface.

AIS—The number of Alarm Indicator Signal (AIS) conditions encountered by the OC3/STM-1 path interface.

RDI—The number of Remote Defect Indication (RDI) conditions encountered by the OC3/STM-1 path interface. Also known as FERF (Far End Receive Failure). This is the alarm that is generated when a far end AIS or LOP defect is detected.

UEQ—The number of Unequipped (UEQ) conditions encountered by the OC3/STM-1 path interface. If a path is not provisioned (i.e. it is idle), the SONET equipment will signal this state.

PLM—Physical Layer Module.

OC3/STM-1 UNI Far Path Current Performance Monitoring

ES—The number of far end errored seconds (ESs) encountered by the OC3/STM-1 path interface.

SES—The number of far end severely-errored seconds (SESs) encountered by the OC3/STM-1 path interface.

UAS—The number of far end unavailable seconds (UASs) encountered by the OC3/STM-1 path interface.

CVS—The number of far end coding violations (CVs) encountered by the OC3/STM-1 path interface.

OC3/STM-1 UNI ATM Statistics The OC3/STM-1 UNI ATM Statistics screen displays the following statistics:

Cells Received—The number of ATM cells received on the OC3/STM-1 since the last user reset of this counter.

Cells transmitted—The number of ATM cells transmitted on the OC3/STM-1 since the last user reset of this counter.

Cells dropped—The number of idle/unassigned cells encountered and dropped on the interface.

Cells with HCS errors—The number of header check sequence (HCS) errored cells encountered on the ATM interface.

Viewing DS1 UNI and E1 UNI with IMA Module Statistics

You can view DS1 UNI and E1 UNI statistics for ports or for groups.

To view statistics for a DS1 UNI or E1 UNI with IMA module, follow these steps:

1. From the Card Statistics menu, shown earlier in Figure 176, select the option corresponding to the DS1 UNI or E1 UNI card to open the DS1/E1 UNI Performance menu.
2. Select *[1] Port/Link Performance Management* to view port statistics or *[2] Group Performance Management* to view group statistics.
3. Enter the number corresponding to the port or group for which you want to view statistics.
4. Select the option corresponding to the type of statistics you want to view.
   - Port statistics
     - Physical performance
     - IMA link performance
     - IMA link ATM
   - Group statistics
     - Group performance
     - Group ATM

If you select a performance monitoring option, you need to select the type of data you want to view (current, interval, or total; for this release current data is your only option) from an intermediary screen before the performance statistics for the selected group or port are displayed. You can also clear the performance statistics from this intermediary screen.

The following sections list the specific counters listed for each type of DS1/E1 UNI statistic.

DS1 UNI and E1 UNI Port/Link Physical Performance Statistics The DS1/E1 UNI Performance Monitoring screens display the following current, interval, or total statistics:

ES—The number of errored seconds (ESs) encountered by the T1/E1 interface.

SES—The number of severely-errored seconds (SESs) encountered by the T1/E1 interface.

SEFS—The number of severely errored framing seconds (SEFSs) encountered by the T1/E1 interface.

UAS—The number of unavailable seconds (UASs) encountered by the T1/E1 interface.

CSS—The number of controlled slip seconds (CSSs) encountered by the T1/E1 interface.

PCV—The number of path coding violations (PCVs) encountered by the T1/E1 interface.

LES—The number of line errored seconds (LESs) encountered by the T1/E1 interface.

BES—The number of bursty errored seconds (BESs) encountered by the T1/E1 interface.

DM—The number of degraded minutes (DM) encountered by the T1/E1 interface.

LCV—The number of line coding violations (LCVs) encountered by the T1/E1 interface.

You can view the statistics as current, interval, or total data.

DS1 UNI and E1 UNI Port/Link IMA Link Performance Statistics The DS1/E1 IMA Link Performance Monitoring screen lists the following statistics:

IMA Violation (IV-IMA)—Number of errored, invalid, or missing ICP cells.

NE Severe Errored Sec (SES-IMA)—Near end severely-errored seconds; the number of seconds with IMA violation, LOS, AIS, OOF, LCD, LIF, LODS at the near end.

FE Severe Errored Sec (SES-IMA-FE)—Far end severely-errored seconds; the number of seconds with IMA violation, LOS, AIS, OOF, LCD, LIF, LODS at the far end.

NE Unavailable Sec (UAS-IMA)—Near end unavailable seconds; the number of unavailable seconds at the near end.

FE Unavailable Sec (UAS-IMA-FE)—Far end unavailable seconds; the number of unavailable seconds at the far end.

NE Tx Unusable Sec (Tx-UUS-IMA)—Near end transmit unusable seconds; the number of unusable seconds at the near end interworking Tx link state machine.

NE Rx Unusable Sec (Rx-UUS-IMA)—Near end receive unusable seconds; the number of unusable seconds at the near end interworking Rx link state machine.

FE Tx Unusable Sec (Tx-UUS-IMA-FE)—Far end transmit unusable seconds; the number of unusable seconds at the far end interworking Tx link state machine.

FE Rx Unusable Sec (Rx-UUS-IMA-FE)—Far end receive unusable seconds; the number of unusable seconds at the far end interworking Rx link state machine.

NE Tx Number of Failures (Tx-FC)—Number of Tx failure alarms at the near end.

NE Rx Number of Failures (Rx-FC)—Number of Rx failure alarms at the near end.

FE Tx Number of Failures (Tx-FC-FE)—Number of Tx failure alarms at the far end.

FE Rx Number of Failures (Rx-FC-FE)—Number of Rx failure alarms at the far end.

DS1 UNI and E1 UNI Port/Link IMA Link ATM Statistics The T1/E1 Link ATM Statistics screen lists the following statistics:

Tx Cells—The number of Tx data cells since the counter was cleared.

Rx Cells—The number of Rx data cells since the counter was cleared.

Rx ICP Cell Error—Number of Rx errored ICP cells since the counter was cleared.

Tx Cell Rate—Current Tx cells per second.

Rx Cell Rate—Current Rx cells per second.

Rx ICP Cell Error Rate—Current Rx errored ICP cells per second.

Avg. Tx Cell Rate—Average Tx data cells rate calculated over the last 8 seconds.

Avg. Rx Cell Rate—Average Rx data cells rate calculated over the last 8 seconds.

Avg. Rx ICP Cell Err Rate—Average Rx errored ICP cells rate calculated over the last 8 seconds.

DS1 UNI and E1 UNI Group Performance Statistics The T1/E1 Group Performance screen lists the following statistics:

Running Sec—Count of operational seconds at the near end interworking group state machine.

Unavailable Sec—Count of unavailable seconds at the near end interworking group state machine.

NE Number of Failures—Number of failure alarms at the near end.

FE Number of Failures—Number of failure alarms at the far end.

DS1 UNI and E1 UNI Group ATM Statistics The T1/E1 Group ATM Statistics screen lists the following statistics:

Tx Cells—The number of Tx data cells since the counter was cleared.

Rx Cells—The number of Rx data cells since the counter was cleared.

Rx ICP Cell Error—Number of Rx errored ICP cells since the counter was cleared.

Tx Cell Rate—Current Tx cells per second.

Rx Cell Rate—Current Rx cells per second.

Rx ICP Cell Error Rate—Current Rx errored ICP cells per second.

Avg. Tx Cell Rate—Average Tx data cells rate calculated over the last 8 seconds.

Avg. Rx Cell Rate—Average Rx data cells rate calculated over the last 8 seconds.

Avg. Rx ICP Cell Err Rate—Average Rx errored ICP cells rate calculated over the last 8 seconds.

Viewing Ethernet Module Statistics

You can view the following types of statistics for the Ethernet Modules:

- Bridging and Ethernet Statistics (per port)
- Spanning Tree Statistics
- ATM VC Statistics

Bridging and Ethernet Statistics The Bridging and Ethernet Statistics screen displays the following statistics:

- Bridge statistics
- Filtering statistics
- Ethernet statistics

Bridge Statistics

Port state—The operational state of the Ethernet bridged port, based on the 802.1D specification: *disabled*, *listening*, *learning*, *forwarding*, or *blocking*.

Total frames received—The total number of frames received at this port.

Broadcast Frames—The number of broadcast frames received on the port.

Spanning Tree Frames—The total number of 802.1D Bridge Protocol Data Unit frames received by the bridged port since the statistics were last cleared.

Discarded Frames—The number of valid frames received that were discarded (filtered) by the forwarding process.

Flooded Frames—The total number of incoming frames that were flooded on this port.

Forwarded Frames—The number of incoming frames at this port that were forwarded.

Total frames transmitted—The total number of frames transmitted at this port.

Filtering Statistics

MAC MTU Exceeded—The number of frames discarded because of a size greater than the maximum MTU size for the port.

No ATM VCs present—The number of frames discarded because there was no ATM VC associated with the physical port.

Bridge discards—The number of frames discarded due to the bridging operation.

Output port disabled—The number of frames discarded because the output port was disabled.

Source address filtered—The number of frames discarded due to source address filtering.

Destination address filtered—The number of frames discarded due to destination address filtering.

SAP Filtered—The number of frames discarded due to the protocol filtering operation.

Ethernet Statistics

Transmitted frames—The total number of frames transmitted at this port.

Transmitted bytes—The total number of bytes transmitted at this port.

Received frames—The total number of frames received at this port.

Received bytes—The total number of bytes received at this port.

CRC errored frames—The number of frames with CRC errors detected at this port.

Deferred transmits—The number of frames for which the first transmission attempt at this port was delayed because the port was busy. This count does not include frames involved in collisions.

Single collisions—The number of successfully-transmitted frames at this port for which transmission is inhibited by exactly one collision.

Multiple collisions—The number of successfully-transmitted frames at this port for which transmission is inhibited by more than one collision.

Late collisions—The number of times that a collision has been detected on this port later than 512 bit-times into the transmission of a packet.

Excessive collisions—The number of frames for which transmission at this port failed due to excessive collisions.

Carrier sense errors—The number of times that the carrier sense condition was lost or never asserted when attempting to transmit a frame at this port.

Internal transmit errors—The number of frames for which reception at this port failed due to an internal MAC sublayer receive error.

Oversized frames—The number of frames received at this port that exceeded the maximum permitted frame size.

Alignment Errors—The total number of alignment errors detected for the bridged physical port since the statistics were last cleared.

Spanning Tree Statistics The Spanning Tree Statistics screen displays the following statistics:

Bridge Identifier—The bridge address of the Ethernet port.

Root Bridge—The bridge root address of the Ethernet port.

Designated Bridge ID—The designated Spanning Tree bridge ID of this port.

Hello Time—The time interval between issuing STP (Spanning Tree Protocol) configuration messages.

Forward Delay—The amount of time in the "learning" and "listening" states; half the amount of time that must elapse between the time when it is decided that a port should become part of the Spanning Tree and the time when data traffic is allowed to be forwarded to and from that port.

Maximum Age—The time at which a configuration message is discarded.

Port Identifier—The bridge root port of the Ethernet port.

Root Path Cost—The bridge root path cost of the Ethernet port.

Designated Port ID—The designated Spanning Tree bridge port ID of this port.

Topology Changed—The topology change state of Spanning Tree for this port.

Topology Changed Count—The number of topology changes of Spanning Tree for this port.

Total Forward Transitions—The total number of state transitions to a forwarding state since the statistics were last cleared.

Total BridgeUp Time—The total amount of time, in seconds, that the bridge has been active with Spanning Tree enabled. This count is valid only when Spanning Tree is enabled for a bridged port.

ATM VC Statistics The ATM VC Statistics screen displays the following statistics:

VC#—The system-assigned virtual circuit number.

(Side A) card s/p—The slot and port number for side A of the circuit.

(Side A) rx—The receive VCI/VPI for side A.

(Side A) tx—The transmit VCI/VPI for side A.

(Side B) card s/p—The slot and port number for side B of the circuit.

(Side B) rx—The receive VCI/VPI for side B.(Side B) tx —The transmit VCI/VPI for side B.

(Side B) Desc—The user-entered description of the circuit.

Viewing DSX-1 and E1 CBR Module Statistics

You can view the following types of statistics for the DSX-1/E1 CBR modules:

- DSX-1/E1 CBR Performance Monitoring (physical monitoring of the line)
- ATM Statistics (monitoring of the ATM payload)

DSX-1/E1 CBR Performance Monitoring The DSX-1 CBR and E1 CBR Performance Monitoring screens display the following statistics:

ES—The number of errored seconds (ESs) encountered by the DSX-1/E1 CBR interface.

SES—The number of severely-errored seconds (SESs) encountered by the DSX-1/E1 CBR interface.

SEFS—The number of severely errored framing seconds (SEFSs) encountered by the DSX-1/E1 CBR interface.

UAS—The number of unavailable seconds (UASs) encountered by the DSX-1/E1 CBR interface.

CSS—The number of controlled slip seconds (CSSs) encountered by the DSX-1/E1 CBR interface.

PCV—The number of path coding violations (PCVs) encountered by the DSX-1/E1 CBR interface.

LES—The number of line errored seconds (LESs) encountered by the DSX-1/E1 CBR interface.

BES—The number of bursty errored seconds (BESs) encountered by the DSX-1/E1 CBR interface.

DM—The number of degraded minutes (DMs) encountered by the DSX-1/E1 CBR interface.

LCV—The number of line coding violations (LCVs) encountered by the DSX-1/E1 CBR interface.

DSX-1/E1 CBR ATM Statistics ATM cell statistics are cell counts since the last counter reset. On the ATM Statistics window, you can reset the counter by entering [c]. ATM statistics are displayed as a list rather than a table, as shown earlier in Figure 174. The DSX-1 and E1 CBR ATM Statistics screens display the following statistics:

Total Cells Received—Number of cells received and played out (reassembled).

Total Cells Transmitted—Number of cells sent to the cell bus.

Total Cell Pointer Errors—Number of cells dropped due to structure pointer mismatches.

Total Cells Lost—The difference between the number of cells transmitted and the number of cells received.

Total Number of Buffer UnderFlows—Number of underrun events.

Total Number of Buffer OverFlows—Number of overrun events.

Total out of Sequence Errors—Number of cells received with out-of-sequence number mismatch.

Total CRC Errors—Number of cells received with uncorrectable sequence number CRC error.

Total OAM Cells Received—Number of OAM (Operations, Administration, and Maintenance) cells received. These cells carry OAM information used for network management.

Total OAM Cells Transmitted—Number of OAM (Operations, Administration, and Maintenance) cells transmitted. These cells carry OAM information used for network management.

Current Cell Status—Cell loss period count (for CBR use only).

Viewing QSIM/HSIM/FAM Statistics

You can view the following types of statistics for the QSIM/HSIM/FAM modules:

- HDLC Statistics
- Frame Relay Statistics (per DLCI)
- ATM VC Statistics (per VCI)
- LMI Statistics
- FAM DS1 Performance Monitoring (FAM module only)

HDLC Statistics The HDLC Statistics screen lists the following statistics:

Received Frames—The total number of received frames with good FCS at this port.

Transmitted Frames—The total number of successfully-transmitted frames at this port.

Discarded Invalid Frames—The total number of frames discarded at this port because they were invalid. Invalid frames are frames that are received with good FCS but that cannot be processed due to wrong content.

Discarded Congested Frames—The total number of frames discarded at this port because they were congested. Congested frames are frames that were not transmitted due to link congestion.

Received bytes—The total number of bytes received at this port.

Transmitted bytes—The total number of bytes transmitted at this port.

FCS Errors—The total number of received frames with bad FCS at this port.

Frame Relay Statistics (per DLCI) When you select *Frame Relay Statistics* from the QSIM, HSIM, or FAM Performance Management menu, a Frame Relay Statistics table appears, listing configured virtual circuits. Enter a number corresponding to one of the listed virtual circuits to display a list of Frame Relay Statistics for that virtual circuit.

The Frame Relay Statistics screen lists the following statistics (per DLCI):

Received Frames—The total number of received frames with good FCS at this port.

Transmitted Frames—The total number of successfully-transmitted frames at this port.

Discarded Invalid Frames—The total number of frames discarded at this port because they were invalid. Invalid frames are frames that are received with good FCS but that cannot be processed due to wrong content.

Discarded Congested Frames—The total number of frames discarded at this port because they were congested. Congested frames are frames that were not transmitted due to link congestion.

Received bytes—The total number of bytes received at this port.

Received DE—The number of DE (Discard Eligibility) frames received at this port.

Received FECN—The number of FECN (Forward Explicit Congestion Notification) frames received at this port.

Received BECN—The number of BECN (Backward Explicit Congestion Notification) frames received at this port.

ATM VC Statistics (per VCI) When you select *ATM VC Statistics* from the QSIM, HSIM, or FAM Performance Management menu, an ATM VC Statistics table appears, listing configured virtual circuits. Enter a number corresponding to one of the listed virtual circuits to display a list of ATM VC Statistics for that virtual circuit,

The ATM VC Statistics screen lists the following statistics (per VCI):

Port transmit VPI—The transmit VPI for the port side (the side toward the connector, rather than toward the bus) of the circuit.

Port transmit VCI—The transmit VCI for the port side of the circuit.

Port receive VPI—The receive VPI for the port side of the circuit.

Port receive VCI—The receive VCI for the port side of the circuit.

Received Frames—The total number of received frames with good FCS at this port.

Transmitted Frames—The total number of successfully-transmitted frames at this port.

AAL5 Errors—ATM Adaptation Layer 5 (AAL5) Error counter.

Discarded Congested Frames—The total number of congested frames discarded at this port. Congested frames are frames that were not transmitted due to link congestion.

LMI Statistics The LMI Statistics screen lists the following statistics:

Received LMI Frames—Total number of frames received at this port.

Discarded LMI Frames—Total number of frames discarded at this port.

LIV/Full Status Timeouts—Number of Link Integrity Verification (LIV) timeouts for the User Side.

Transmit LIV Requests—Number of Link Integrity Verification (LIV) Requests transmitted for the User Side.

Receive LIV Responses—Number of Link Integrity Verification (LIV) Responses received for the User Side.

Transmit Full Status Requests—Number of Full Status Requests transmitted for the User Side.

Receive Full Status Responses—Number of Full Status Responses received for the User Side.

Loss of Seq Num Sync—Number of Sequence Number Synchronized Losses for the User Side. The number of alarm events generated when the sequence numbers between polling and polled units are not matched.

Receive Unconfigured PVCs—Number of unconfigured PVCs received for the User Side.

Last statistics reset date—The date on which LMI statistics were last reset.

Last statistics reset time—The time at which LMI statistics were last reset.

FAM Performance Monitoring For the FAM module only, you can view DS1 performance monitoring statistics. The FAM Performance Monitoring screen displays the following statistics:

ES—The number of errored seconds (ESs) encountered by the FAM interface.

SES—The number of severely-errored seconds (SESs) encountered by the FAM interface.

SEFS—The number of severely errored framing seconds (SEFSs) encountered by the FAM interface.

UAS—The number of unavailable seconds (UASs) encountered by the FAM interface.

CSS—The number of controlled slip seconds (CSSs) encountered by the FAM interface.

PCV—The number of path coding violations (PCVs) encountered by the FAM interface.

LES—The number of line errored seconds (LESs) encountered by the FAM interface.

BES—The number of bursty errored seconds (BESs) encountered by the FAM interface.

DM—The number of degraded minutes (DMs) encountered by the FAM interface.

LCV—The number of line coding violations (LCVs) encountered by the FAM interface.

Viewing Virtual Circuit Statistics

The virtual circuit statistics available for the PathBuilder S700 provide you with circuit parameters and cell counts broken down in two ways:

- by circuit
- by port/group

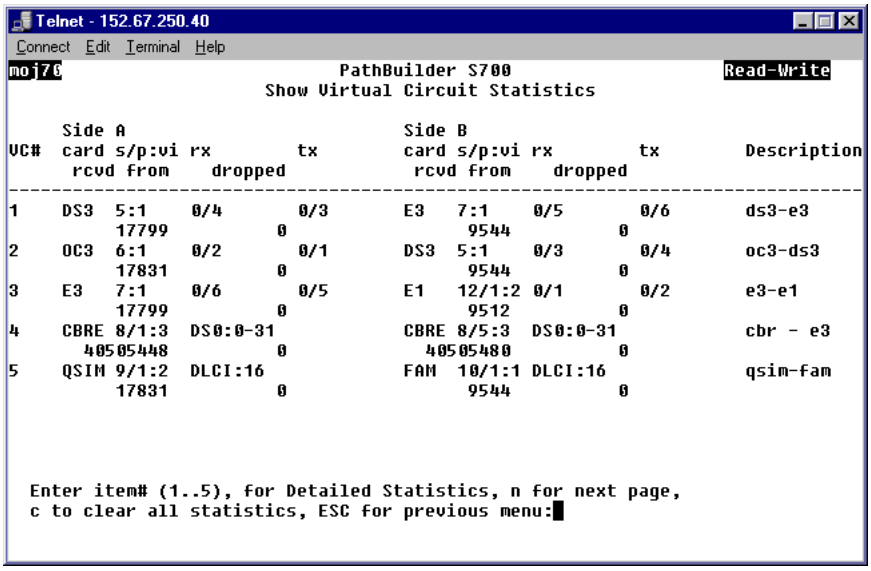
These statistics enable you to look at cell loss at various points in the data flow and adjust parameters—such as shaper values—accordingly.

Viewing Virtual Circuit Statistics by Circuit

To display virtual circuit statistics by circuit, follow these steps:

1. From the Configuration Management menu, select *[2] Manage Circuits* to display the Virtual Circuit menu.
2. From the Virtual Circuit menu select *[5] Show Virtual Circuit Statistics* to display a summary of statistics for all circuits, as shown in Figure 178.

Figure 178 Show Virtual Circuit Statistics Window



Each pair of rows on the Virtual Circuit Statistics Summary screen provides the following information about one of the existing virtual circuits:

Row 1 (left to right)

VC#—Virtual circuit ID number.

Card—Side A card type.

s/p: vi—(Side A) slot number /port number: virtual interface number.

rx—(Side A) receive VCI/VPI (IP address for the MCPU card).

tx—(Side A) transmit VCI/VPI (IP address for the MCPU card).

Card—Side B card type.

s/p: vi—Side B slot number /port number: virtual interface number.

rx—Side B receive VCI/VPI (IP address for the MCPU card).

tx—Side B transmit VCI/VPI (IP address for the MCPU card).

Description—Virtual circuit description.

Row 2 (left to right)

rcvd from—number of cells received on side A per port or group

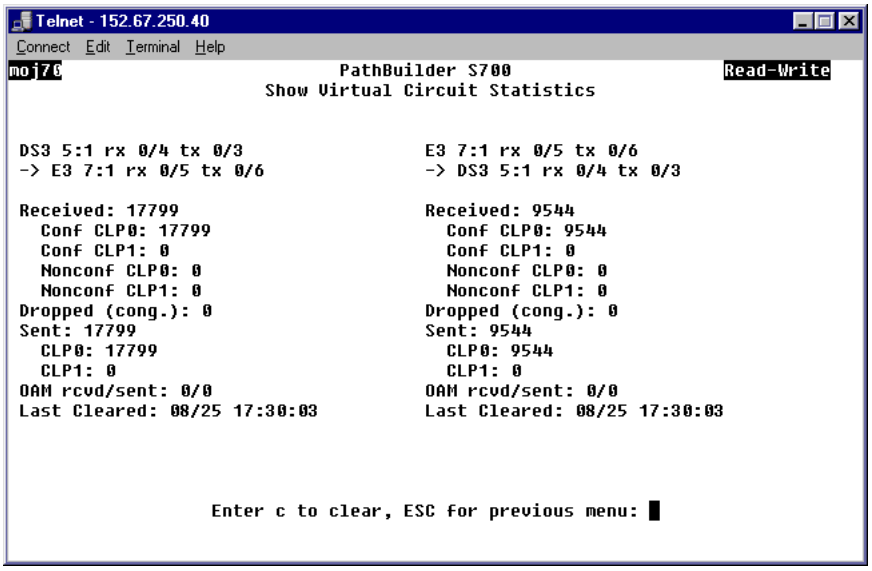
dropped—number of cells dropped on side A due to queue congestion or early packet discard (EPD).

rcvd from—number of cells received on side B per port or group

dropped—number of cells dropped on side B due to queue congestion or early packet discard (EPD).

3 To view additional information about a particular circuit, enter the desired virtual circuit number to display the Virtual Circuit Statistics Detail screen for that circuit. Figure 179 shows a representative Virtual Circuit Statistics Detail screen.

Figure 179 Show Virtual Circuits Detail Window



The Virtual Circuit Statistics Detail screen displays the following statistics:

For further details about conforming CLPO+CLP1 and non-conforming CLP1+CLP0 cells, see "Conforming/Non-Conforming Cell Counters" later in this section.

Received—Total number of cells received (conforming CLPO+CLP1 and non-conforming CLP1+CLPO cells).

Conf CLP0—Ingress CLPO; the number of conforming CLP=0 cells received.

ConfCLP1—Ingress CLP1; the number of conforming CLP=1 cells received.

Nonconf CLP0—Number of non-conforming CLP=0 cells received. This counter is used only with *Policing* enabled.

NonconfCLP1—Number of non-conforming CLP=1 cells received. This counter is used only with *Policing* enabled.

Dropped (due to congestion)—Number of cells dropped due to queue congestion or EPD (early packet discard).

Sent—Total number of cells sent (total of CLP0 + CLP1 cells).

CLP0—Total number of CLP=0 cells sent.

CLP1—Total number of CLP=1 cells sent.

Last Cleared—Date and time that the statistics were last cleared.

Conforming/Non-Conforming Cell Counters

The conforming and non-conforming cells reflect a cell's ingress types (CLP0 or CLP1) prior to any policing actions. These counters do not count a cell more than once. If a cell is received as a CLP0 type and is then tagged due to policing, the cell will still be counted as a CLP0 cell.

The following subsections provide additional information that applies to the conforming and non-conforming cell counters, depending on which policing configuration you choose.

Conforming/Non-Conforming Cell Counters for CBR Traffic

Config 1

Conf CLP0 = Conforming CLP0 cells

Conf CLP1 = Ingress CLP1 cells

Nonconf CLP0 = Non-conforming CLP0 cells that were tagged

Nonconf CLP1 = not counted

Config 2

Conf CLP0 = Conforming CLP0 cells

Conf CLP1 = Conforming CLP1 cells

Nonconf CLP0 = Non-conforming CLP0 cells that were dropped

Nonconf CLP1 = Non-conforming CLP1 cells that were dropped

Total dropped cell count = Received - Sent

Conforming/Non-Conforming Cell Counters for Non-CBR Traffic

Config 1

Conf CLP0 = Conforming CLP0 cells

Conf CLP1 = Conforming CLP1 cells

Nonconf CLP0 = Non-conforming CLP0 cells that were tagged and/or dropped

Nonconf CLP1 = Non-conforming CLP1 cells that were dropped

Tagged cell count = Sent CLP1 - Conf CLP1

Total dropped cell count = Received - Sent

Total dropped by policing = ((Received - Sent) - Dropped (due to congestion))

Config 2

Conf CLP0 = Conforming CLP0 cells

Conf CLP1 = Conforming CLP1 cells

Nonconf CLP0 = Non-conforming CLP0 cells that were tagged

Nonconf CLP1 = Non-conforming CLP1 cells that were dropped

Tagged cell count = Sent CLP1 - Conf CLP1

Total dropped cell count = Received - Sent

Total dropped by policing = ((Received - Sent) - Dropped (due to congestion))

Viewing Virtual Circuit Statistics by Port/Group

To display statistics for all virtual circuits by port/group, follow these steps:

1 From the Configuration Management menu, select *[2] Manage Circuits* to display the Virtual Circuit menu.

2 From the Virtual Circuit menu select *[6] Show Virtual Circuit Statistics By Port/Group* to view a summary of statistics for all circuits on each port/group. The Virtual Statistics by Port/Group Summary screen, shown in Figure 180, displays the following information for each port/group:

Port/Group—The port and group number.

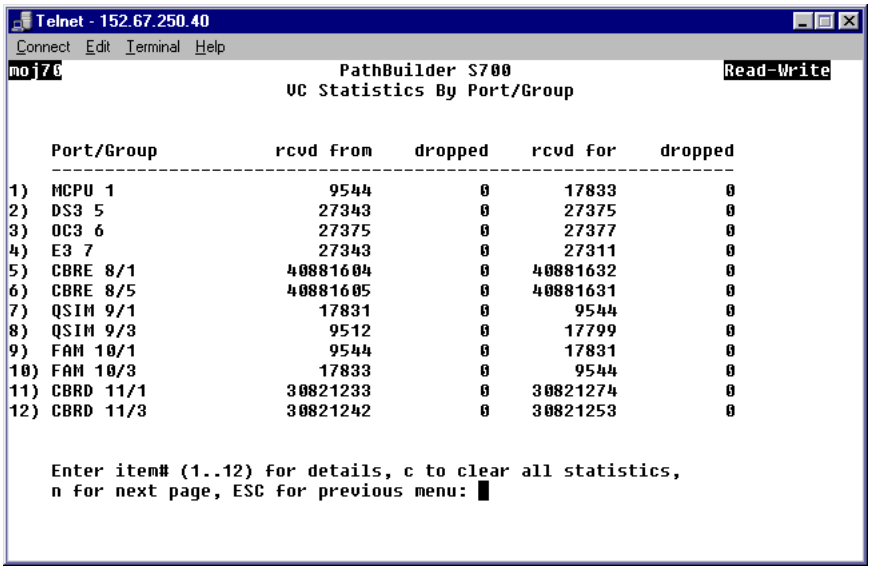
rcvd from—The number of cells received.

(rcvd from) dropped—The number of received cells dropped.

rcvd for—The number of cells sent.

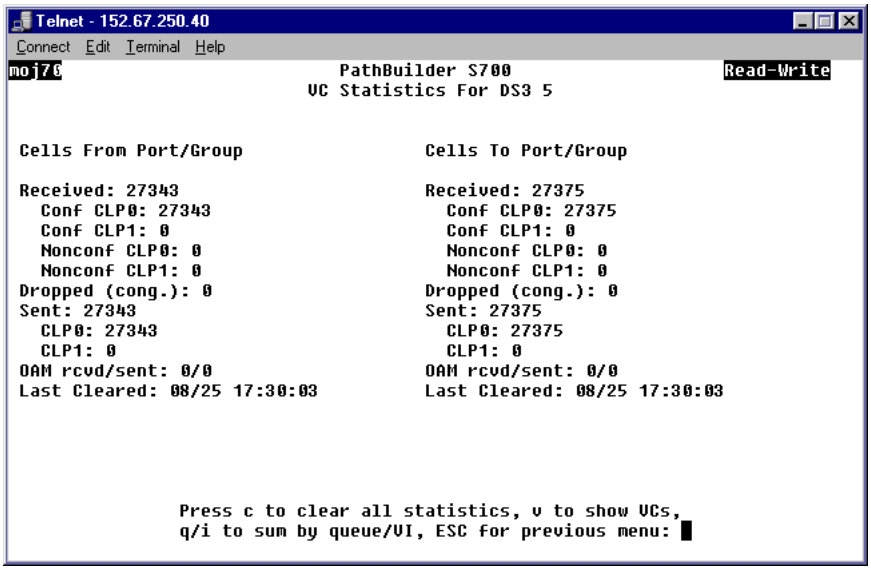
(rcvd for) dropped—The number of sent cells dropped.

Figure 180 Virtual Statistics by Port/Group Summary Screen



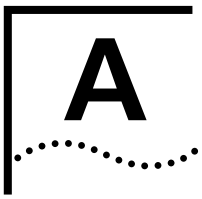
3 To view the number of cells received, dropped, and sent from and to a particular port/group, enter the desired pot/group number to display the Virtual Circuit Statistics by Port/Group Detail screen, shown in Figure 181.

Figure 181 Virtual Circuit Statistics By Port/Group Detail Window



From the Virtual Circuits by Port/Group detail screen, you can:

- Press [c] to clear all statistics.
- Press [v] to show VCs.
- Press [q] to view summary statistics by queue.
- Press [i] to view summary statistics by virtual interface.



TECHNICAL SUPPORT

3Com provides easy access to technical support information through a variety of services. This appendix describes these services.

Information contained in this appendix is correct at time of publication. For the very latest, 3Com recommends that you access the 3Com Corporation World Wide Web site.

Online Technical Services

3Com offers worldwide product support 24 hours a day, 7 days a week, through the following online systems:

- World Wide Web site
- 3Com FTP site
- 3Com Bulletin Board Service (3Com BBS)
- 3ComFacts℠ automated fax service

World Wide Web Site

Access the latest networking information on the 3Com Corporation World Wide Web site by entering the URL into your Internet browser:

`http://www.3com.com/`

This service provides access to online support information such as technical documentation and software library, as well as support options ranging from technical education to maintenance and professional services.

3Com FTP Site

Download drivers, patches, and software, across the Internet from the 3Com public FTP site. This service is available 24 hours a day, 7 days a week.

To connect to the 3Com FTP site, enter the following information into your FTP client:

- Hostname: **`ftp.3com.com`** (or **`192.156.136.12`**)
- Username: **`anonymous`**
- Password: **`<your Internet e-mail address>`**

A user name and password are not needed with Web browser software such as Netscape Navigator and Internet Explorer.

3Com Bulletin Board Service

The 3Com BBS contains patches, software, and drivers for 3Com products. This service is available through analog modem or digital modem (ISDN) 24 hours a day, 7 days a week.

Access by Analog Modem

To reach the service by modem, set your modem to 8 data bits, no parity, and 1 stop bit. Call the telephone number nearest you:

Country	Data Rate	Telephone Number
Australia	Up to 14,400 bps	61 2 9955 2073
Brazil	Up to 14,400 bps	55 11 5181 9666
France	Up to 14,400 bps	33 1 6986 6954
Germany	Up to 28,800 bps	4989 62732 188
Hong Kong	Up to 14,400 bps	852 2537 5601
Italy	Up to 14,400 bps	39 2 27300680

Country	Data Rate	Telephone Number
Japan	Up to 14,400 bps	81 3 3345 7266
Mexico	Up to 28,800 bps	52 5 520 7835
P.R. of China	Up to 14,400 bps	86 10 684 92351
Taiwan, R.O.C.	Up to 14,400 bps	886 2 377 5840
U.K.	Up to 28,800 bps	44 1442 438278
U.S.A.	Up to 28,800 bps	1 408 980 8204

Access by Digital Modem

ISDN users can dial in to the 3Com BBS using a digital modem for fast access up to 56 Kbps. To access the 3Com BBS using ISDN, use the following number:

1 408 654 2703

3ComFacts Automated Fax Service

The 3ComFacts automated fax service provides technical articles, diagrams, and troubleshooting instructions on 3Com products 24 hours a day, 7 days a week.

Call 3ComFacts using your Touch-Tone telephone:

1 408 727 7021

Support from Your Network Supplier

If additional assistance is required, contact your network supplier. Many suppliers are authorized 3Com service partners who are qualified to provide a variety of services, including network planning, installation, hardware maintenance, application training, and support services.

When you contact your network supplier for assistance, have the following information ready:

- Product model name, part number, and serial number
- A list of system hardware and software, including revision levels
- Diagnostic error messages
- Details about recent configuration changes, if applicable

If you are unable to contact your network supplier, see the following section on how to contact 3Com.

Support from 3Com

If you are unable to obtain assistance from the 3Com online technical resources or from your network supplier, 3Com offers technical telephone support services. To find out more about your support options, please call the 3Com technical telephone support phone number at the location nearest you.

When you contact 3Com for assistance, have the following information ready:

- Product model name, part number, and serial number
- A list of system hardware and software, including revision levels
- Diagnostic error messages
- Details about recent configuration changes, if applicable

Below is a list of worldwide technical telephone support numbers:

Country	Telephone Number	Country	Telephone Number
Asia Pacific Rim			
Australia	1 800 678 515	P.R. of China	10800 61 00137 or
Hong Kong	800 933 486		021 6350 1590
India	61 2 9937 5085	Singapore	800 6161 463
Indonesia	001 800 61 009	S. Korea	
Japan	0031 61 6439	From anywhere in S. Korea:	82 2 3455 6455
Malaysia	1800 801 777	From Seoul:	00798 611 2230
New Zealand	0800 446 398	Taiwan, R.O.C.	0080 611 261
Pakistan	61 2 9937 5085	Thailand	001 800 611 2000
Philippines	1235 61 266 2602		
Europe			
From anywhere in Europe, call:	+31 (0)30 6029900 phone +31 (0)30 6029999 fax		
From the following European countries, you may use the toll-free numbers:			
Austria	06 607468	Netherlands	0800 0227788
Belgium	0800 71429	Norway	800 11376
Denmark	800 17309	Poland	0800 3111206
Finland	0800 113153	Portugal	05 05313416
France	0800 917959	South Africa	0800 995014
Germany	0130 821502	Spain	900 983125
Hungary	00800 12813	Sweden	020 795482
Ireland	1 800 553117	Switzerland	0800 55 3072
Israel	177 3103794	U.K.	0800 966197
Italy	1678 79489		
Latin America			
Argentina	541 312 3266	Colombia	571 629 4847
Brazil	55 11 523 2725, ext. 422	Mexico	01 800 849 2273
North America	1 800 NET 3Com (1 800 638 3266)		

Returning Products for Repair

Before you send a product directly to 3Com for repair, you must first obtain a Return Materials Authorization (RMA) number. Products sent to 3Com without RMA numbers will be returned to the sender unopened, at the sender's expense.

To obtain an RMA number, call or fax:

Country	Telephone Number	Fax Number
Asia, Pacific Rim	65 543 6342	65 543 6348
Europe, South Africa, and Middle East	011 44 1442 435860	011 44 1442 435718
From the following European countries, you may call the toll-free numbers; select option 2 and then option 2:		
Austria	06 607468	
Belgium	0800 71429	
Denmark	800 17309	
Finland	0800 113153	
France	0800 917959	
Germany	0130 821502	
Hungary	00800 12813	
Ireland	1800553117	
Israel	177 3103794	
Italy	1678 79489	
Netherlands	0800 0227788	
Norway	800 11376	
Poland	00800 3111206	
Portugal	05 05313416	
South Africa	0800 995014	
Spain	900 983125	
Sweden	020 795482	
Switzerland	0800 55 3072	
U.K.	0800 966197	
Latin America	1 408 326 2927	1 408 764 6883
U.S.A. and Canada	1 800 876 3266, option 2	1 408 764 7120

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3Com Corporation LIMITED WARRANTY

HARDWARE

3Com warrants its hardware products to be free from defects in workmanship and materials, under normal use and service, for the following lengths of time from the date of purchase from 3Com or its authorized reseller:

Network Interface Cards	Lifetime
Other hardware products *unless otherwise specified above	1 year*
Spare parts and spares kits	90 days

If a product does not operate as warranted above during the applicable warranty period, 3Com shall, at its option and expense, repair the defective product or part, deliver to Customer an equivalent product or part to replace the defective item, or refund to Customer the purchase price paid for the defective product. All products that are replaced will become the property of 3Com. Replacement products may be new or reconditioned. Any replaced or repaired product or part has a ninety (90) day warranty or the remainder of the initial warranty period, whichever is longer.

SOFTWARE

3Com warrants that the software programs licensed from it will perform in substantial conformance to the program specifications therefor for a period of ninety (90) days from the date of purchase from 3Com or its authorized reseller. 3Com warrants the media containing software against failure during the warranty period. No updates are provided. 3Com's sole obligation with respect to this express warranty shall be (at 3Com's discretion) to refund the purchase price paid by Customer for any defective software products, or to replace any defective media with software which substantially conforms to applicable 3Com published specifications. Customer assumes responsibility for the selection of the appropriate applications program and associated reference materials. 3Com makes no warranty or representation that its software products will meet Customer's requirements or work in combination with any hardware or applications software products provided by third parties, that the operation of the software products will be uninterrupted or error free, or that all defects in the software products will be corrected. For any third party products listed in the 3Com software product documentation or specifications as being compatible, 3Com will make reasonable efforts to provide compatibility, except where the non-compatibility is caused by a "bug" or defect in the third party's product.

YEAR 2000 WARRANTY

In addition to the Hardware Products Warranty and Software Products Warranty identified above, 3Com warrants that all Heritage 3Com products sold or licensed to Customer on and after January 1, 1998 that are date sensitive will continue performing properly with regard to such date data on and after January 1, 2000, provided that all other products used by Customer in connection or combination with the 3Com products, including hardware, software, and firmware, accurately exchange date data with the 3Com products, with the exception of those products identified at 3Com's Web site, http://www.3com.com/products/yr2000.html, as not meeting this standard. A product is considered a "Heritage 3Com product" if it is a member of a product family which was manufactured by 3Com prior to its merger with US Robotics Corporation. This Year 2000 limited warranty does not apply to Heritage US Robotics Corporation products. If it appears that any such product does not perform properly with regard to such date data on and after January 1, 2000, and Customer notifies 3Com before the later of April 1, 2000, or ninety (90) days after purchase of the product from 3Com or its authorized reseller, 3Com shall, at its option and expense, provide a software update which would effect the proper performance of such product, repair such product, deliver to Customer an equivalent product to replace such product, or if none of the foregoing is feasible, refund to Customer the purchase price paid for such product.

Any software update or replaced or repaired product will carry a Year 2000 Warranty for ninety (90) days or until April 1, 2000, whichever is later.

OBTAINING WARRANTY SERVICE

Customer must contact 3Com's Corporate Service Center or an Authorized 3Com Service Center within the applicable warranty period to obtain warranty service authorization. Dated proof of purchase may be required. Products returned to 3Com's Corporate Service Center must be pre-authorized by 3Com with a Return Material Authorization (RMA) number marked on the outside of the package, and sent prepaid and packaged appropriately for safe shipment, and it is recommended that they be insured. The repaired or replaced item will be shipped to Customer, at 3Com's expense, not later than thirty (30) days after receipt of the defective product by 3Com.

Dead- or Defective-on-Arrival. In the event a product completely fails to function or exhibits a defect in materials or workmanship within the first forty-eight (48) hours of installation but no later than thirty (30) days after the date of purchase, and this is verified by 3Com, it will be considered dead- or defective-on-arrival (DOA) and a replacement shall be provided by advance replacement. The replacement product will normally be shipped not later than three (3) business days after 3Com's verification of the DOA product, but may be delayed due to export or import procedures. When an advance replacement is provided and Customer fails to return the defective product to 3Com within fifteen (15) days after shipment of the replacement, 3Com will charge Customer for the replacement product, at list price.

3Com shall not be responsible for any software, firmware, information, or memory data of Customer contained in, stored on, or integrated with any products returned to 3Com for repair, whether under warranty or not.

WARRANTIES EXCLUSIVE

IF A 3COM PRODUCT DOES NOT OPERATE AS WARRANTED ABOVE, CUSTOMER'S SOLE REMEDY FOR BREACH OF THAT WARRANTY SHALL BE REPAIR, REPLACEMENT, OR REFUND OF THE PURCHASE PRICE PAID, AT 3COM'S OPTION. TO THE FULL EXTENT ALLOWED BY LAW, THE FOREGOING WARRANTIES AND REMEDIES ARE EXCLUSIVE AND ARE IN LIEU OF ALL OTHER WARRANTIES, TERMS, OR CONDITIONS, EXPRESS OR IMPLIED, EITHER IN FACT OR BY OPERATION OF LAW, STATUTORY OR OTHERWISE, INCLUDING WARRANTIES, TERMS, OR CONDITIONS OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND SATISFACTORY QUALITY. 3COM NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR IT ANY OTHER LIABILITY IN CONNECTION WITH THE SALE, INSTALLATION, MAINTENANCE OR USE OF ITS PRODUCTS.

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Some countries, states, or provinces do not allow the exclusion or limitation of implied warranties or the limitation of incidental or consequential damages for certain products supplied to consumers or the limitation of liability for personal injury, so the above limitations and exclusions may be limited in their application to you. When the implied warranties are not allowed to be excluded in their entirety, they will be limited to the duration of the applicable written warranty. This warranty gives you specific legal rights which may vary depending on local law.

GOVERNING LAW

This Limited Warranty shall be governed by the laws of the State of California, U.S.A. excluding its conflicts of laws principles and excluding the United Nations Convention on Contracts for the International Sale of Goods.

3Com Corporation, 5400 Bayfront Plaza, Santa Clara, CA 95052-8145 (408) 764-5000