

Cisco BPX 8600 Series Installation and Configuration

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About this Manual

This publication provides installation procedures and related information for the installation of the BPX 8600 Series wide-area switches which include the BPX 8620 switch and the BPX 8650 Tag switch.

Cisco documentation and additional literature are available in a CD-ROM package, which ships with your product. The Documentation CD-ROM, a member of the Cisco Connection Family, is updated monthly. Therefore, it might be more current than printed documentation. To order additional copies of the Documentation CD-ROM, contact your local sales representative or call customer service. The CD-ROM package is available as a single package or as an annual subscription. You can also access Cisco documentation on the World Wide Web at <http://www.cisco.com>, <http://www-china.cisco.com>, or <http://www-europe.cisco.com>.

If you are reading Cisco product documentation on the World Wide Web, you can submit comments electronically. Click **Feedback** in the toolbar, select **Documentation**, and click **Enter the feedback form**. After you complete the form, click **Submit** to send it to Cisco. We appreciate your comments.

Objectives

This publication is intended to provide the necessary information for the installation and initial startup of the BPX 8600 series.

Audience

This publication is intended for persons installing the BPX 8600 series. The installers should be familiar with electronic circuitry and electrical wiring practices and should have experience as an electronic or electromechanical technician. It is also intended for the network administrator performing initial BPX configuration. Both the installers and the network administrator should be familiar with BPX network operation and with the StrataView Plus Network Management System.

Cisco WAN Switching Product Name Change

The Cisco WAN Switching products have new names. A switch in the BPX family is now part of the Cisco BPX® 8600 Series wide area switch family. The AXIS shelf is now called the Cisco MGX™ 8220 edge concentrator. Any switch in the IGX switch family (IGX 8, IGX 16 and IGX 32 wide-area switches) is now called the Cisco IGX™ 8400 series-wide area switch. The IGX 8 switch is now called the Cisco IGX™ 8410 wide-area switch. The IGX 16 switch is now called the Cisco IGX™ 8420 wide-area switch, and the IGX 32 switch is now called the Cisco IGX™ 8430 wide-area switch.

Organization

This publication is organized as follows:

PART 1	Installation
Chapter 1	Introduction
	Provides a brief introduction to the document, including a flow diagram that shows which procedures are applicable to the various options, Cisco Cabinet or Customer Cabinet, ac cabinet or dc cabinet
Chapter 2	Installation, Preliminary
	Includes preliminary instructions including site preparation information, parts checklist, and safety requirements.
Chapter 3	Installation with Cisco Cabinet
	Provides installation steps for the mechanical placement of a BPX switch in a standard Cisco cabinet. This cabinet provides rear rails at a 19.86 inch (50.5 cm) setback from the front of the cabinet.
Chapter 4	Installation with Customer Cabinet
	Provides installation steps for the mechanical placement of a BPX switch in a standard 19-inch wide customer supplied equipment cabinet or rack with a rear rail setback at 30 inches.
Chapter 5	Installation, DC Shelf Initial Setup
	Describes how to make the DC power connections.
Chapter 6	Installation, AC Shelf Initial Setup
	Explains how to install the AC power supply tray, power supplies, and make AC power connections.
Chapter 7	Finishing the Installation and Power-Up
	Explains how to install the BPX switch cards, connect the line and trunk cables, connect peripherals, connect to a network management station, and initial power-up.
Chapter 8	T3/E3 Cable Management Tray
	Provides instructions for the installation of the optional cable management tray that may be used to route cables in an open rack non-redundant configuration.
PART 2	Configuration
Chapter 9	Configuration, General
	Provides a brief introduction to BPX switch configuration, including a flow diagram showing the applicable procedures.

Chapter 10	Configuration, Initial Setup Provides initial BPX switch configuration information.
Chapter 11	Configuration, ATM Connections Provides general ATM description and ATM connection parameter information for CBR, VBR, UBR, and ABR connections.
Chapter 12	Configuration, BXM, PVCs, SVCs, and SPVCs Provides a brief description of BXM switch functions and describes command line interface commands for configuring the BXM and for configuring resource partitions for PVCs and SVCs. Refers to other chapters in this manual and to other documents, as applicable, for tag switching and SVCs and SPVCs.
Chapter 13	Configuration, Tag Switching Provides a brief overview of tag switching and configuration procedures for tag switching on the BPX switch.
Chapter 14	Configuration, BME Multicasting Provides a brief overview of BME multicasting and provides configuration examples.
PART 3	Reference
Appendix A	Cisco Cabinet Dimensions Illustrates typical cable management and space requirements for various system configurations in the Cisco cabinet. It also lists the height of components in inches, centimeters, and rack-mount units (RMUs).
Appendix B	BPX Switch Cabling Summary Provides details on the cabling required to install the BPX switch.
Appendix C	BPX Switch Peripherals Provides details on the peripherals used with the BPX switch including printers and modems.

Related Documentation

The following Cisco publications contain additional information related to the operation of the BPX switch and associated equipment in a Cisco WAN switching network:

- *Cisco StrataView Plus Operations Guide* providing for procedures for using the Cisco StrataView Plus network management system.
- *Cisco WAN Design Tools User Guide* provides procedures for modeling networks.
- Release 9.1 of the IGX/IPX/BPX Documentation set, including:
 - *Cisco BPX 8600 Series Reference* provides a general description and technical details of the BPX broadband switch.
 - *Cisco WAN Service Node Extended Services Processor Installation and Operation Release 2.2* provides detailed information about the Extended Services Processor (ESP).
 - *Cisco IPX Reference* provides a general description and technical details of the IPX narrowband switch.
 - *Cisco IPX Installation* provides installation instructions for the IPX narrowband switch.
 - *Cisco IGX 8400 Series Reference* provides a general description and technical details of the IGX multiband switch.
 - *Cisco IGX 8400 Series Installation* provides installation instructions for the IGX multiband switch.
 - *Cisco MGX 8220 Reference* provides a general description and technical details of the MGX 8220.
 - *Cisco MGX 8220 Command Reference* provides detailed information for MGX 8220 command line usage.
 - *Cisco WAN Switching Command Reference* provides detailed information on operating the BPX, IGX, and IPX systems through their command line interfaces.
 - *Cisco WAN Switching SuperUser Command Reference* provides detailed information on their command line interfaces special commands requiring SuperUser access authorization.

Conventions

This publication uses the following conventions to convey instructions and information.

Command descriptions use these conventions:

- Commands and keywords are in **boldface**.
- Arguments for which you supply values are in *italics*.
- Elements in square brackets ([]) are optional.
- Alternative but required keywords are grouped in braces ({ }) and are separated by vertical bars (|).

Examples use these conventions:

- Terminal sessions and information the system displays are in `screen font`.
- Information you enter is in **boldface screen font**.
- Nonprinting characters, such as passwords, are in angle brackets (< >).
- Default responses to system prompts are in square brackets ([]).

Note Means *reader take note*. Notes contain helpful suggestions or references to materials not contained in this manual.



Caution Means *reader be careful*. In this situation, you might do something that could result in equipment damage or loss of data.



Warning This warning symbol means *danger*. You are in a situation that could cause bodily injury. Before you work on any equipment, you must be aware of the hazards involved with electrical circuitry and familiar with standard practices for preventing accidents. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* that accompanied your equipment.)

Waarschuwing Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van standaard maatregelen om ongelukken te voorkomen.

Varoitus Tämä varoitusmerkki merkitsee vaaraa. Olet tilanteessa, joka voi johtaa ruumiinvammaan. Ennen kuin työskentelet minkään laitteiston parissa, ota selvää sähkökytkentöihin liittyvistä vaaroista ja tavanomaisista onnettomuuksien ehkäisykeinoista.

Attention Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant causer des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers posés par les circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents.

Warnung Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu einer Körperverletzung führen könnte. Bevor Sie mit der Arbeit an irgendeinem Gerät beginnen, seien Sie sich der mit elektrischen Stromkreisen verbundenen Gefahren und der Standardpraktiken zur Vermeidung von Unfällen bewußt.

Avvertenza Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di lavorare su qualsiasi apparecchiatura, occorre conoscere i pericoli relativi ai circuiti elettrici ed essere al corrente delle pratiche standard per la prevenzione di incidenti.

Advarsel Dette varselsymbolet betyr fare. Du befinner deg i en situasjon som kan føre til personskade. Før du utfører arbeid på utstyr, må du være oppmerksom på de faremomentene som elektriske kretser innebærer, samt gjøre deg kjent med vanlig praksis når det gjelder å unngå ulykker.

Aviso Este símbolo de aviso indica perigo. Encontra-se numa situação que lhe poderá causar danos físicos. Antes de começar a trabalhar com qualquer equipamento, familiarize-se com os perigos relacionados com circuitos eléctricos, e com quaisquer práticas comuns que possam prevenir possíveis acidentes.

¡Atención! Este símbolo de aviso significa peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considerar los riesgos que entraña la corriente eléctrica y familiarizarse con los procedimientos estándar de prevención de accidentes.

Warning! Denna varningssymbol signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanligt förfarande för att förebygga skador.



Timesaver Means *the described action saves time*. You can save time with this action.

PART 1

Installation



Introduction

Introduction

This document provides installation and configuration instructions for the BPX 8600 Series wide-area switches.

- Installation instructions are provided in this part, *PART 1*.
- Configuration information is provided in *PART 2*.
- Reference information is provided in *PART 3*.

For additional information on the BPX switch, including card descriptions and additional information on configuration, refer to the *Cisco BPX 8600 Series Reference*. For a description of the commands used to operate a BPX switch, refer to the *Cisco WAN Switching Command Reference*. Refer to the *Cisco StrataView Plus* manuals for information on network management.

Installation Sequence

Figure 1-1 shows the sequence of operations followed during the installation of the BPX switch. A summary of this sequence is as follows:

- *Chapter 2, Installation, Preliminary*, provides preliminary setup instructions for the mechanical installation of a BPX switch shelf. Depending on the type of rack or cabinet, the installer is then directed to either:
 - *Chapter 3, Installation with Cisco Cabinet* with rear rail setback at 19.86 inches, or
 - *Chapter 4, Installation with Customer Cabinet* that is 19 inches wide with a rear rail setback of 30 inches.
 - Otherwise, the installation is non-standard and requires that Customer Service be contacted.

The BPX switch shelves are either AC or DC powered. At the completion of the procedures in *Chapter 3* or *Chapter 4*, the installer is directed to the appropriate power setup and connection chapter:

- *Chapter 5, Installation, DC Shelf Initial Setup*, or
- *Chapter 6, Installation, AC Shelf Initial Setup*.

The remaining installation procedures are common and the installer is directed to the final setup and configuration procedures in:

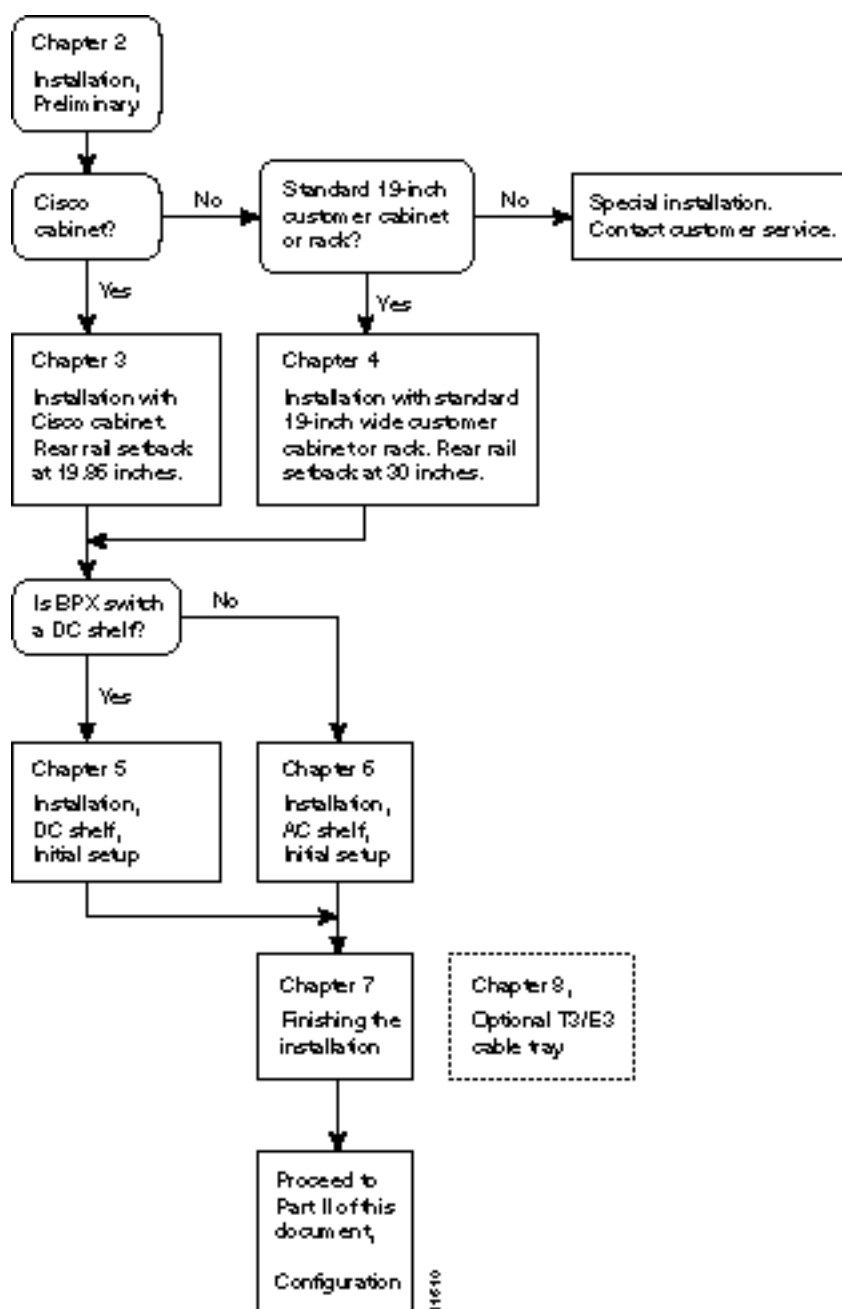
- *Chapter 7, Finishing the Installation and Power-Up*

An optional cable management tray and optional BXM T3/E3 cable management brackets are available for use with T3/E3 BXM cards. The brackets are for use with cards set up as non-redundant (single cables rather than Y-cabling). The tray is designed primarily for use in a mid-mount open rack configuration. Instructions for installing the optional tray are provided in:

- *Chapter 8, T3/E3 Cable Management Tray*

Following the completion of these installation procedures, the BPX switch can be configured. Configuration procedures are provided in *PART 2, Configuration*, starting with *Chapter 9, Configuration, General*.

Figure 1-1 Installation Sequence



Support

Contact your local Cisco sales office for Customer Service information.

Installation, Preliminary

This chapter provides preliminary installation steps for the BPX switch, including the mechanical installation of the BPX switch shelf in a Cisco cabinet or vendor supplied standard 19 inch (48.25 cm) equipment rack.

This chapter contains the following sections:

- Site Preparation
- Parts Checklist
- Safety Requirements
- Mechanical Installation



Warning Installation should be performed by authorized personnel only.

Site Preparation

The BPX switch has the following site preparation requirements.

- **Location**
The BPX switch is to be installed only in a RESTRICTED ACCESS LOCATION.
- **Space**
Each BPX switch shelf requires floor space of 22 inches (55.9 cm) wide and 80 inches (203.2 cm) deep to assure sufficient clearance around the cabinet to allow access to the front and back of the unit.
- **Power**
An AC or DC power source must be available within 6 feet (2 m.) of the rear of the BPX switch shelf. A maximum configuration for an AC powered BPX switch may require up to 2333 VA (13 A at 180 VAC, 10 A at 230 VAC). A maximum configuration for a DC powered BPX switch may require up to 1680 Watts (40 A at -42 VDC, 35 A at -48 VDC).
- **Cooling**
The site must be capable of maintaining an ambient temperature of 40°C maximum (recommended range 20°C to 30°C) while the system is operating. A fully loaded BPX switch may dissipate up to 7200 BTUs. It is extremely important that the BPX switch is positioned to assure an unrestricted air flow through the enclosure.

Parts Checklist

Before proceeding, go through this parts checklist to verify that all the parts you ordered are present, and that they are all in good condition. If there is anything missing or damaged, report it to your Cisco Order Administration representative.

Plug-in cards may be shipped installed or under separate cover. The exact number of cards will vary from site to site, depending on the selected configuration. The BPX switch is shipped with all unused slots covered by backplane inserts which prevent radio frequency emissions from the equipment. The unit must not be operated with any unused slots left uncovered.

Refer to the list below and check the number and type of cards shipped against the number and type of card you ordered.

- _____ If a DC version, the correct number of Power Entry modules.
- _____ If an AC version, the unit has the correct number of power supplies (1 or 2).
- _____ For non- redundant configuration, one Broadband Controller Card. This can be a BCC-4, BCC-3, or a BCC-32 depending on system configuration
- _____ For a non-redundant configuration, one Broadband Controller backcard. For a BCC-4 or BCC-3 front card, a BCC-3-bc backcard must be used. For a BCC-32 front card, a BCC-bc backcard must be used.
- _____ For a redundant configuration, two Broadband Controller Cards. These can be two BCC-3s or two BCC-32s.
- _____ For a redundant configuration, two Broadband Controller backcards. For BCC-4 or BCC-3 front cards, these must be BCC-3-bc backcards. For BCC-32 front cards, these must be BCC-bc backcards.
- _____ One ASM card.
- _____ One LM-ASM card.
- _____ Correct number of BXM cards.
- _____ Correct number of BNI cards.
- _____ Correct number of BME cards.
- _____ Correct number of ASI cards.
- _____ One line module backcard for each BXM, as applicable (e.g., BPX-T3/E3-BC, MMF-155-4, SMF-155-4, SMFLR-155-4, MMF-155-8, SMF-155-8, SMFLR-155-8, SMF-622, SMFLR-622, SMF-622-2, or SMFLR-622-2).
- _____ One line module backcard, SMF-622-2 for each BME.
- _____ One line module backcard (e.g., BPX-T3-BC, BPX-E3-BC, MMF-2-BC, SMF-2-BC, or SMFLR-2-BC) for each BNI, as applicable.
- _____ One line module backcard (e.g., BPX-T3-BC, BPX-E3-BC, MMF-2-BC, SMF-2-BC, or SMFLR-2-BC) for each ASI, as applicable.
- _____ All cables specified in the order.

Note An inventory of the installed cards is taped to the BPX switch stating each card's serial number, revision number, and slot number (serial and revision numbers are also found on the component side of each card).

Safety Requirements

The following paragraphs contain safety information for system planners, installers, and maintenance personnel. The mechanical design of the BPX switch prevents any access to exposed voltages without the use of tools. When installed properly, all front and rear cards are held captive mechanically.



Warning For protection against shock hazard, verify all power cords or cables are disconnected before servicing unit (there may be more than one). The highest voltage that may be present in the node when powered up is 264 VAC (AC systems) or 56 VDC (DC systems).

Laser Safety Guidelines

The optical ports contain an information label as shown in Figure 2-1.

Figure 2-1 Laser Information Label



Warning Invisible laser radiation may be emitted from the optical ports of the single-mode or multi-mode products when no fiber cable is connected. Avoid exposure and do not look into open apertures. (For translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* that accompanied your equipment).



Warning Class 1 laser product. (For translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* that accompanied your equipment).



Warning Laser radiation when open. (For translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* that accompanied your equipment).

Maintaining Safety with Electricity

You must install your BPX switch in accordance with national and local electrical codes. In the United States, National Fire Protection Agency (NFPA) 70, United States National Electrical Code. In Canada, Canadian Electrical Code, C22.1, part 1. In other countries, International Electrotechnical Commission (IEC) 364, part 1 through part 7.

The BPX switch operates safely when it is used in accordance with its marked electrical ratings and product usage restrictions.

Additional safety statements are provided in the following paragraphs:

Basic Guidelines

Follow these basic guidelines when working with any electrical equipment:

- Locate the emergency power-OFF switch for the room in which you are working before beginning any procedures requiring access to the interior of the BPX chassis.
- Disconnect all power and external cables before removing or installing a chassis.
- Carefully examine your work area for possible hazards such as moist floors, ungrounded power extension cables, frayed power cords and missing safety grounds
- Never work alone when potentially hazardous conditions exist.
- Never assume that power has been disconnected from a circuit; always check.
- Never perform any action that creates a potential hazard to people or makes the equipment unsafe.
- Never install equipment that appears damaged.

The following guidelines will help to ensure your safety and protect the equipment. The list of guidelines may not address all potentially hazardous situations in your working environment so be alert and exercise good judgment at all times.

The safety guidelines are:

- Keep the chassis area clear and dust-free before, during, and after installation.
- Keep tools away from walk areas where you and others could fall over them.
- Do not wear loose clothing or jewelry, such as ear rings, bracelets, or chains that could get caught in the equipment.
- Wear safety glasses if you are working under any conditions that might be hazardous to your eyes.
- Never attempt to lift an object that might be too heavy for you to lift alone.
- Always power OFF all power supplies and unplug all power cables before opening, installing, or removing a chassis.

Power and Grounding

- Step 1** In order for the BPX switch to function safely and correctly, along with peripheral equipment, use only the power cords, cables, and connectors specified for the attached peripheral equipment, and make sure they are in good condition.
- Step 2** Certain BPX switches are supplied with two power feeds (cords). Before commencing installation or maintenance inside the cabinet, be sure both power feeds are disconnected from their respective sources.
- Step 3** Ensure that the BPX switch frame is attached to an isolated ground connection (connection attached directly to ground through an uninterrupted line).
- Step 4** A conduit hookup box is factory-installed on each DC Power Entry Module for sites requiring wiring to be enclosed in conduit. A plastic terminal block cover is also provided for installations that do not require conduit hookup. Install one or the other as protection for the DC input.
- Step 5** For an AC system, verify that the node is powered from a dedicated AC branch circuit. The circuit shall be protected by a dedicated 2-pole circuit breaker sized such that the rated current and the trip delay is higher and longer than the BPX switch circuit breaker. A dedicated 20A, 2-pole AC circuit breaker with a long trip delay is recommended for installation.

Note The BPX switch uses a 15A (or in newer models a 20-A), 2-pole AC circuit breaker with a medium trip delay on each AC input. The circuit breaker manufacture is either Carlingswitch (p/n CA2-B0-34-615-121-C) or Heinemann (p/n AM2-A3-A-0015-02E).

- Step 6** For a DC system, verify that the node is powered from a dedicated DC branch circuit. The circuit shall be protected by a dedicated circuit breaker sized such that the rated current and the trip delay is higher and longer than the BPX switch circuit breaker. A dedicated 50A, 1-pole DC circuit breaker with a long trip delay is recommended for installation.

Note The BPX switch uses a 50A, 1-pole DC circuit breaker with medium trip delay on the -48V input. The circuit breaker manufacture is Heinemann (p/n AM1S-B3-A-0050-02-H).

- Step 7** An insulated grounding conductor that is identical in size to the grounded and ungrounded branch circuit supply conductors, but is green with yellow stripes, is to be installed as part of the branch circuit that supplies the unit.

CEPT Requirements

All apparatus (e.g., 48 VDC power supplies) connected to the BPX switch must comply with BS6301 or EN60950

EMI Requirements

Compliance with emission regulations depends upon adherence to the installation steps in this manual, including installation of faceplates for all slots and the use of shielded cables between systems.

Mechanical Installation

Weight

A fully loaded, AC-version, BPX switch can weigh up to 213 pounds (97 Kgs). A fully-loaded DC-version BPX switch may weigh up to 163 pounds (74 Kgs).

Cooling



Caution If the BPX switch is to be mounted in an enclosed cabinet, assure that a free flow of air in and out of the enclosure is provided. Contact Customer Service for further information.

Horizontal Positioning

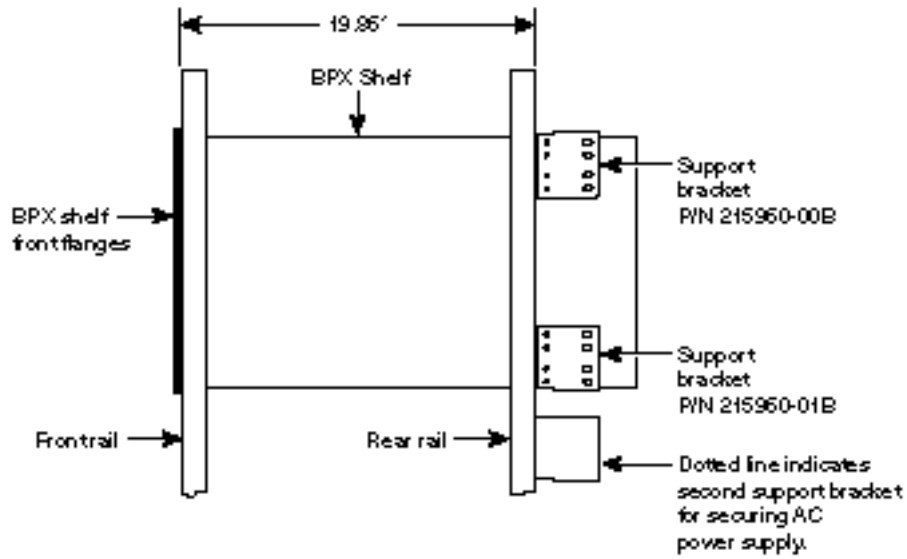
BPX switch shelves are designed to be mounted to two sets of vertical mounting rails in either a Cisco cabinet or a standard 19-inch equipment rack with unrestricted front to rear air flow. When installed in a Cisco cabinet (Figure 2-2), the front flanges of the BPX switch are secured to the front rails of the Cisco cabinet. In factory installations, rear support is provided by rear mounting rails in the cabinet at a setback of 19.86 inches. As an option, a rear set of rails located at a setback of approximately 30 inches may be used for rear support.

BPX switch shelves can also be mid-mounted to an open T-Rail type rack (Figure 2-3) with unrestricted front to rear air flow. To facilitate this type of installation, brackets may be fastened to the BPX switch shelf at a 5 or 10 inch setback for supporting the front of the BPX switch shelf. Additional rear mounting support is also recommended. Contact Customer Service for further information.

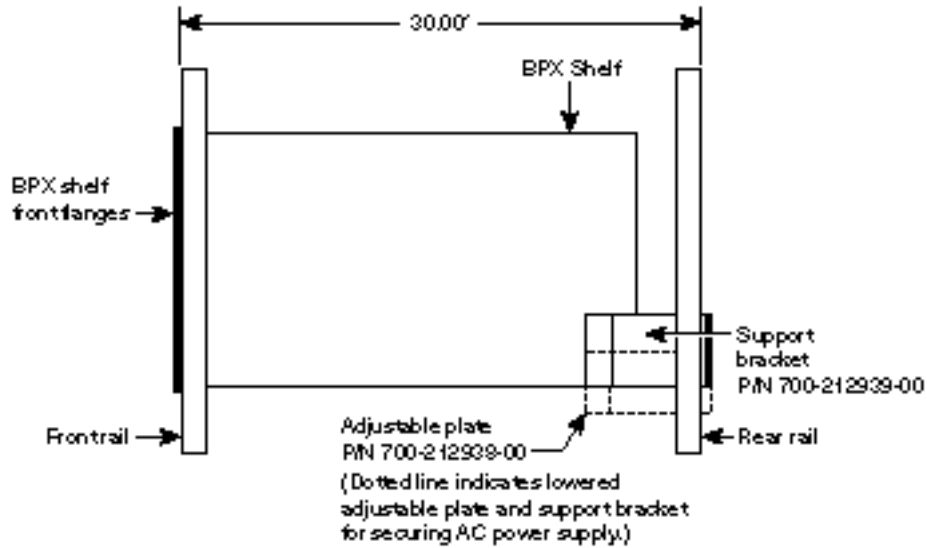
Vertical Positioning

For recommended typical equipment configurations in a Cisco cabinet, refer to *Appendix A, Cisco Cabinet Dimensions*.

Figure 2-2 Cabinet Mounting Options for the BPX Shelf



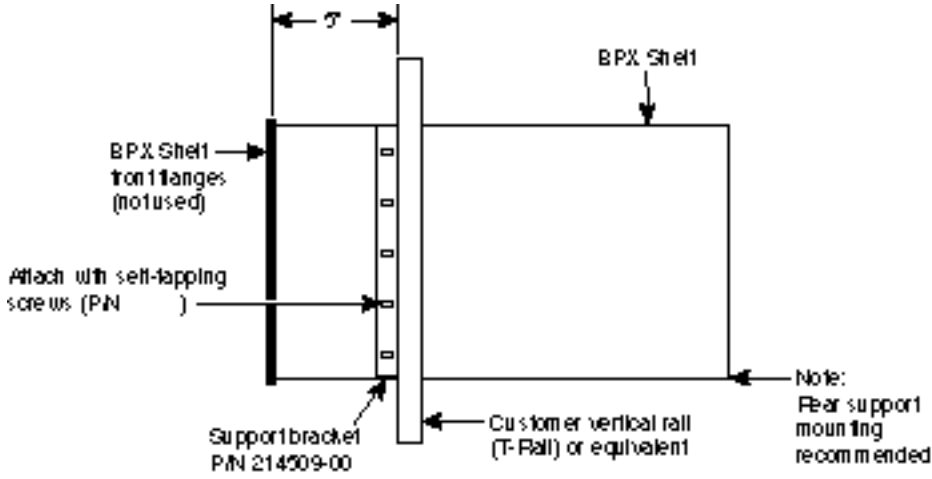
A. Cisco Cabinet mounting with rear rail at 19.95 inches setback.



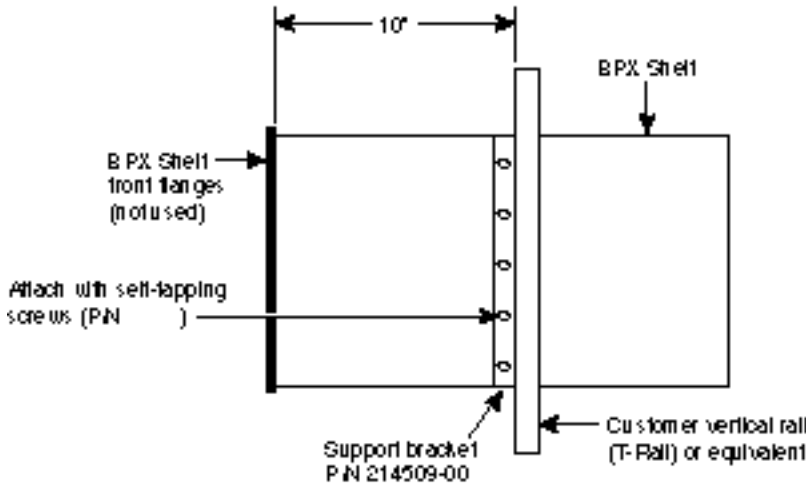
B. Customer furnished cabinet mounting with rear rail set at approximately 30 inches.

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Figure 2-3 BPX Shelf and T-Rail (Open Rack) or Equivalent Mounting Options



A. T-Rack or equivalent provided by customer, with setback of 5 inches.



A. T-Rack or equivalent provided by customer, with setback of 10 inches.

⋮

Installing a BPX Switch Shelf, Preliminary Steps

The BPX switch shelf is designed for mounting in a standard 19-inch (48.25 cm.) equipment rack such as the standard Cisco cabinet. A minimum width between rails of 17.750 inches (44.45 cm) is required (Figure 2-4 and Figure 2-5). Mounting flanges are permanently attached to the front edge of the BPX switch shelf. It is recommended that the shelf be mounted with all plug-in cards temporarily removed to lessen the weight.

There are two types of BPX switch shelves, AC powered and DC powered. When an AC powered BPX switch shelf is installed, an AC Power Supply Tray is installed directly below it. The DC Powered BPX switch Shelf contains factory installed DC power entry modules (PEMs) within the shelf itself.

Temporary support brackets and a spacer bar are furnished to ease installation by supporting the BPX shelf as it is slid into a cabinet.

The following instructions are for BPX switch shelf installation in a Cisco cabinet which has rear rails at 19.86 inches (50.5 cm) or in a customer supplied standard 19-inch (48.25 cm) equipment rack with rear rails at a 30 inch (76.2 cm) setback.

Note Installation in a non-Cisco cabinet or T-Rail type rack is similar to installation in a Cisco cabinet. Contact Customer Service for recommended rear support details.

To install the BPX switch in a rack proceed as follows:

- Step 1** Position the shipping container and pallet in front of the cabinet with the rear of the chassis towards the cabinet. Remove the foam strips on the sides, front, and rear.
- Step 2** Remove the card retaining bracket from the front of the chassis by unscrewing the four Phillips screws. This bracket is used to retain the boards during shipping.
- Step 3** Remove the Air Intake Grille and all front and rear cards from the shelf and temporarily set aside as follows:
 - (a) Locate the small access hole in the top center of the front Air Intake Grille below the card slots (see Figure 2-6 for location).
 - (b) Insert a small slotted blade screwdriver (0.20/0.25 inch blade width) into the access hole until it stops (approximately 1 inch).
 - (c) Carefully rotate the screwdriver approximately a quarter turn in either direction. The top of the Air Intake Grille should spring out.
 - (d) Remove Air Intake Grille.



Caution Ground yourself before handling BPX switch cards by placing a wrist strap on your wrist and clipping the strap lead to the cabinet.

- (e) To remove the cards, rotate the extractor handles at the top and bottom of each card to release the card and slide it out.
- Step 4** Decide where the BPX switch is to be located. Refer to Figure 2-2 through Figure 2-5 for typical mounting dimensions. Also, for typical mounting configuration examples, refer to *Appendix A, Cisco Cabinet Dimensions*. The appendix lists dimensions in inches, centimeters, and rack mounting units (RMUs). The top of the spacer bracket should be temporarily installed in the rack 22.75" (57.8 cm.) below the location selected for the top of the BPX switch chassis.

- Step 5** Install the temporary support brackets and spacer bar (shipped with the unit). Use two mounting screws to attach each temporary support bracket and two screws to attach the temporary spacer bar to the rack (Figure 2-7 and Figure 2-8).

Note It is recommended that all BPX switches use a set of vertical support rails to provide additional support for the rear of the chassis. In the Cisco cabinet these are located at a 19.86 inch setback from the front in factory installations.

Step 6 If the BPX switch shelf is being installed in a Cisco cabinet and is using factory installed rear rails located at a 19.86 inch setback from the front, go to Chapter 3, Installation with Cisco Cabinet.

Step 7 If the BPX switch shelf is being installed in a customer supplied cabinet using rear rail mounting support brackets located at a setback of approximately 30 inches from the front, go to Chapter 4, Installation with Customer Cabinet.

Figure 2-4 Rack Mounting Dimensions, DC Powered Shelf

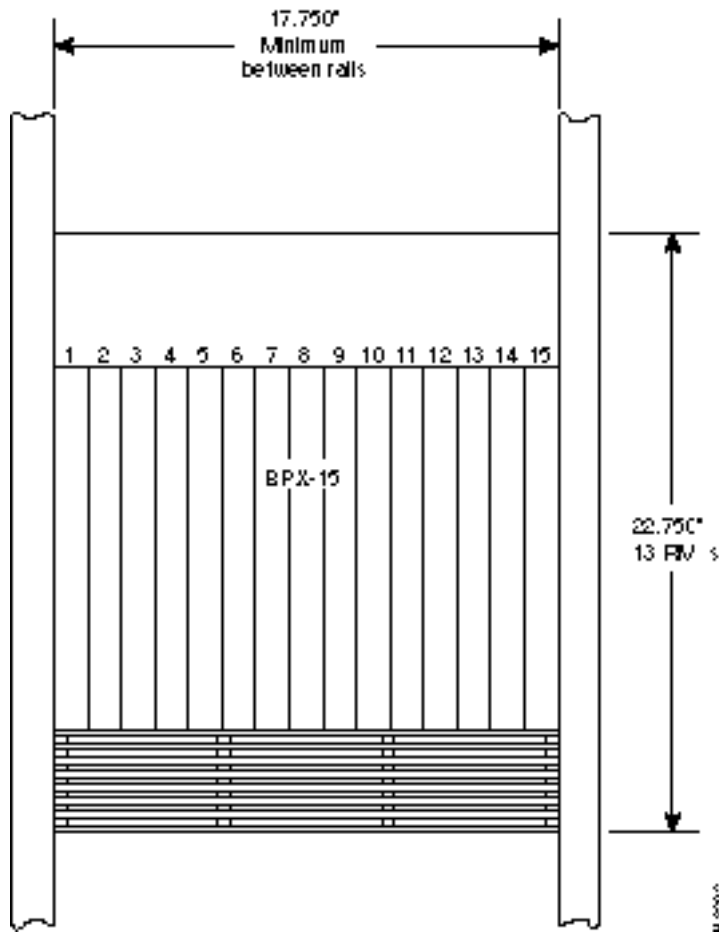


Figure 2-5 Rack Mounting Dimensions, AC Powered Shelf

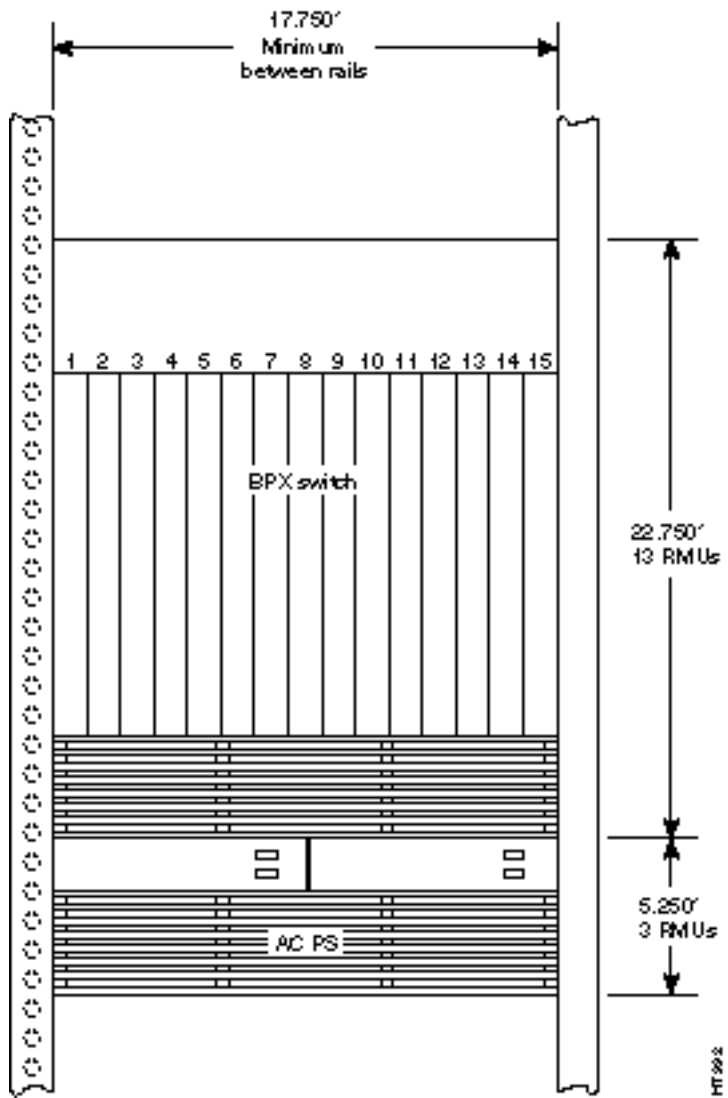


Figure 2-6 Removing an Air Intake Grille

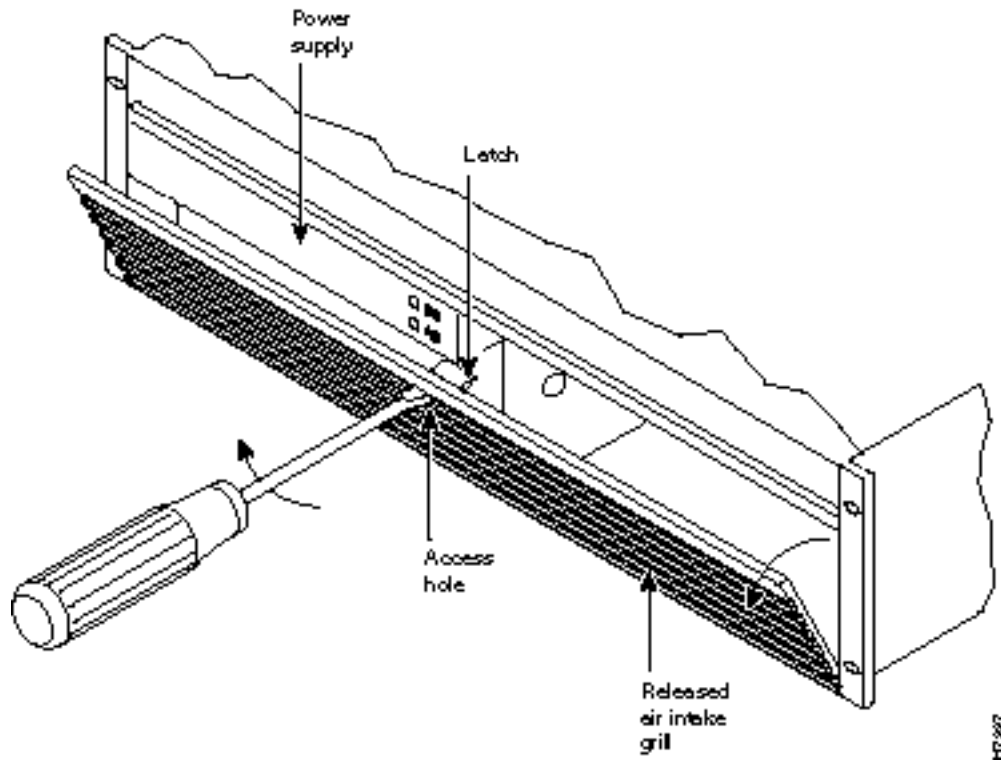


Figure 2-7 Temporary Spacer Bar and Support Brackets Installation

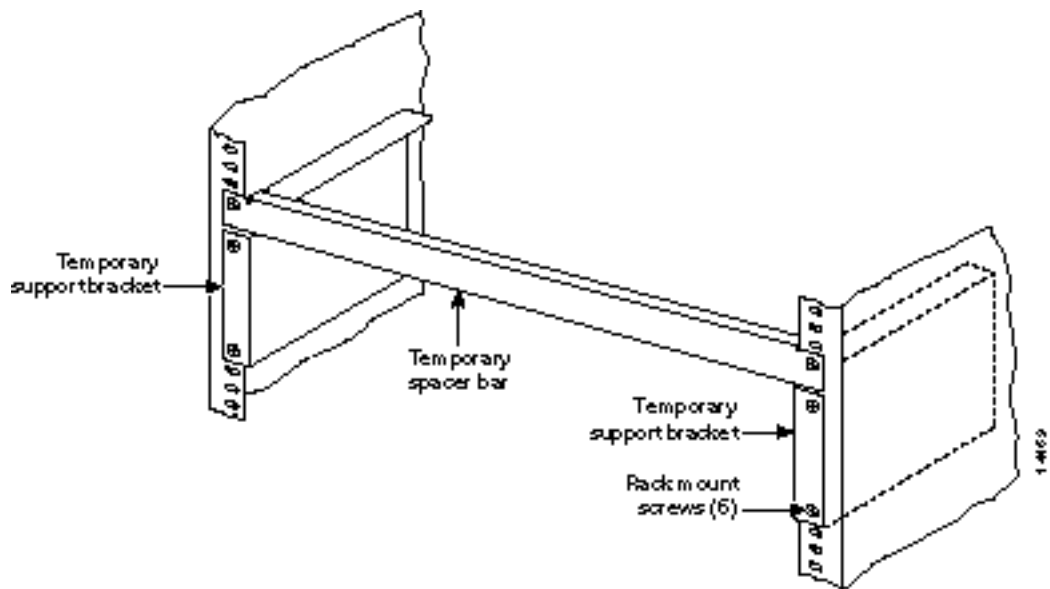
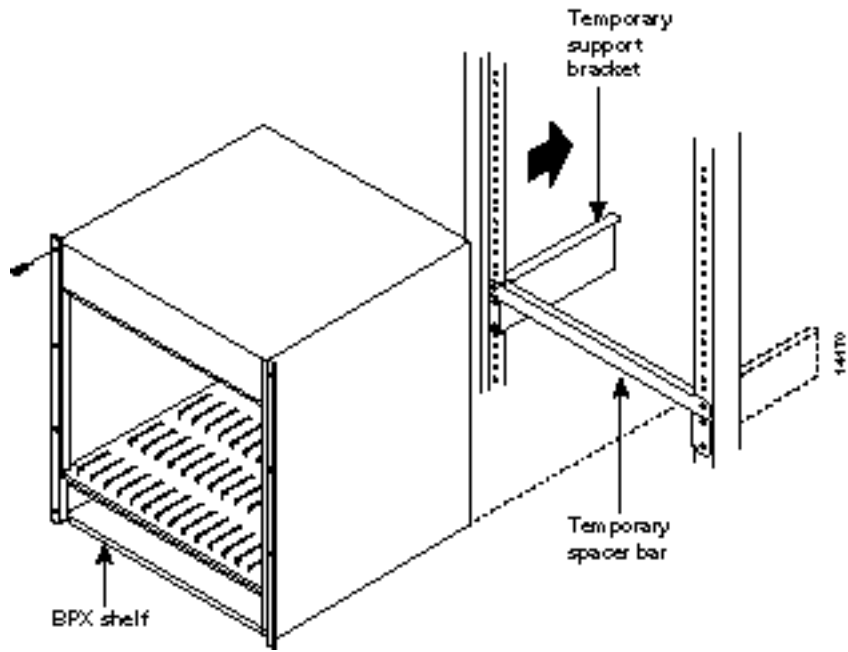


Figure 2-8 BPX Switch Shelf Aligned with Temporary Support Brackets and Bar



Installation with Cisco Cabinet

This chapter provides installation steps for the mechanical placement of a BPX switch shelf in a standard Cisco cabinet. This cabinet provides rear rails at a 19.86 inch (50.5 cm) setback from the front of the cabinet.

Before proceeding to this chapter, the procedures should be completed, in:

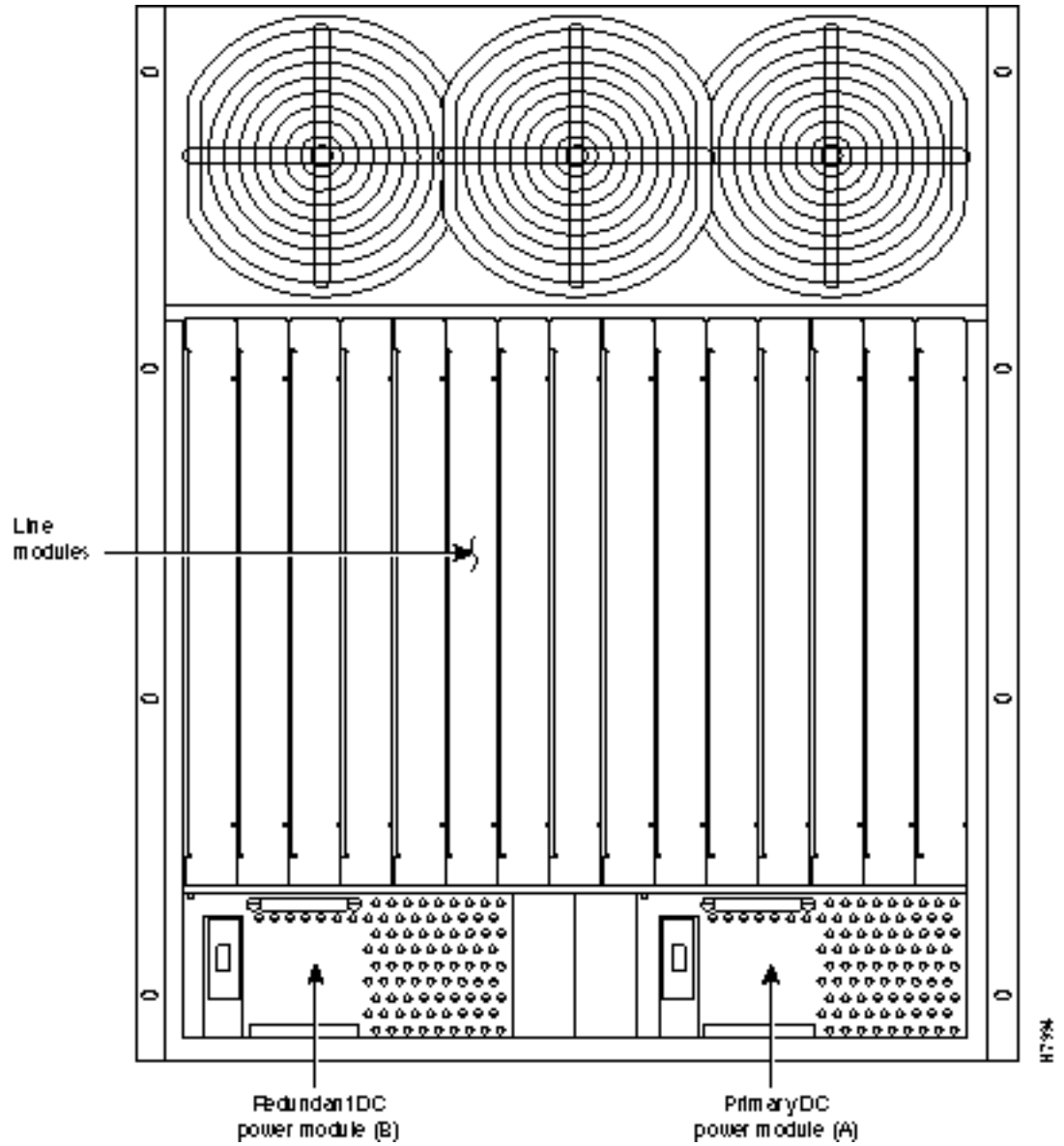
— *Chapter 2, Installation, Preliminary*

Installing a BPX Switch, Rear-Rail Setback at 19.86 Inch

The steps in this procedure apply to a BPX switch shelf that is being installed in a Cisco cabinet and using factory installed rear rails located at 19.86 inches from the front.

If the BPX switch shelf is DC-powered, the DC Power Entry Modules are factory-installed in the lower portion of the rear of the BPX switch shelf (Figure 3-1). Locate the DC Power Entry Module(s) and make sure it/they are equipped as ordered. If the BPX switch shelf is AC-powered, an AC Power Tray is installed below it as part of the installation process.

Figure 3-1 Location of DC Power Entry Module(s), Cabinet Rear View



Preliminary Procedure:

Proceed as follows to install either an AC or DC powered BPX switch shelf, referring to Figure 3-2 and Figure 3-3 and to either Figure 3-4 for DC powered systems or Figure 3-5 for AC powered systems:

- Step 1** Locate the rear support brackets (P/N 215960-00B and 215960-01B) in the miscellaneous parts kit.
- Step 2** Secure one support bracket to the back of each of the two rear rails located at 19.86 inches from the front flange of the Cisco cabinet using two each #10-32 machine screws and flat washers per bracket. The flange on each bracket faces down and inward to support the bottom of the BPX shelf.

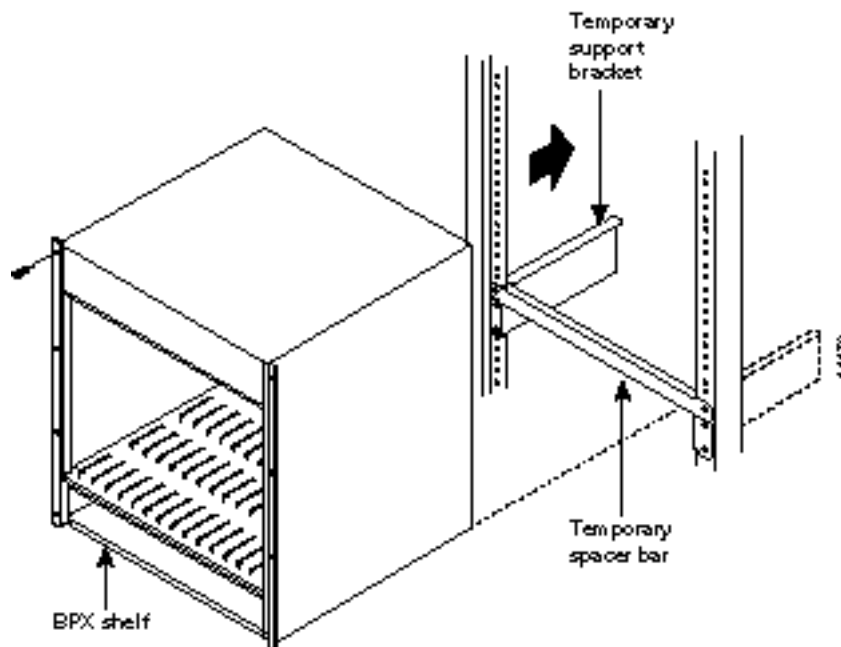
Note European installation may use a size M6 metric screw.



Warning An empty BPX switch shelf weighs 75 pounds (34 Kgs.) and requires a 2 or 3-person lift to move into place.

- Step 3** With one person on each side of the BPX shelf, lift the BPX shelf and rest it on the temporary space bar and temporary support brackets (Figure 3-2).
- Step 4** Slide the BPX switch shelf into the cabinet over the temporary support bar and brackets and into place over the flanges of the brackets previously attached to the rear rails of the cabinet.

Figure 3-2 BPX Shelf Aligned with Temporary Support Brackets and Bar



- Step 5** Attach the BPX switch shelf to the cabinet front rail using 8 each # 10-32 screws.
- Step 6** An extra set of support brackets is supplied to mount to the rear rails at the top back of the shelf. These are used to prevent any upward movement of the shelf
- Step 7** Remove the temporary support brackets and spacer bar.
- Step 8** If this is a DC powered shelf, proceed to Chapter 5, Installation, DC Shelf Initial Setup.
- Step 9** If this is an AC powered shelf, proceed to Chapter 6, Installation, AC Shelf Initial Setup.

Figure 3-3 BPX Shelf with Rear Rail Mounting at Setback of 19.86 inches

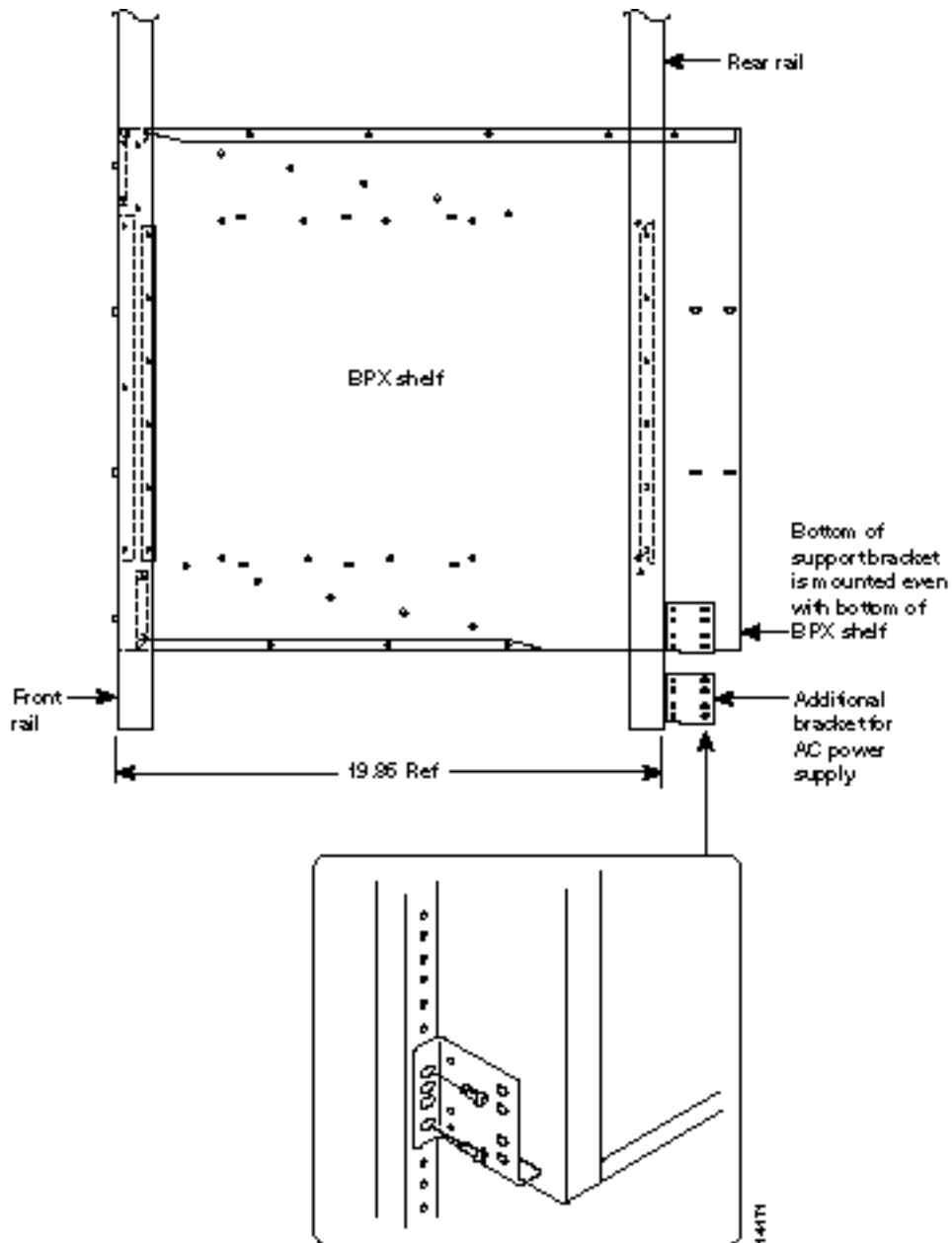


Figure 3-4 Rear Mounting Brackets, with 19.86 Inch Rear Rail Setback (DC Systems)

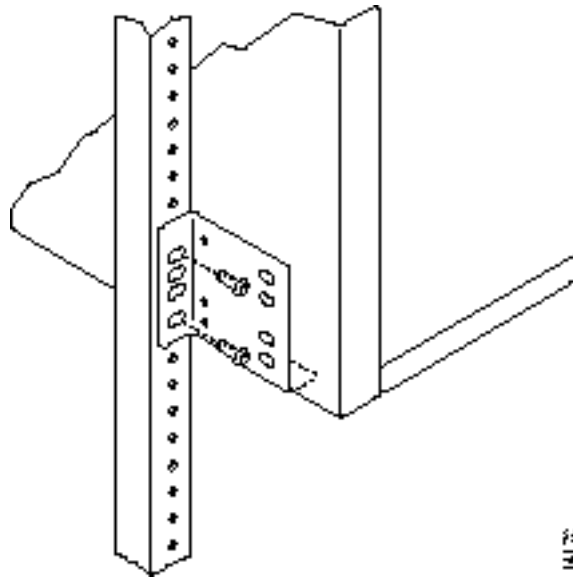
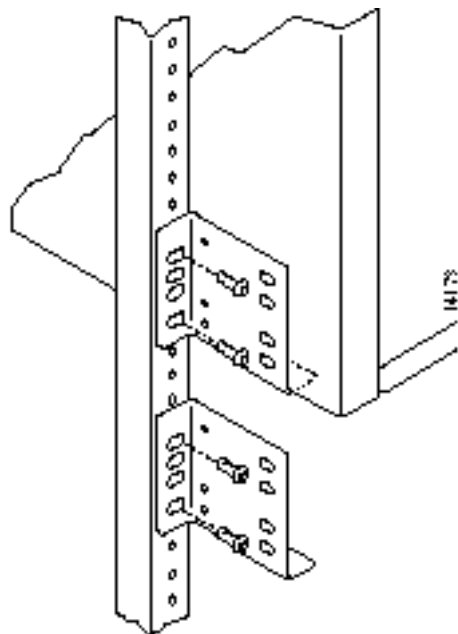


Figure 3-5 Rear Mounting Brackets, 19.86 Inch Rear Rail Setback (AC-Systems)



Installation with Customer Cabinet

This chapter provides installation steps for the mechanical placement of a BPX switch shelf in a standard 19-inch customer supplied equipment cabinet or rack with a rear rail setback at 30 inches.

Before proceeding to this chapter, the procedures should be completed, in:

— *Chapter 2, Installation, Preliminary*

Installing a BPX Switch, Rear Rail Setback at 30-Inch

The steps in this procedure apply to a BPX switch shelf that is being installed in a customer supplied cabinet with rear vertical rails located at a setback of approximately 30 inches from the front.

If the BPX switch shelf is DC-powered, the DC Power Entry Modules are factory-installed in the lower portion of the rear of the BPX switch shelf itself. Locate the DC Power Entry Module(s) and make sure it/they are equipped as ordered. If the BPX switch shelf is AC-powered, an AC Power Assembly will be installed below it.

Preliminary Procedure:

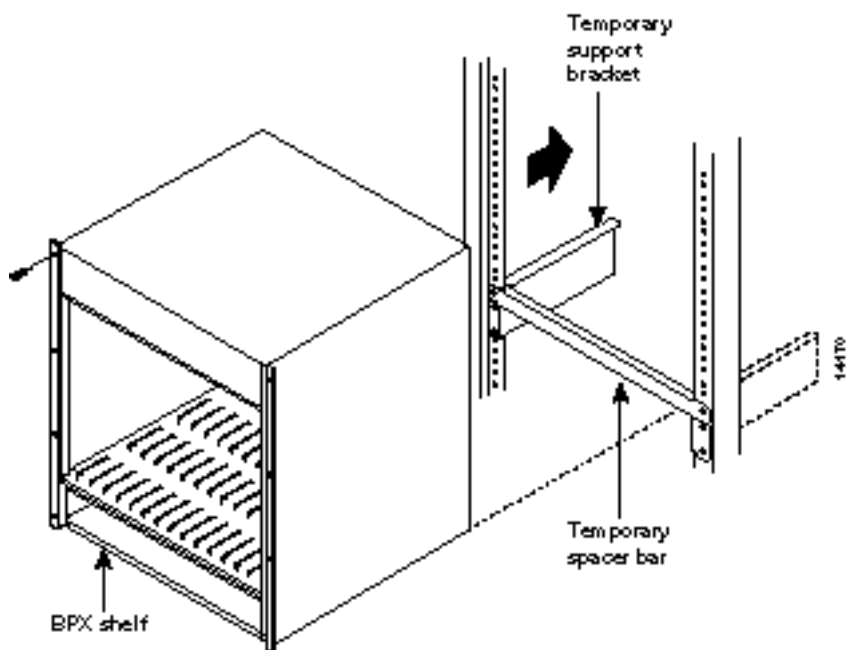
Proceed as follows to install the BPX switch shelf, referring to Figure 4-1 through Figure 4-3, and to either Figure 4-4 for DC powered systems or Figure 4-5 for AC powered systems. Figure 4-2 shows the location of the rear located third rails in a customer supplied cabinet and of the corresponding adjustable plates and support brackets on the BPX switch shelf.

- Step 1** With one person on each side of the BPX switch shelf, lift the pallet tray and BPX switch shelf positioning the slots at the rear of the pallet tray over the locating tabs on the spacer bracket (Figure 4-1).
- Step 2** Slide the BPX switch shelf back over the support brackets and into place.
- Step 3** Secure the BPX switch shelf to the front rail using 8 each #10-32 screws.

Note European installation may use a size M6 metric screw.

- Step 4** Locate the two rear support brackets and adjustable plates in the miscellaneous parts kit.
- Step 5** Position the adjustable plates with the tabs in the three punchouts facing up as shown in Figure 4-3.

Figure 4-1 BPX Switch Aligned with Temporary Support Brackets and Spacer Bar



- Step 6** Align the top and bottom holes in the adjustable plates with corresponding holes in the side panel of the BPX switch shelf. (The bottom of the plates should be approximately aligned with the bottom of a DC powered BPX switch shelf. They should be extended below the bottom of an AC powered BPX switch shelf so that the AC Power Supplies can be secured to the shelf.)
- Step 7** Secure one each adjustable plate to each side of the BPX switch shelf using (2) each #10-32 machine screws and flat washers.
- Step 8** Attach a rear support bracket to each one of the adjustable plates with 2 each #10-32 screws and washers. Do not tighten yet.
- Step 9** Secure the support brackets to the rear located vertical rails using 2 each #10-32 screws. You may have to lift the BPX switch shelf slightly to align the holes in the bracket to the holes in the rack.
- Step 10** Tighten the screws attaching the support bracket to the adjustable plate.
- Step 11** Slide a cable strap over each of the three tabs on the support brackets.
- Step 12** Remove the temporary support bracket and spacer bracket from the front of the cabinet.
- Step 13** If this is a DC powered shelf, proceed to Chapter 5, Installation, DC Shelf Initial Setup.
- Step 14** If this is an AC powered shelf, proceed to Chapter 6, Installation, AC Shelf Initial Setup.

Figure 4-2 BPX Switch with Rear Rail Mounting at Setback of 30 Inches

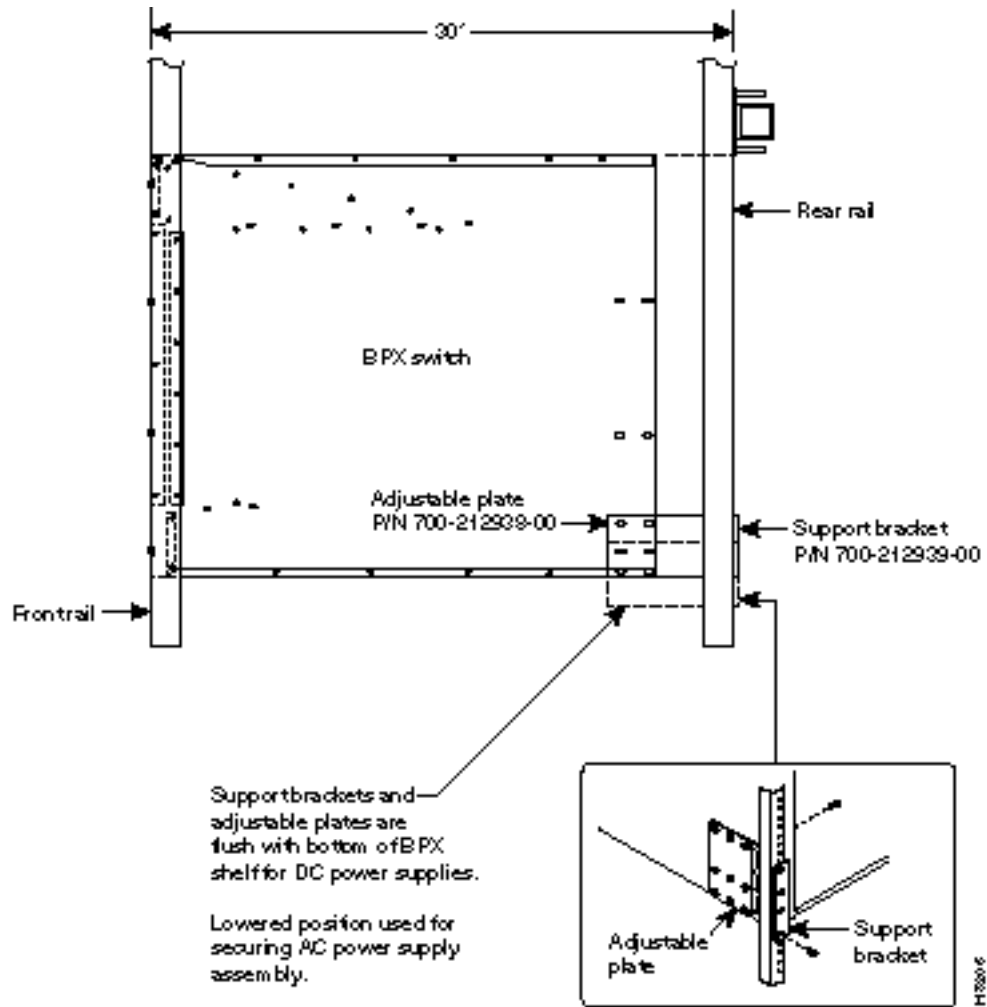


Figure 4-3 Rear Mounting Brackets, Detail

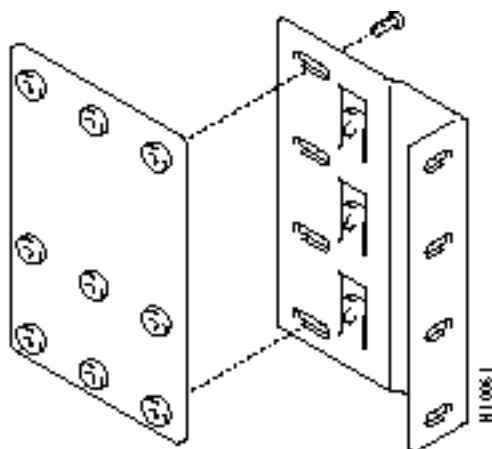
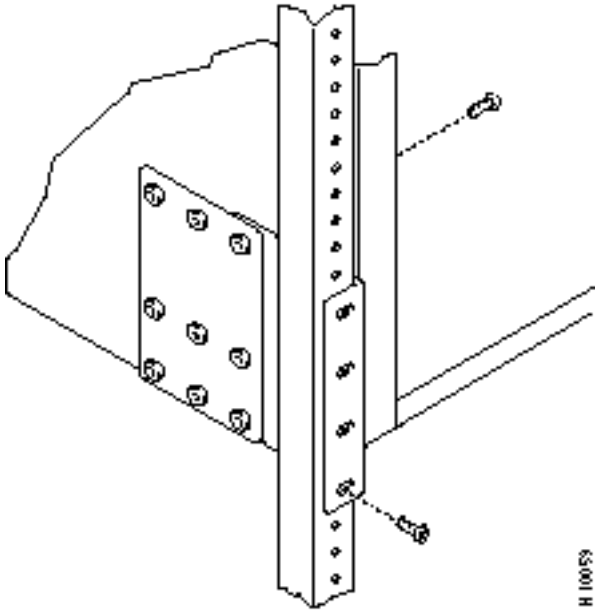
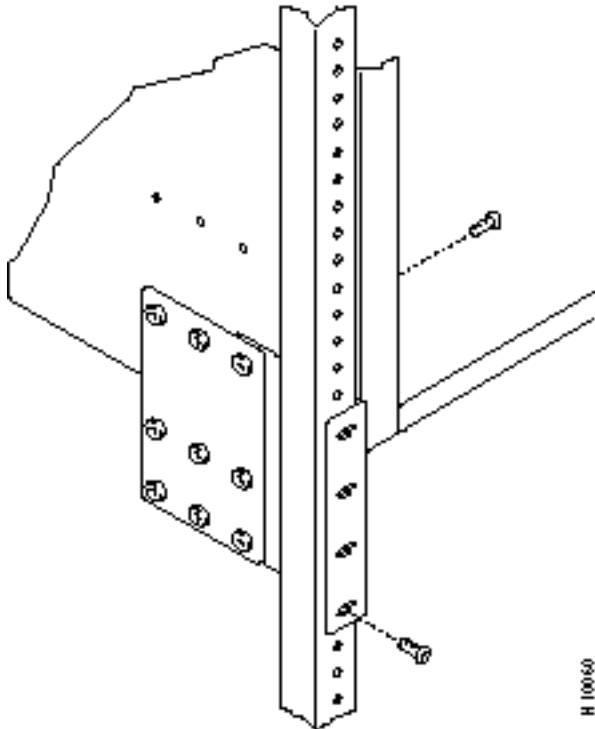


Figure 4-4 Rear Mounting Brackets, with 30 Inch Rear Rail Setback (DC Systems)



H 100059

Figure 4-5 Rear Mounting Brackets, 30 Inch Rear Rail Setback (AC-Powered Systems)



H 100060

Installation, DC Shelf Initial Setup

This chapter describes how to make the DC power connections.

Before proceeding to this chapter, the procedures should be completed, in either:

- Chapter 3, Installation with Cisco Cabinet, or
- Chapter 4, Installation with Customer Cabinet.

This chapter contains the following sections:

- DC Power Input Connections
- Card Slot Fuses
- Fan Power Fuses

DC Power Input Connections

There are two versions of the DC-powered BPX switch as follows:

- Single DC Power Entry Module, single power feed.
- Dual DC Power Entry Module, dual power feed.

For DC systems, the wiring is connected from a 48 VDC power source to one or two DC Power Entry Modules (Figure 5-1). This wiring is provided by the installer. A metallic conduit box that meets all electrical codes for attaching electrical conduit is factory-installed (Figure 5-2). A simple plastic cover is also enclosed for customers who do not require conduit protection for the input power leads (Figure 5-3). Use conduit if required by local electrical code.

Only a source that complies with the safety extra low voltage (SELV) requirements in UL1950, CSA C22.2 No. 950, EN60950 can be connected to a BPX switch DC system.

To make DC power connections to the BPX switch:

- Step 1** Locate the conduit terminating box, one for each Power Entry Module. (Figure 5-2). Remove the two cover screws and lift off the cover. If conduit is required, proceed to step 2. If conduit is not required, proceed to step 3.
- Step 2** Determine which knockout to remove (rear or bottom). Remove knockout and install conduit fitting.
- Step 3** If conduit is not required, remove the conduit box by removing the two screws, one above the terminal block and one below it.

Step 4 Run three wires from the DC terminal block to a source of 48 VDC. Use 8 AWG wire (or metric equivalent for E1 systems). Use a #10 screw ring lug designed for 8 AWG wire (90° lug if using conduit box) to terminate the wires.

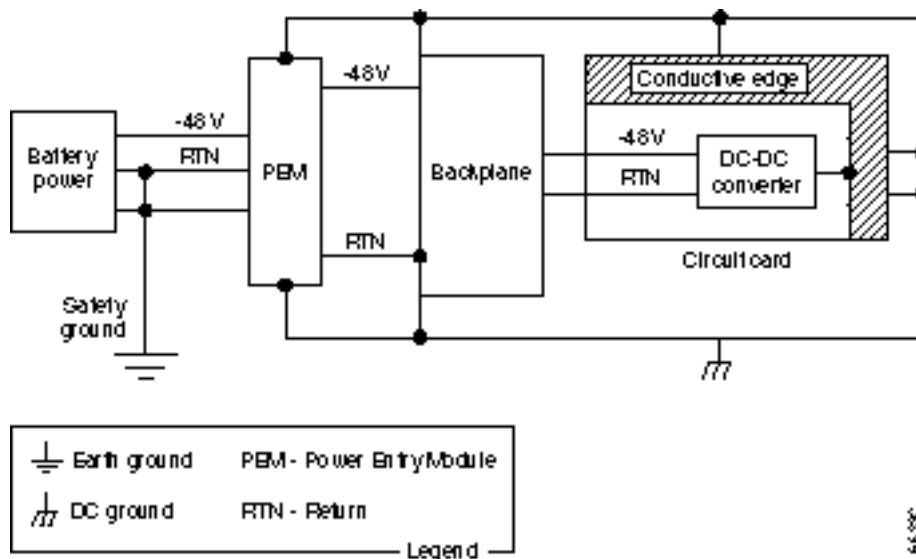


Caution Ensure that polarity of the DC input wiring is correct! Connections with reversed polarity may damage the equipment



Warning Remember that this is a positive ground system. Connect the positive lead to the +RTN terminal. Connect the negative lead to the -48V terminal. Connect the earth ground to the middle terminal labeled SAFETY GROUND. See Figure 5-1, Figure 5-2 and Figure 5-3. For personnel safety, the green/yellow wire must be connected to safety (earth) ground at both the equipment and at the supply side of the dc wiring.

Figure 5-1 DC Power



Step 5 Terminate the DC input wiring to a DC source capable of supplying at least 50 amperes. A 50A dc circuit breaker is required at the 48 VDC facility power source. An easily accessible disconnect device should be incorporated into the facility wiring. Be sure to connect the ground wire/conduit to a solid office (earth) ground.

Note Primary overcurrent protection is provided by the building circuit breaker. In North America, this breaker should protect against excess currents, short circuits, and earth faults in accordance with NEC ANSI NFPA 70/CEC.

Step 6 If the system is equipped with dual power feed, repeat steps 1 through 6 for the second power feed.

Step 7 Either replace the cover on the conduit terminating box(es) or attach the plastic cover plate(s) to the terminal block with screws into the two terminal block standoffs. See Figure 5-2 and Figure 5-3.

Step 8 Proceed to Chapter 7, Finishing the Installation and Power-Up.

Figure 5-2 DC Power Connections—With Conduit Box

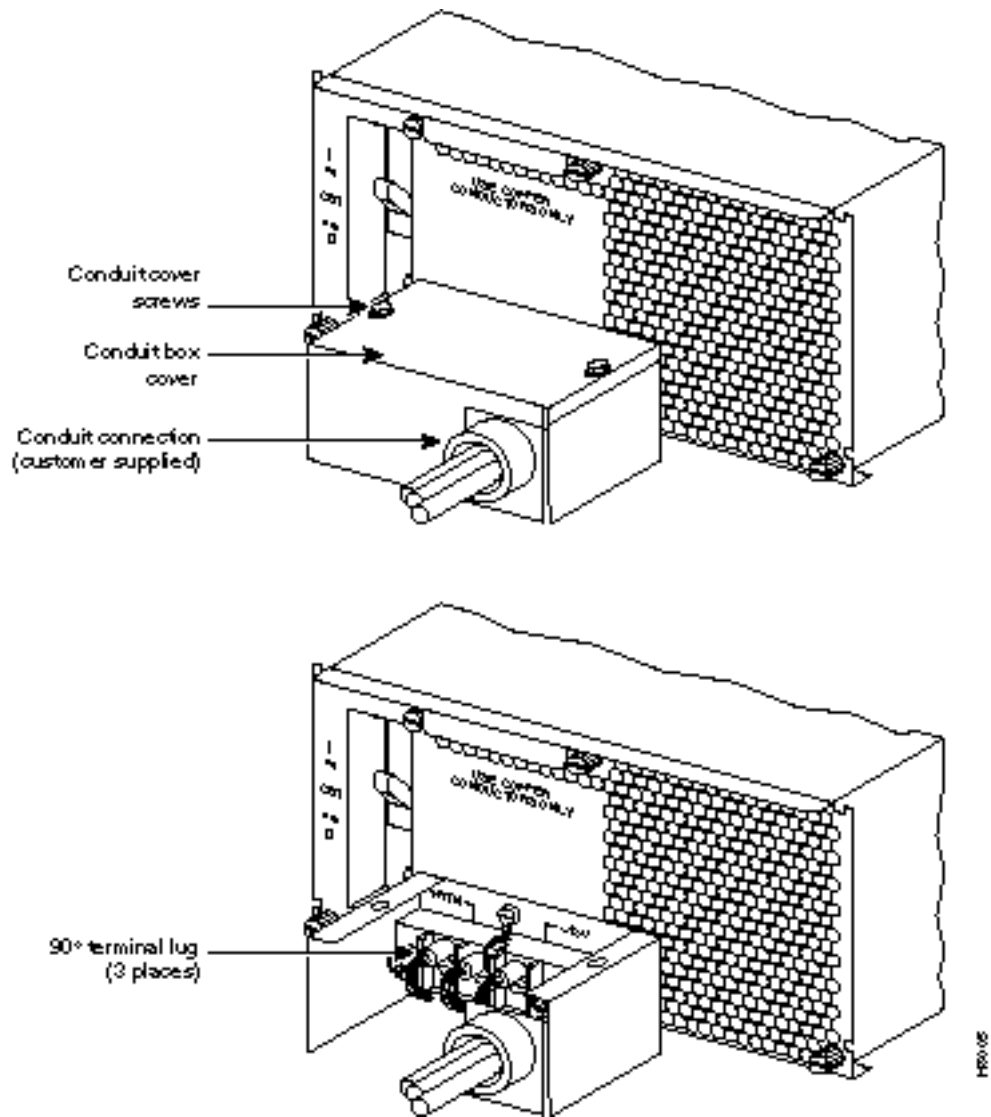
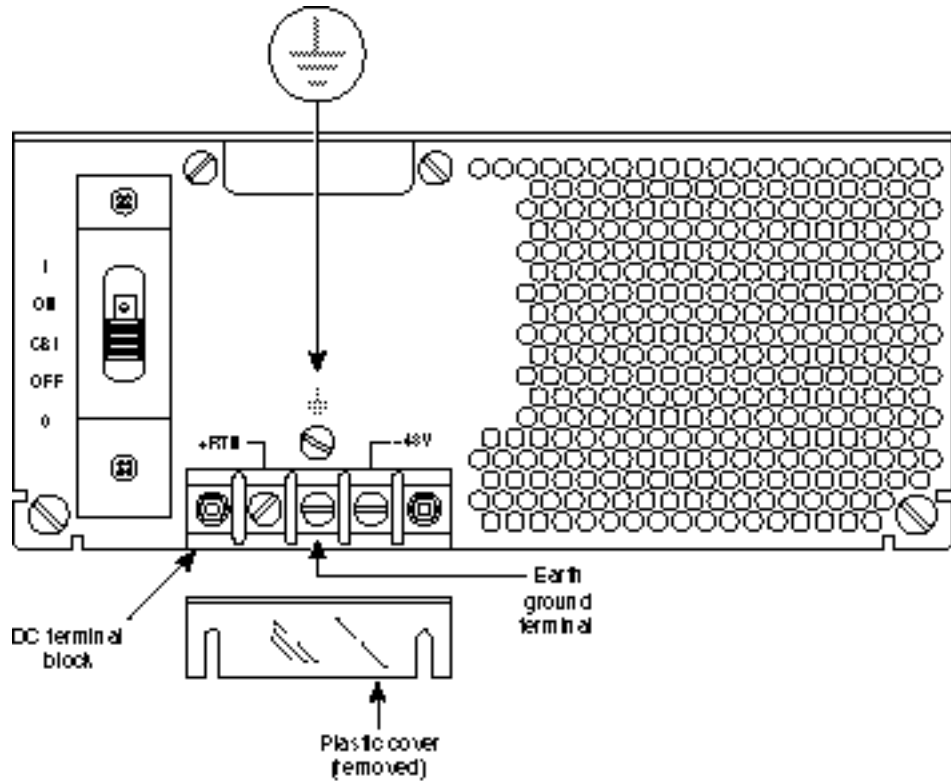


Figure 5-3 DC Power Connections—Without Conduit Box



Card Slot Fuses

Fuses for each card slot have been added to the backplane of later versions of the BPX switch to protect against catastrophic backplane damage in the event of a shorted connector power pin. Backplane fuses should rarely, if ever, need replacement. The card slot fuses are designated F4 through F18, corresponding to card slot numbers 1 through 15, respectively.

Refer to the *Cisco BPX 8600 Series Reference* document, *Repair and Replacement* chapter, for instructions on replacement of these fuses, and contact Cisco Customer Service for assistance regarding their replacement.



Caution For continued protection against risk of fire, replace only with the same type and rating of fuse. Fuses should only be replaced after all power to the BPX switch has been turned off.

Fan Power Fuses

Fan fuses are located on the backplane of the BPX switch to protect against catastrophic backplane damage in the event of a shorted fan cable. Backplane fuses should rarely, if ever, need replacement. The fuses are designated F1 through F3, corresponding to fans 1 through 3.



Caution Refer to the *Cisco BPX 8600 Series Reference* document, *Repair and Replacement* chapter, for instructions on replacement of these fuses, and contact Cisco Customer Service for assistance regarding their replacement.



Warning For continued protection against risk of fire, replace only with the same type and rating of fuse. **Replace fuses only after all power to the BPX switch has been turned off.**

Installation, AC Shelf Initial Setup

This chapter explains how to install the AC power supply tray, power supplies, and make AC power connections.

Before proceeding to this chapter, the procedures should be completed, in either:

- Chapter 3, Installation with Cisco Cabinet, or
- Chapter 4, Installation with Customer Cabinet.

This chapter contains the following sections:

- Installing an AC Power Supply Tray
- Installing an AC Power Supply
- AC Power Input Connections
- Card Slot Fuses
- Fan Power Fuses

Installing an AC Power Supply Tray

The AC Power Supply Assembly is shipped separately and must be mounted directly below the BPX switch shelf. It consists of a Power Supply Tray and one or two AC power supplies. The power supplies are shipped separately from the AC Power Supply Tray and are installed after the BPX switch shelf is mounted in place.

All AC-powered systems are required to use a set of rear support brackets to provide additional support for the rear of the Power Supply Tray. To install the AC Power Supply Tray proceed as follows:

- Step 1** Use two screws to attach each of two temporary support brackets and a temporary spacer bar to the rack (Figure 6-1 and Figure 6-2).
- Step 2** Locate the small access hole in the top center of the front Air Intake Grille on the Power Supply Tray (Figure 6-3).
- Step 3** Insert a slotted blade screwdriver (0.20/0.25 inch blade width) into the access hole until it stops (approximately 1 inch).
- Step 4** Carefully rotate the screwdriver approximately a quarter turn in either direction. The top of the Air Intake Grille should spring out.
- Step 5** Remove the Air Intake Grille.

Figure 6-1 Temporary Spacer Bracket and Support Bracket Installation

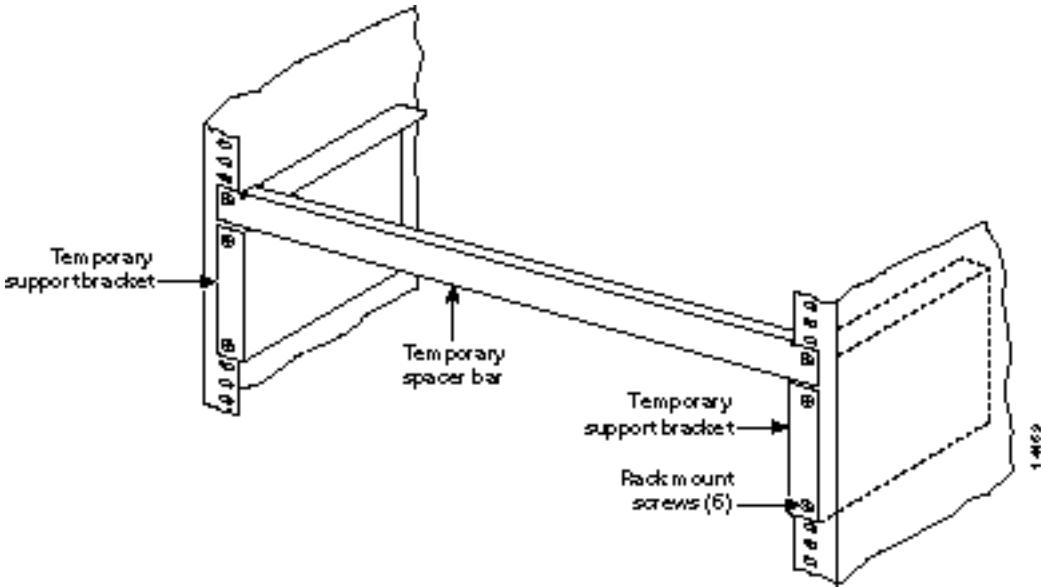


Figure 6-2 Power Supply Tray aligned with Temporary Support Brackets and Bar

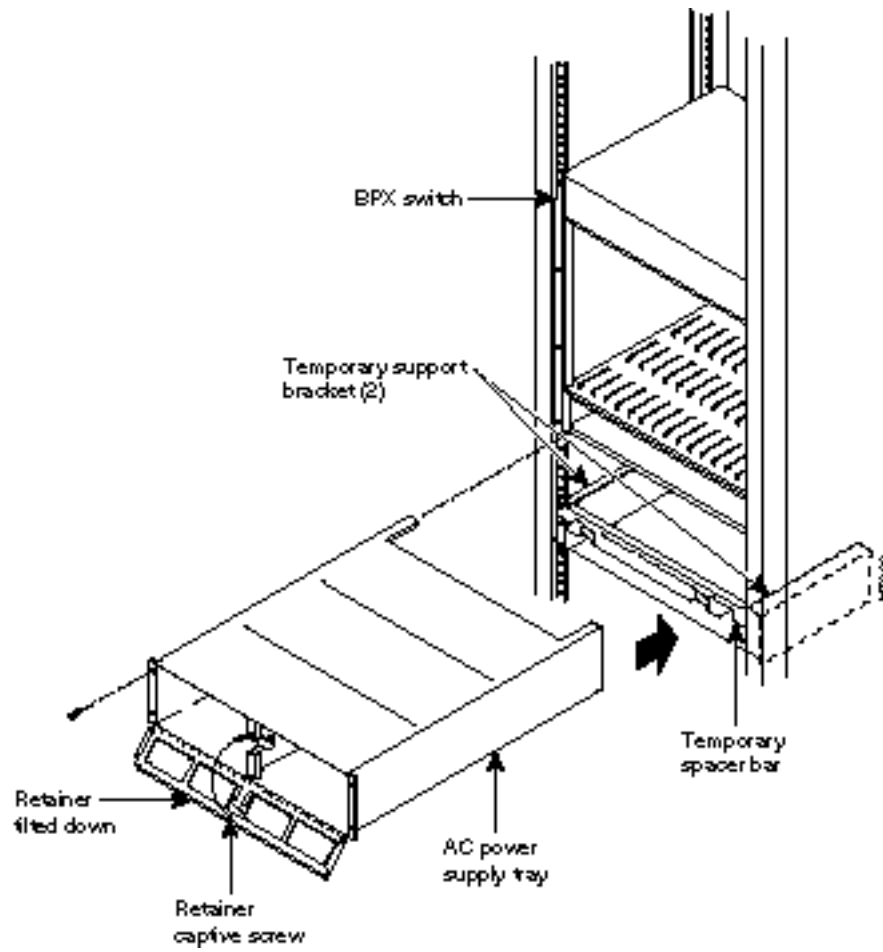
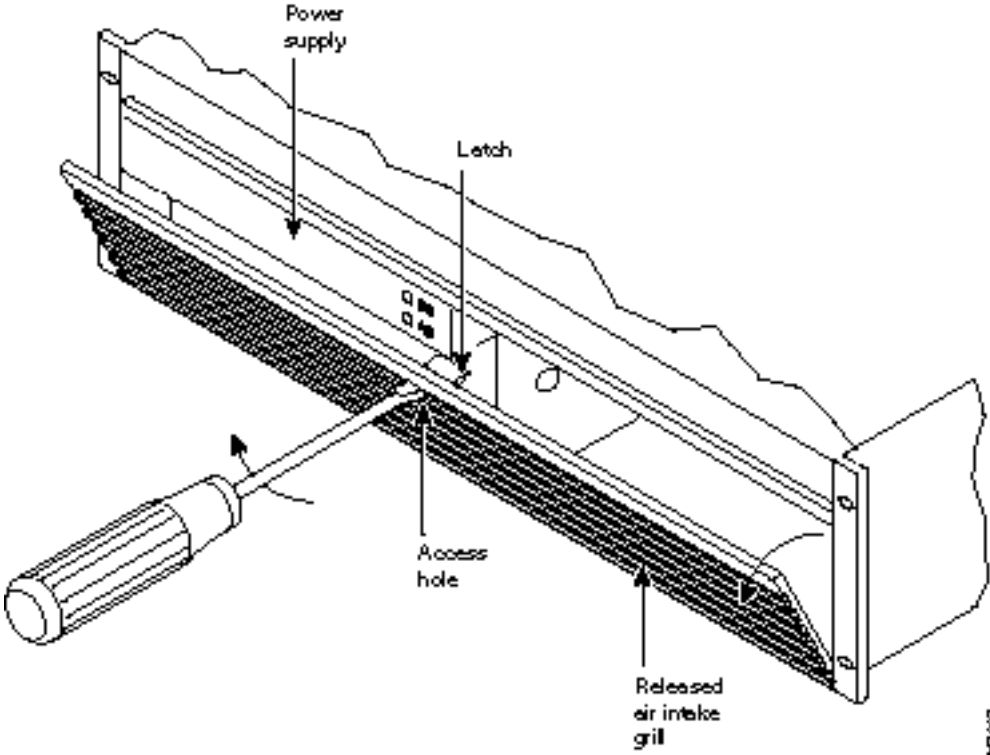


Figure 6-3 Removing an Air Intake Grille



- Step 6** Slide the Power Supply Tray in the rack between the BPX switch shelf and the temporary support brackets and spacer bar (Figure 6-2). If cables are attached, use care to avoid damaging them.
- Step 7** Install screws and washers to loosely secure power supply assembly to the front of the BPX switch shelf. Align the front flanges of the Power Supply Tray with the flanges on the BPX switch shelf and tighten screws. There should be approximately 1/16" clearance between the BPX switch shelf and the Power Supply Tray to provide sufficient clearance for inserting power supplies.
- Step 8** Secure the Power Supply Tray to the rear support bracket (plate) using one #10-32 screw and flat washer on each side. Use the lower hole in the brackets. Figure 6-4 shows the setup for a configuration with the vertical rails at a 30 inch setback.

For a configuration with vertical rails at a 19.86 inch rail setback, attach one #10-32 screw and flat washer to the single bracket on each side. Use the lower hole in the brackets. Figure 6-5 shows the bracket configuration only; the power supply tray position is the same as shown for in Figure 6-4.

Figure 6-4 Securing AC Power Supply Tray, 30-Inch Rail Setback

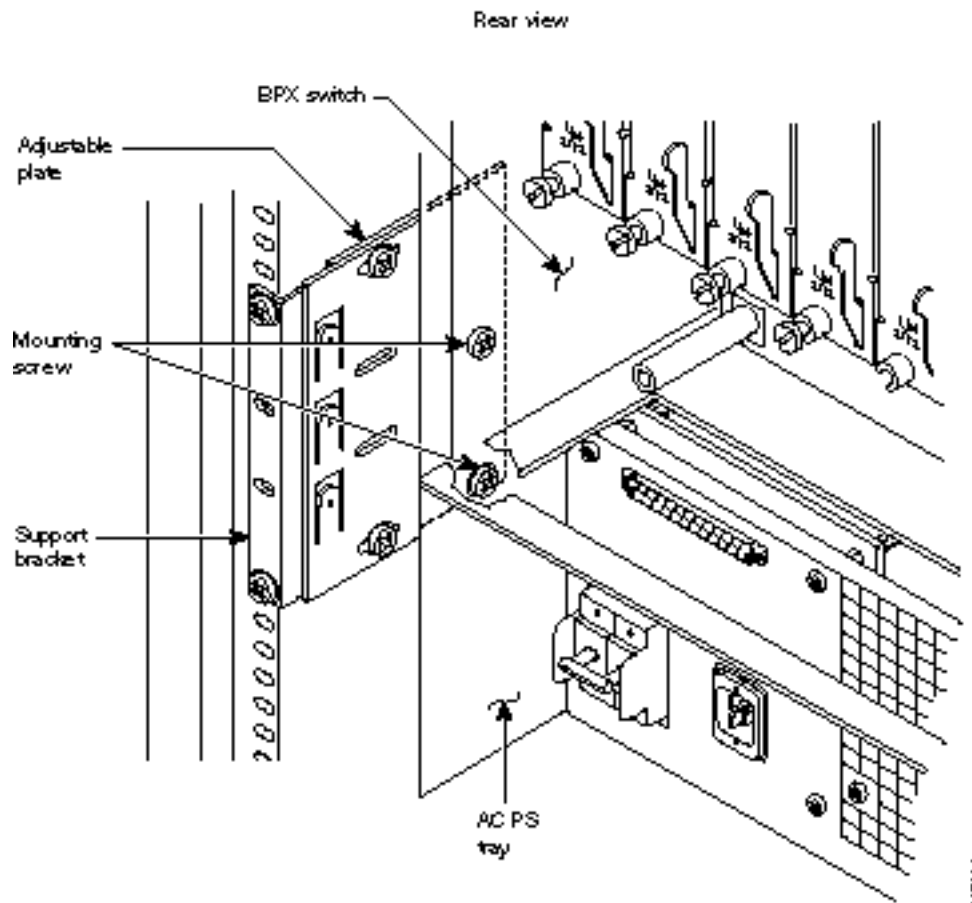
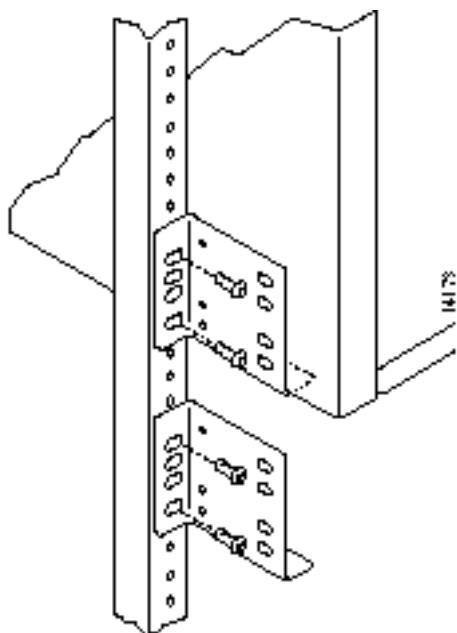
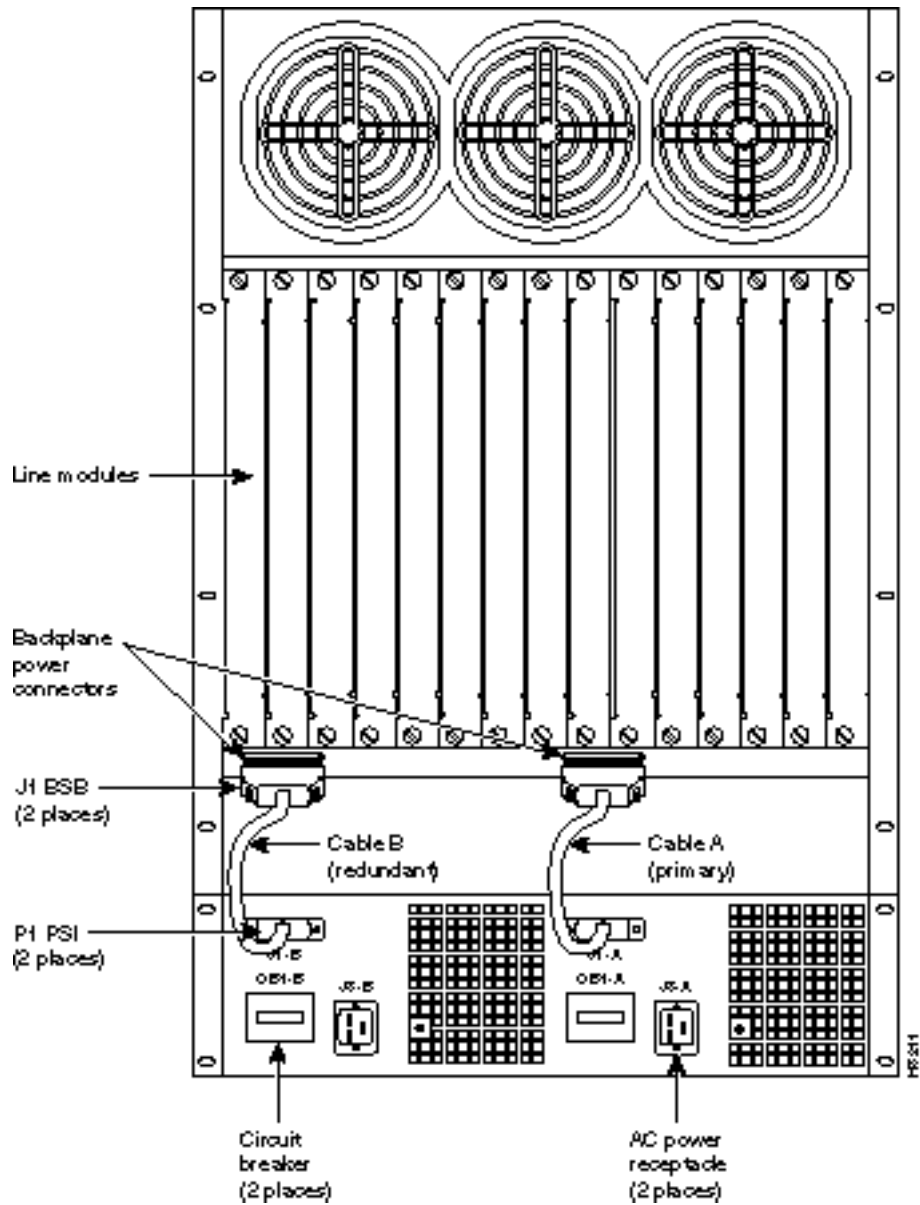


Figure 6-5 Securing an AC Power Supply Tray, 19.86 inch Rear Rail Setback



- Step 9** Connect and secure a power supply interconnect cable (Cable A in Figure 6-6) between the primary AC Power Supply and the BPX switch backplane power connector.
- Step 10** Connect and secure a second power supply interconnect cable (Cable B in Figure 6-6) between the redundant AC Power Supply and the BPX switch backplane power connector.
- Step 11** Remove the temporary support bracket and spacer bracket from the front of the cabinet.

Figure 6-6 AC Power Supply Tray with Redundant AC Inputs (view from rear)



Installing an AC Power Supply

The AC Power Supply is an assembly consisting of an AC-DC Converter, cooling fan, LED bezel, and mounting frame. The AC Power Supply is installed and removed as an integral unit. There may be one or two AC Power Supplies depending on node configuration. They are housed in the Power Supply Tray.

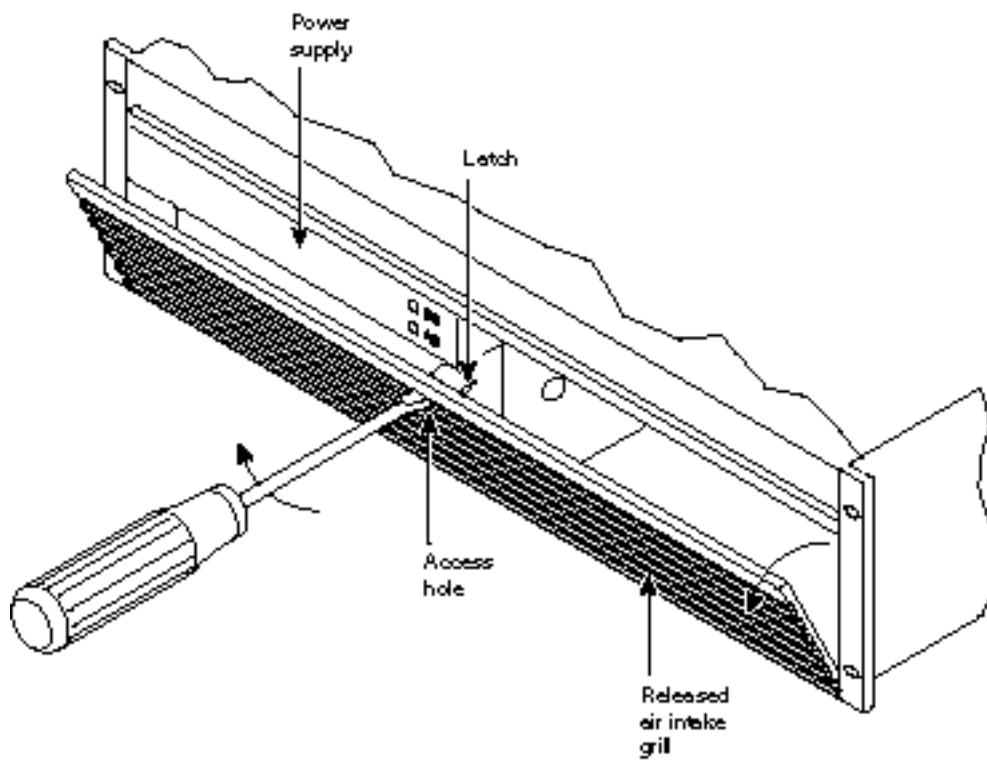
Proceed as follows to install an AC Power Supply in the Power Supply Tray:

- Step 1** First install the Power Supply Tray in a rack (see “Installing an AC Power Supply Tray” section).
- Step 2** Set the circuit breaker(s) at the rear of the Power Supply Tray to OFF.

Note When replacing an AC power supply, the circuit breaker at the rear of the Power Supply Tray may be left ON as the power supplies are hot pluggable.

- Step 3** If not already removed, remove the Power Supply Tray front Air Intake Grille. Locate the small access hole in the top, center of the front Air Intake Grille for the Power Supply Tray (Figure 6-7).

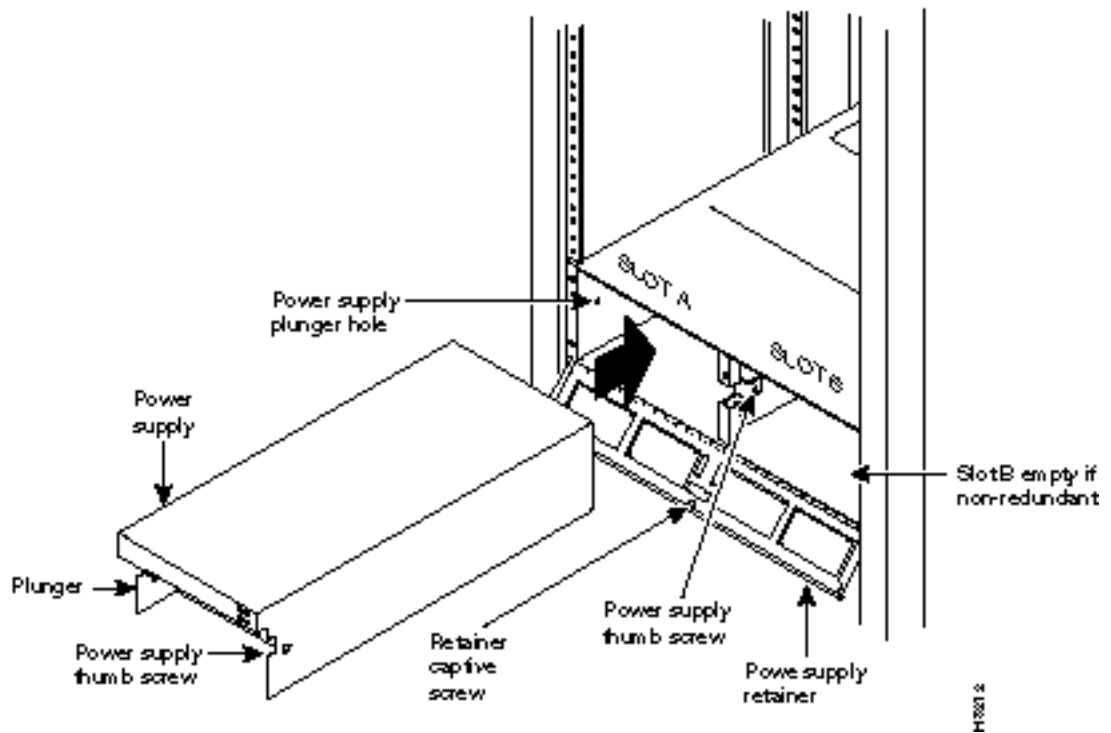
Figure 6-7 Removing an Air Intake Grille



- Step 4** Insert a small slotted blade screwdriver (0.20/0.25 inch blade width) into the access hole until it stops, approximately 1 inch (2.5 cm).

- Step 5** Carefully rotate the screwdriver approximately a quarter turn in either direction. The top of the Air Intake Grille should spring out.
- Step 6** Loosen the captive screw in the center of the power supply retainer and rotate the hinged retainer frame down (Figure 6-8).

Figure 6-8 AC Power Supply Installation



- Step 7** Align the power supply in the PS-A slots at the bottom of the Power Supply Tray and gently slide it in part way (Figure 6-8).
- Step 8** Continue to slide the power supply in until it mates with the rear connector.
- Step 9** When the power supply is completely seated in its connector, the pin plunger on the left side of the supply will engage with a hole in the tray. If not, push firmly on the front edge until the power supply assembly seats in the connector.
- Step 10** Screw the right-hand thumbscrew in finger tight.
- Step 11** When a second power supply is provided, install it in the PS-B slot in the same manner after removing the Blank Panel from Slot B.
- Step 12** Rotate the power supply retainer up and tighten the center captive screw.
- Step 13** Install the Air Intake Grille. Press on the top center until the latch snaps into place.

AC Power Input Connections

There are three configurations of the AC-powered BPX switch cabinet as follows:

- Single power supply, single AC power feed.
- Dual power supplies, single AC power feed.
- Dual power supplies, dual AC power feed.

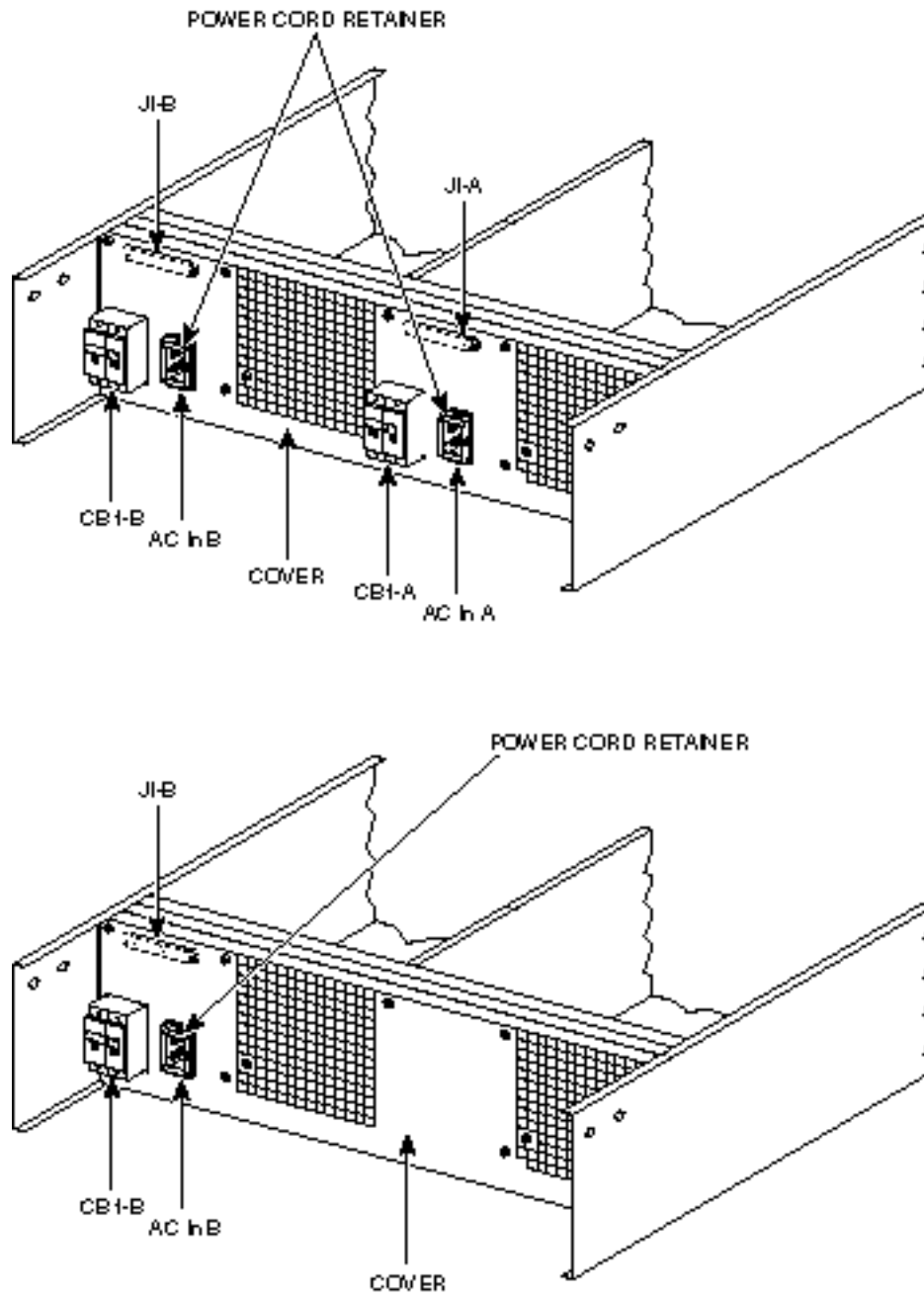
An 8 ft. (3 m.) power cord is supplied with each AC Power Supply Assembly. To make AC power connections to the BPX switch:

- Step 1** Plug the power cord(s) into the applicable IEC connector(s) as shown in Figure 6-9 and tighten the cord retainers. A separate power cord connects to each of one or two IEC connectors depending on the version of power supply shelf provided.
- Step 2** Plug the BPX switch cord into a 220 to 240 VAC, single-phase, wall outlet capable of supplying 20 A. The building circuit should be protected with a 20 A circuit breaker.

Note The BPX switch circuit breaker has been changed from 15 A to 20 A to provide improved system availability for installations with a single line cord and (N+1) power supplies.

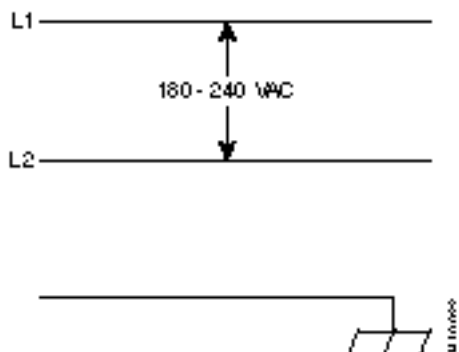
- Step 3** For the dual power feed version, plug each power cord into receptacles on separate building circuits to provide protection against a power feed failure. Each building circuit should be protected with a 20A circuit breaker.

Figure 6-9 AC Power Supply Connections (Dual and Single Versions Shown)



- Step 4** The ground (green/yellow) wire of the AC power cord provides the safety ground to the BPX switch via the grounding prong on the three-prong connectors. Make sure the building AC receptacle is also properly grounded (Figure 6-10).

Figure 6-10 AC Power



- Step 5** As applicable, provide a convenience AC outlet strip, with at least four outlets, near the BPX switch to power optional modems, CSU, or DSUs, test equipment, etc. There is no accessory AC outlet supplied on the BPX switch. This outlet strip should be connected to a source of AC voltage normal for the region (e.g., 115 VAC for domestic US use).
- Step 6** Proceed to Chapter 7, Finishing the Installation and Power-Up.

Card Slot Fuses

Fuses for each card slot have been added to the backplane of later versions of the BPX switch to protect against catastrophic backplane damage in the event of a shorted connector power pin. Backplane fuses should rarely, if ever, need replacement. The card slot fuses are designated F4 through F18, corresponding to card slot numbers 1 through 15, respectively.

Refer to the *Cisco BPX 8600 Series Reference* document, *Repair and Replacement* chapter, for instructions on replacement of these fuses, and contact Customer Service for assistance regarding their replacement.



Caution For continued protection against risk of fire, replace only with the same type and rating of fuse. Fuses should only be replaced after all power to the BPX switch has been turned off.

Fan Power Fuses

Fan fuses are located on the backplane of the BPX switch to protect against catastrophic backplane damage in the event of a shorted fan cable. Backplane fuses should rarely, if ever, need replacement. The fuses are designated F1 through F3, corresponding to fans 1 through 3.



Caution Refer to the *Cisco BPX 8600 Series Reference* document, *Repair and Replacement* chapter, for instructions on replacement of these fuses, and contact Customer Service for assistance regarding their replacement.



Caution For continued protection against risk of fire, replace only with the same type and rating of fuse. Replace fuses only after all power to the BPX switch has been turned off.

Finishing the Installation and Power-Up

This chapter explains how to install the BPX switch cards, check for a 9.6 or 19.2 Gbps backplane, connect line and trunk cables, connect peripherals, connect to a network management station, initial power up, and initial configuration.

Before proceeding to this chapter, the procedures should be completed, in either:

- Chapter 5, Installation, DC Shelf Initial Setup, or
- Chapter 6, Installation, AC Shelf Initial Setup.

This chapter contains the following sections:

- Installing the BPX Switch Cards
- Verifying 9.6 or 19.2 Gbps Backplane
- Making T3 or E3 Connections
- Making an ASI-155 or BNI-155 Connection
- Making a BXM OC3 or OC12 Connection
- Making a BXM T3/E3 Connection
- Setting up the BME OC-12 Port Loop
- Alarm Output Connections
- Attaching Peripherals
- LAN Connection for the Network Management Station
- Connecting a Network Printer to the BPX Switch
- Connecting Modems
- Making External Clock Connections
- Initial Power-Up of the BPX Switch
- Provisioning the BPX Switch
- Configuration

Installing the BPX Switch Cards



Caution Ground yourself before handling BPX switch cards by placing a wrist strap on your wrist and clipping the strap lead to the cabinet, or use the wrist strap that is connected to the cabinet.

The card shelf in the BPX switch has card slots numbered from 1 to 15, as viewed from left to right from the front of the cabinet. Front and rear views of the BPX switch card shelf are shown in Figure 7-1 and Figure 7-2, respectively. The configuration rules for the BPX switch are summarized as follows.

- For non-redundant nodes, either a Broadband Controller Card BCC-4, BCC-3, or BCC-32 is used in front slot number 7.
- For non-redundant nodes, a BCC-3-bc backcard must be used in back slot number 7 with a BCC-4 or BCC-3 front card, or a BCC-bc (also known as BCC backcard) must be used in back slot number 7 with a BCC-32 front card.
- For redundant nodes, two Broadband Controller Cards, a pair of BCC-4s, BCC-3s, or BCC-32s are used in front slot numbers 7 and 8.
- For redundant nodes, BCC-3 bc backcards must be used in back slot numbers 7 and 8 with BCC-4 or BCC-3 front cards, or BCC-c (also known as BCC backcards) backcards must be used in back slot numbers 7 and 8 with BCC-32 front cards.

Note In some cases it may be possible to operate two of the three types of BCCs with their proper backcards temporarily for maintenance purposes, i.e., replacing a failed controller card. Contact Customer Service for assistance.

- ASM in front slot number 15.
- LM -ASM in back slot number 15.
- BNI-3T3, BNI-3E3, BNI-155 in any other front slot than 7, 8, or 15.
- LM -3T3, LM-3E3, 2OC3-SMF, 2OC3-MMF in all back slots with a BNI in the corresponding front slot
- ASI-2T3, ASI-2E3, ASI-155 in any other front slot than 7, 8, or 15.
- LM -2T3, LM-2E3, 2OC3-SMF, 2OC3-MMF in all back slots with an ASI in the front other than 7, 8, or 15.

Figure 7-1 BPX Shelf (front view)

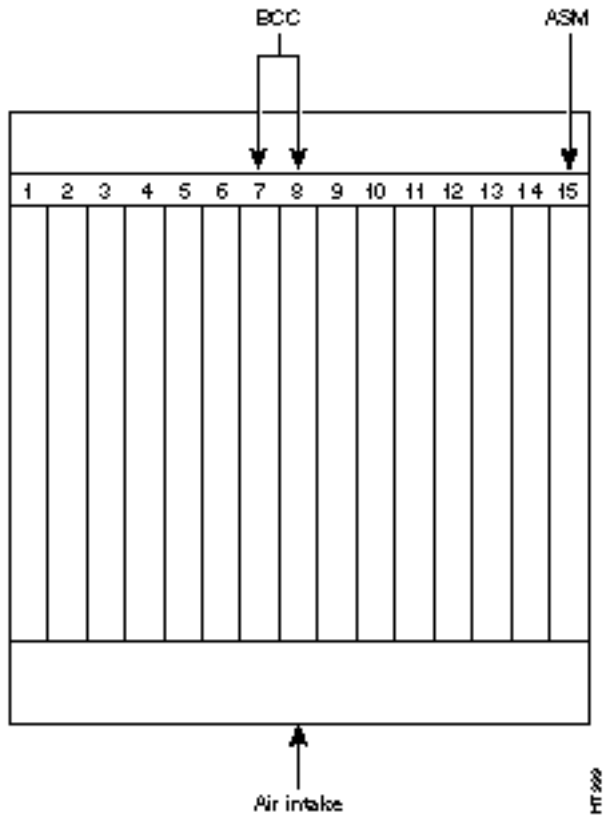
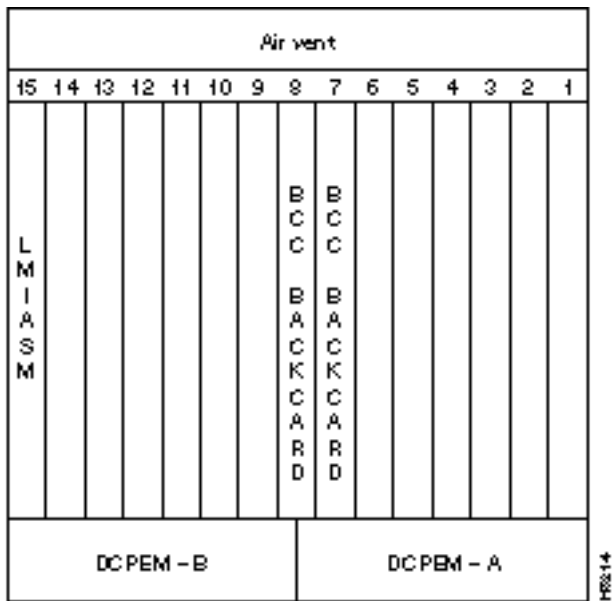


Figure 7-2 BPX Shelf (rear view, DC shelf shown)



Installing Front Cards



Caution Ground yourself before handling BPX switch cards by placing a wrist strap on your wrist and clipping the strap lead to the cabinet, or use the wrist strap that is connected to the cabinet.



Caution Blank Front Card and Rear Face Plates must be used to fill/cover empty card slots to eliminate Radio Frequency Interference (RFI) and Electromagnetic Interference (EMI) and to ensure correct air flow through the card cage.

Systems may be shipped with empty shelves, with filler cards or with plug-in cards installed. If filler cards are installed in each slot, some of them may need to be replaced with functional cards. The front cards are held captive mechanically by the Air Intake Grille and can not be removed until the lower Air Intake Grille is released.



Caution Do not attempt to remove a front card from the BPX switch cabinet until the Air Intake Grille is released and lowered or the Air Intake Grille and/or card extractors may be damaged.

Proceed as follows to remove/install a front card.



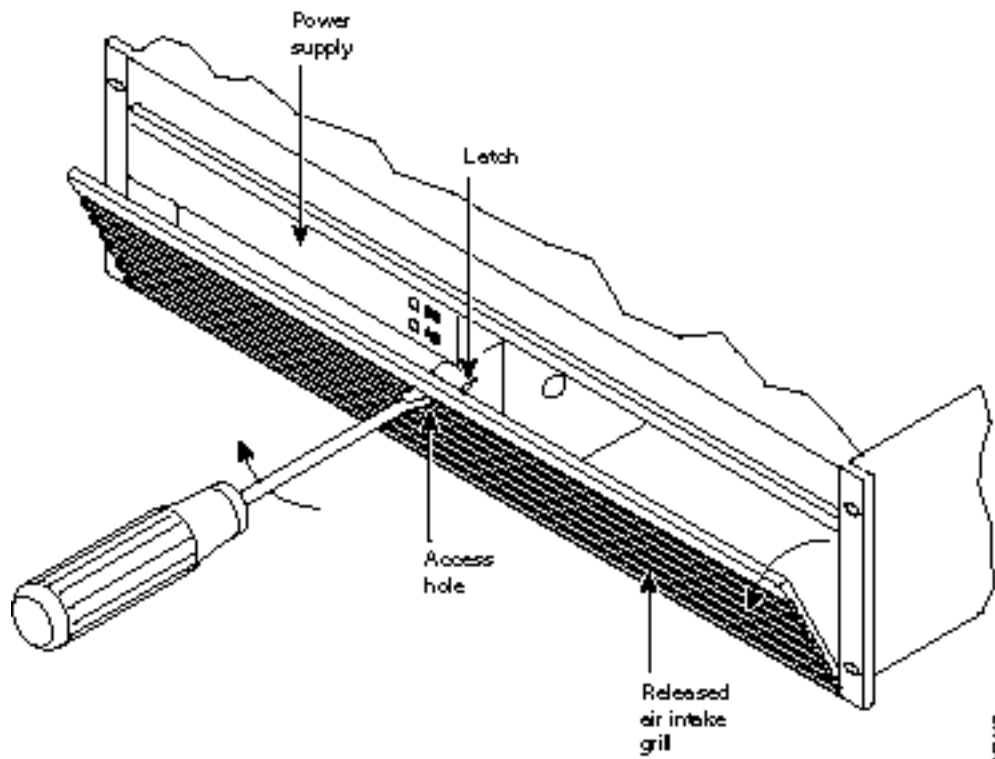
Caution Before any card is installed, always examine the chassis backplane and card cage guides for any signs of loose or misplaced EMI gasketing. Examine the backplane connectors for bent or damaged connection or pre-power pins.

Step 1 Turn off all power to the BPX switch.

Note While it is a good idea to turn off power when initially installing cards, when replacing cards, on an operating BPX switch, it is not necessary to turn off power as the cards are hot pluggable replaceable.

Step 2 Locate the small access hole in the top center of the front Air Intake Grille below the card slots (see Figure 7-3 for location).

Figure 7-3 Removing an Air Intake Grille



- Step 3** Insert a small slotted blade screwdriver (0.20/0.25 inch blade width) into the access hole until it stops (approximately 1 inch).
- Step 4** Carefully rotate the screwdriver approximately a quarter turn in either direction. The top of the Air Intake Grille should spring out.
- Step 5** Remove Air Intake Grille.
- Step 6** To remove a card, rotate the extractor handles at the top and bottom of the card to release the card and slide it out.
- Step 7** To insert a new card, position the rear card guides over the appropriate slots at the top and bottom of the card cage.
- Step 8** Gently slide the card in all the way to the rear of the slot and seat the board by fully seating both extractor handles. The handles should snap back to a vertical position when seated.

Note The card should slide in with slight friction on the adjacent board's EMI gaskets. Investigate any binding. Do not use excessive force.

Installing Back Cards



Caution Ground yourself before handling BPX switch cards by placing a wrist strap on your wrist and clipping the strap lead to the cabinet, or use the wrist strap that is connected to the cabinet.

The optical ports contain an information label as shown in Figure 7-4.

Figure 7-4 Laser Information Label



Warning Invisible radiation may be emitted from the optical ports of the single-mode or multi-mode products when no fiber cable is connected. Avoid exposure and do not look into open apertures. (For translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* that accompanied your equipment).



Warning Class 1 laser product. (For translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* that accompanied your equipment).



Warning Laser radiation when open. (For translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* that accompanied your equipment).

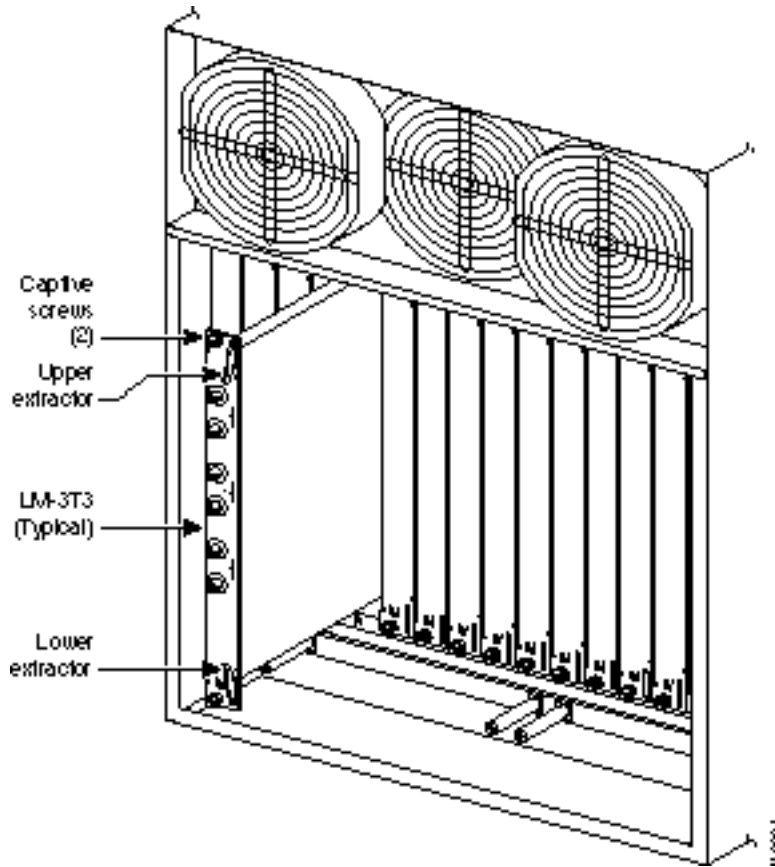
Proceed as follows to install back cards:

- Step 1** Locate the card to remove.
- Step 2** For existing installations, remove any cable(s) that may be attached and tag them so they may be replaced in the same location.
- Step 3** Loosen the captive mounting screws on both top and bottom of the line module faceplate with a slotted blade screwdriver (Figure 7-5)
- Step 4** Lift the extractor handles at the top and bottom, and slide out the line module.
- Step 5** To re-insert the line module, locate the corner edges of the card into the appropriate guide slots at the top and bottom of the card cage. Gently slide the card in all the way to the rear of the slot and push to seat the card in the connector.

Note The card should slide in easily. Investigate any binding. Do not use excessive force.

- Step 6** Screw in the captive screws.
- Step 7** Replace any cables that may have been removed in step 2.

Figure 7-5 Installing a Back Card



Verifying 9.6 or 19.2 Gbps Backplane

In order to operate the BPX Switch at 19.2 Gbps the following is required:

- A 19.2 Gbps backplane
- BCC-4 or later controller cards
- One or more BXM cards
- Release 8.4.00 or later switch software
- A backplane NOVRAM that is programmed to identify the backplane as a 19.2 Gbps backplane.

Switch software will not allow node operation at 19.2 Gbps unless it can read the backplane NOVRAM to verify that the backplane is a 19.2 Gbps backplane.

The 19.2 backplane can be visually identified by the small white card slot fuses at the bottom rear of the backplane. These fuses are approximately 1/4 inch high and 1/8 inch wide. The 9.6 Gbps backplane does not have these fuses. If the BPX Switch is a late model, then a 19.2 Gbps backplane is installed. This can be verified by running the `dsppbnv` command which will display “Word #2 =0001” if the backplane NOVRAM has been programmed. If anything else is displayed, you’ll have to visually check the backplane for the fuses.

If the backplane is a 19.2 Gbps backplane, but the backplane NOVRAM has not been set to display Word #2 =0001, then the **cnfbpnv** command may be used to program the NOVRAM as follows:

Step 1 Enter **cnfbpnv**, and the response should be:

```
Are you sure this is a new backplane (y/n).
```

Step 2 Enter **y**

Step 3 Confirm that the change has been made by entering **dspbnpv** to confirm the response:

```
Word #2 =0001
```

Note If for some reason the change does not take place, it will be necessary to change the backplane NOVRAM. Contact customer service.

Step 4 Enter **switchcc** in order for the change to be recognized by the switch software.

If the backplane is not a 19.2 Gbps backplane, then it will be necessary to install a 19.2 Gbps backplane to obtain 19.2 Gbps operation. Contact Customer Service.

Making T3 or E3 Connections

Each LM-3T3 and LM-3E3 line module (BNI backcard) provides three ports with a BNC connector each for the XMT trunk output and for the RCV trunk input. Each LM-2T3 and LM-2E3 line module (ASI backcard) provides two ports with a BNC connector each for the XMT line output and for the RCV line input. Make the T3/E3 connections to each port as follows.

- Step 1** Bring each cable through the opening at the bottom of the cabinet at the back and route them up the side.
- Step 2** The BPX switch has tie-downs inside the cabinet to hold cabling in place. Pull them apart as applicable, place the routed cable in position, wrap the ties around the cable and remake the loops by pressing the two sections together.
- Step 3** Connect the cables to the BNC connectors on the LM-3T3 or LM-3E3 line modules. Remember, the RCV is an input to the BPX switch and XMT is an output from the BPX switch. The ports are numbered from top to bottom as indicated in Figure 7-6.

Note Maximum distance from a BPX switch to a DSX3 cross connect point is approximately 450 feet (150 meters).

- Step 4** Record which slot and port number are used for each trunk or line. You'll need the information later when configuring the network.
- Step 5** If optional Y-cable redundancy is desired, locate a 3-way BNC Y-cable adapter for each port to be so equipped. As an alternative to the Y-cable, use a BNC "T" and two short BNC-BNC cables.
- Step 6** For card redundancy, make sure there are two appropriate line modules equipped in adjacent slots.
- Step 7** Connect two legs of the Y-cable to the XMT T3 or E3 connectors on the same port on each of the two line modules (Figure 7-7). Do the same with the two RCV T3 or E3 connectors.
- Step 8** Connect the third leg of the XMT and RCV Y-cable adapters to the XMT and RCV trunk cable.

Figure 7-6 Connecting T3 Cables to BPX LM-T3 (BNI T3 backcard)

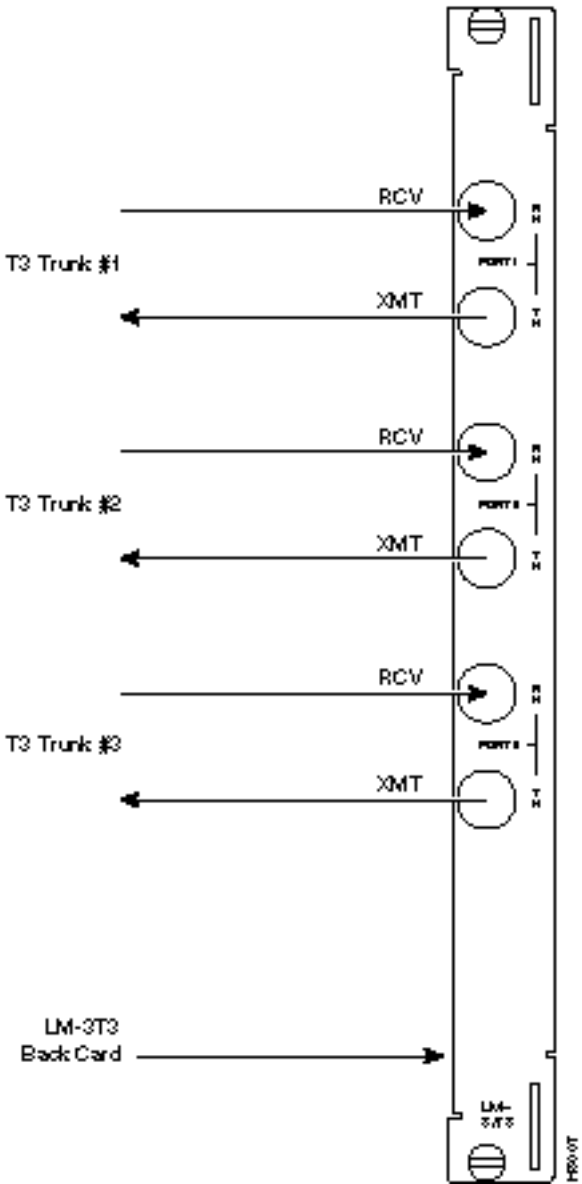
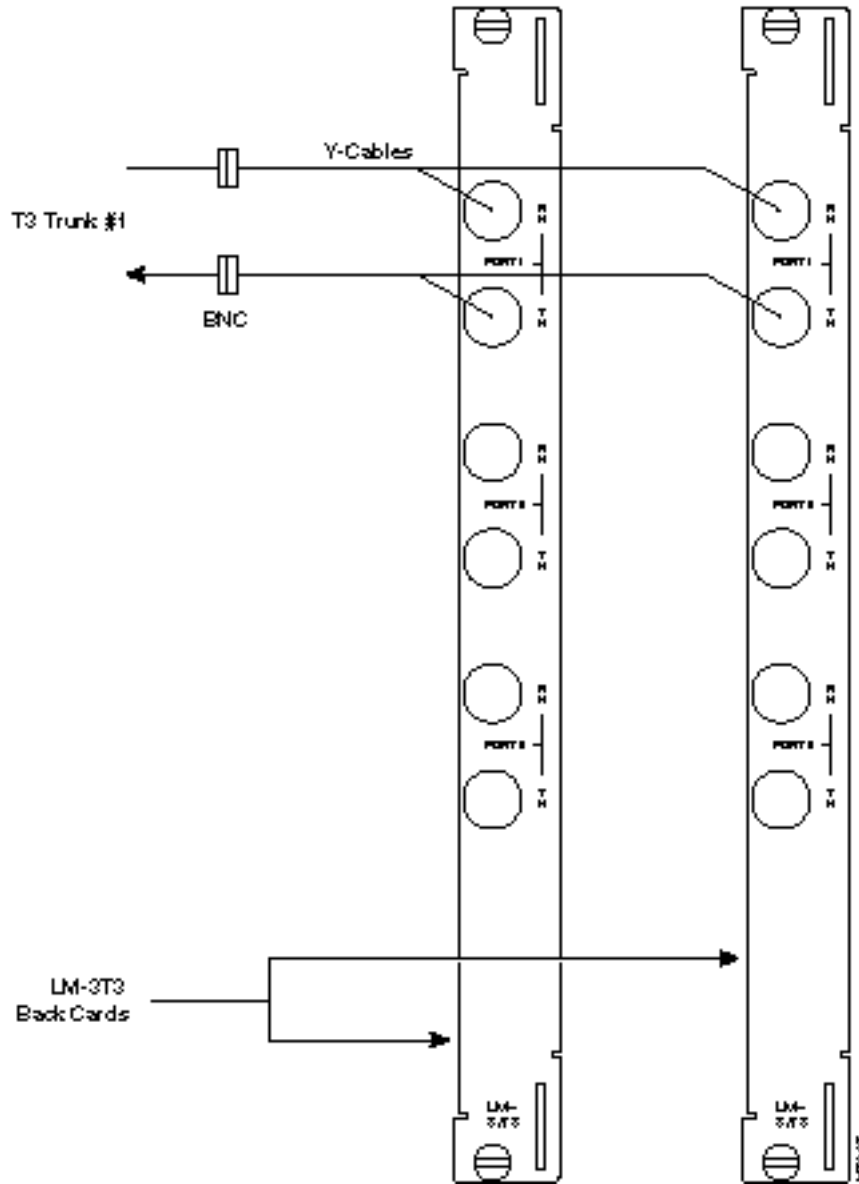


Figure 7-7 Connecting Y-Cable Adapters to a T3 Port



Making an ASI-155 or BNI-155 Connection

Each OC3 line module provides two ports with both a transmit and receiver connector for each port. The following applies to the 2OC3-SMF and 2OC3-MMF backcards, except that Y-Cabling redundancy is supported only for the 2OC3-SMF card. Make connections as follows:

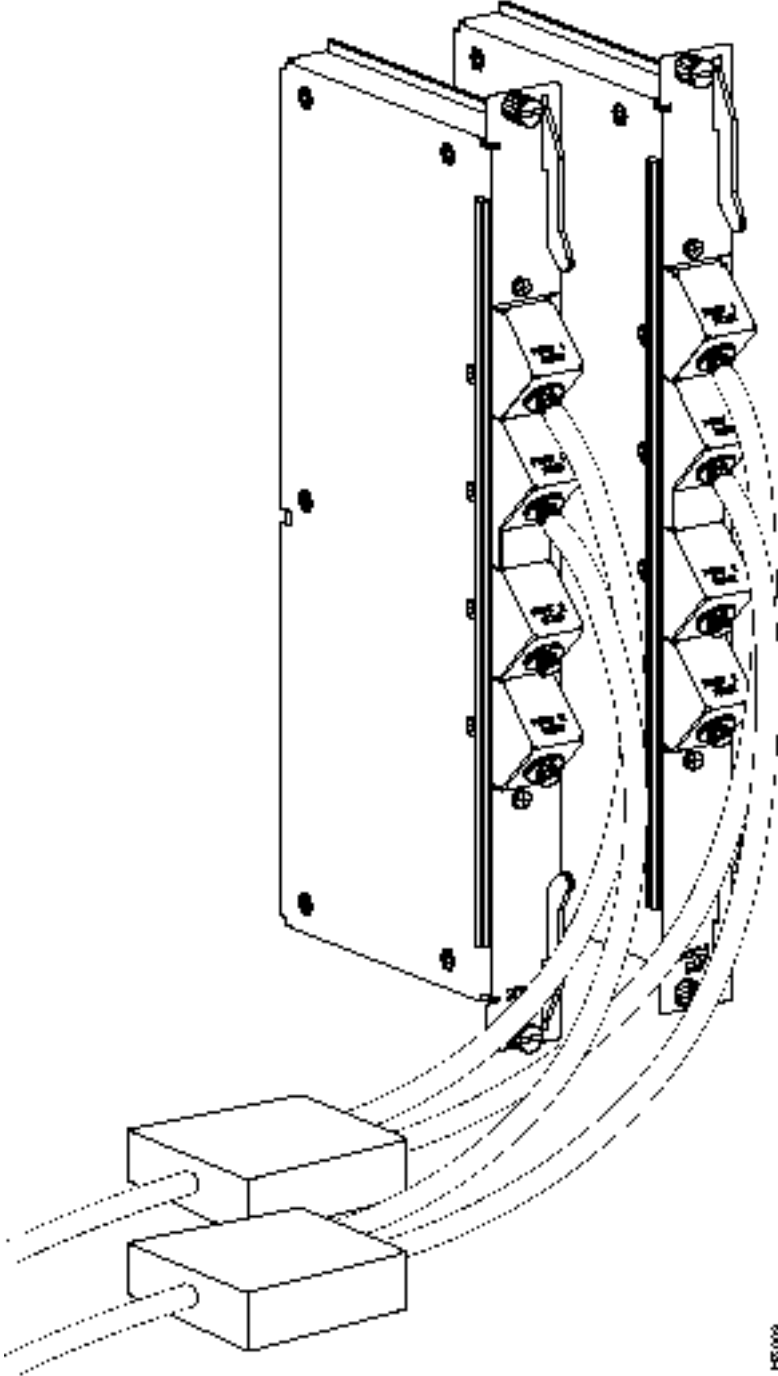
- Step 1** At the back of the cabinet, route each cable up the inside of the cabinet, as applicable.
- Step 2** The Cisco cabinet has tie-downs inside the cabinet to hold cabling in place. If using a Cisco cabinet, pull the tie downs apart as applicable, place the routed cable in position, wrap the ties around the cable and remake the loops by pressing the two sections together.
- Step 3** Connect the cables to the applicable connectors on the OC3 line modules. Remember, the RCV is an input to the BPX switch and XMT is an output from the BPX switch. The ports are numbered from top to bottom as indicated in Figure 7-8.

Making a BXM OC3 or OC12 Connection

Each OC3 or OC12 line module provides ports with both a transmit and receiver connector for each port. The following applies to OC3 and OC12 backcards, except that Y-Cabling redundancy is supported only for the SMF cards. Make connections as follows:

- Step 1** At the back of the cabinet, route each cable up the inside of the cabinet, as applicable.
- Step 2** The Cisco cabinet has tie-downs inside the cabinet to hold cabling in place. If using a Cisco cabinet, pull the tie downs apart as applicable, place the routed cable in position, wrap the ties around the cable and remake the loops by pressing the two sections together.
- Step 3** Connect the cables to the applicable connectors on the line modules. Remember, the RCV is an input to the BPX switch and XMT is an output from the BPX switch. The ports are numbered from top to bottom.
- Step 4** Record which slot and port number are used for each trunk or line. You'll need the information later when configuring the network.
- Step 5** A Y-Cable redundancy connection for the SMF-2-BC backcard is shown in Figure 7-8. Y-Cable redundancy is supported only for the SMF-2-BC backcard which is used with either the BNI-155 or the ASI-155.
- Step 6** For card redundancy, make sure there are two appropriate line modules equipped in adjacent slots.
- Step 7** Connect two legs of the Y-cable to the XMT connectors on the same port on each of the two line modules (Figure 7-8). Do the same with the two RCV connectors.

Figure 7-8 Connecting Y-Cables to an OC3-SMF Backcard



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Making a BXM T3/E3 Connection

Each T3/E3 line module provides ports with both a transmit and receiver connector for each port. The backcards can provide 4, 8, or 12 ports. Figure 7-9 shows a typical T3/E3 cable connector that connects to the BXM T3/E3 cards. Y-Cabling redundancy is supported on the BXM T3/E3 cards. An example of a Y-cable is shown in Figure 7-10.

Make connections as follows:

- Step 1** At the back of the cabinet, route each cable up the inside of the cabinet, as applicable. If Y-cables are used, the Y-cable connects to the corresponding connectors on adjacent cards.
- Step 2** The Cisco cabinet has tie-downs inside the cabinet to hold cabling in place. If using a Cisco cabinet, pull the tie downs apart as applicable, place the routed cable in position, wrap the ties around the cable and remake the loops by pressing the two sections together.
- Step 3** Connect the cables to the applicable connectors on the T3/E3 line modules. Remember, the RCV is an input to the BPX switch and XMT is an output from the BPX switch. The ports are numbered from top to bottom.
- Step 4** For an open rack configuration and where Y-redundancy is not being used, an optional cable management tray is available to help route cables when a number of DS3/T3 cards are installed resulting a large number of cables to handle. Refer to Chapter 8, T3/E3 Cable Management Tray

Figure 7-9 BXM T3/E3 Cable Connector Detail

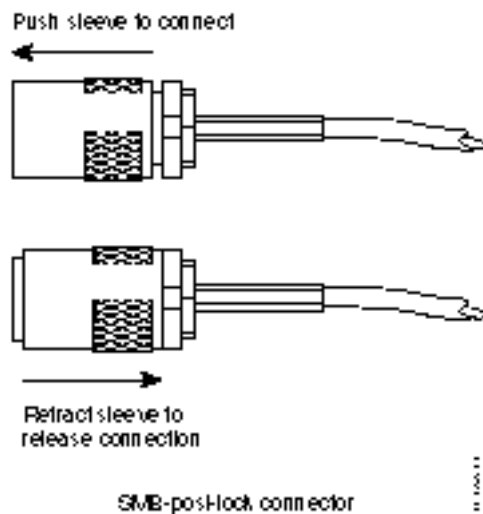
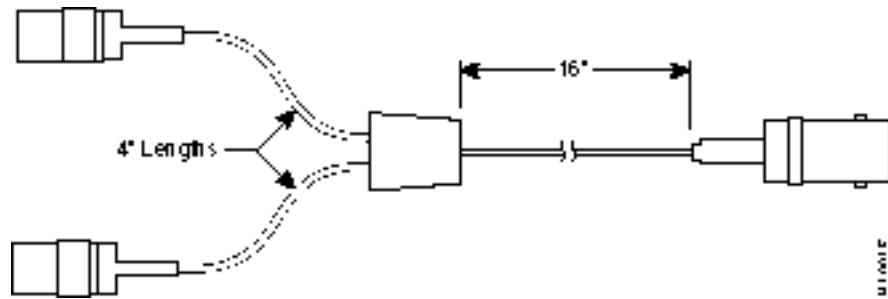


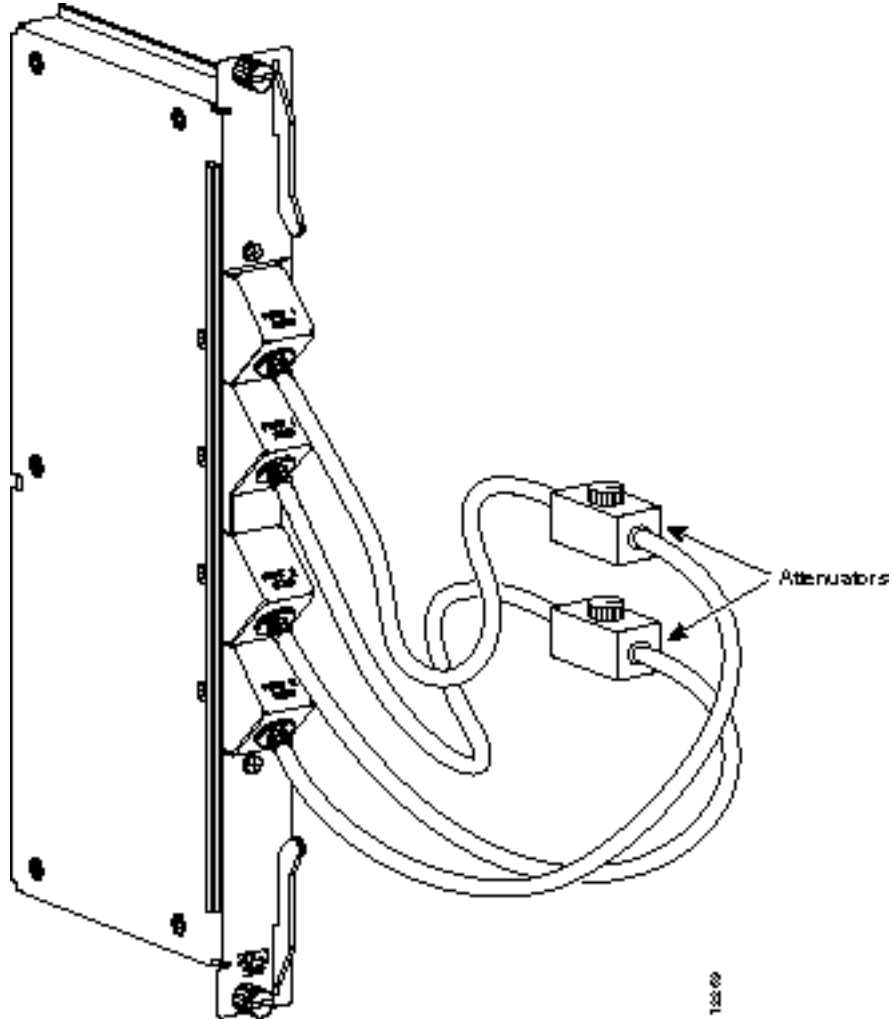
Figure 7-10 Y-Cable for BXM T3/E3 Cards



Setting up the BME OC-12 Port Loop

The two ports on the OC-12 backcard for the BME multicast card are setup of by connecting the transmit of port 1 to the receive of port 2 and the receive to port 1 to the transmit of port 2, thus looping the two ports together. This is shown in Figure 7-11.

Figure 7-11 Looping Ports 1 and 2 for BME on OC-12 Backcard

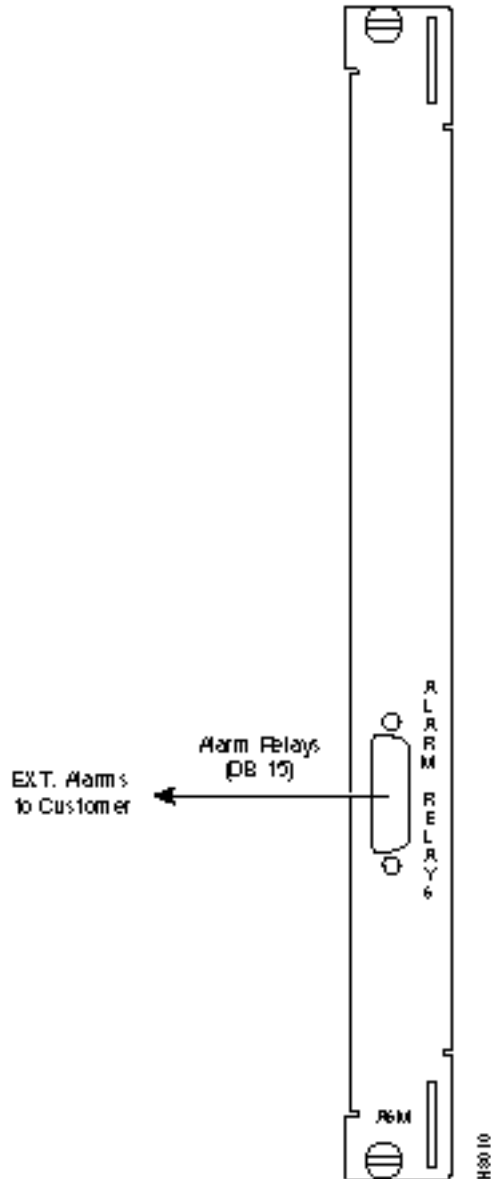


132-09

Alarm Output Connections

Dry contact relay closures are available for forwarding BPX switch alarms to a user office alarm system. Separate visual and audible alarm outputs are available for both major as well as minor alarm outputs. These outputs are available from a DB15 connector on the LM-ASM faceplate (Figure 7-12). Refer to *Appendix B, BPX Switch Cabling Summary*, for a list of the pinouts for this connector. Use switchboard cable for running these connections.

Figure 7-12 Alarm Output Connector



Attaching Peripherals

The BPX switch has two RS-232 serial data ports (labeled CONTROL port and AUXILIARY port) and an Ethernet port (labeled LAN) on the LM-BCC back card for attaching peripherals.

A network (or each domain in a structured network) must have at least one connection to a control terminal or StrataView Plus network management workstation. The StrataView Plus NMS workstation is used to configure and maintain all nodes in a network and report network statistical data. In addition, a network printer must be connected to the AUXILIARY port if you wish to print.

If it is desired to have Customer Service perform remote troubleshooting, a dial-in modem must be attached to the network. Procedures for attaching peripherals to the BPX switch are contained in the following paragraphs. Be sure to read the manufacturers literature to ensure that you have made the equipment ready for attachment, before attempting to attach it to the BPX switch.

Refer to the following for additional information on the following related subjects:

- *Appendix B, BPX Switch Cabling Summary*, lists the pin assignments for the BPX switch control terminal port.
- *Appendix C, BPX Switch Peripherals*, lists the control terminals supported and their required configuration settings.
- For instructions on using the switch commands, see the *Command Reference Manual*.
- For instructions on using the StrataView Plus workstation, see the *StrataView Plus Operations Guide*.

Connecting a terminal or NMS to the Control Port

A basic VT-100 type terminal may be connected to this port for use in entering commands to bring up a new node. (Note: Since the StrataView Plus NMS workstation requires a LAN connection to a node in the network in order to perform its management functions, it is not connected to the Control Port during normal operation.) In these procedures, the term BCC is used to refer to the BCC-4, BCC-3 or BCC-32. The BCC-4 and BCC-3 require BCC-3-bc backcards, and the BCC-32 requires the BCC-bc backcard.

Attach a terminal to the BPX switch as follows:

- Step 1** From the back of the cabinet, run the control terminal RS-232/V.24 cable through the opening at the bottom and up to the LM-BCC card in back slot 7.
- Step 2** **For nodes with a single BCC:** Locate the CONTROL port connector on the LM-BCC in slot 7. Attach the RS-232/V.24 cable as shown in Figure 7-13, then proceed to Step 5.
- Step 3** **For nodes with redundant BCCs:** A Y-cable is required for this application. Connect one leg of the Y-cable to the CONTROL port connector on the backcard in slot 7 and the other leg to the slot 8 CONTROL port connector.
- Step 4** Attach a RS-232/V.24 cable to the remaining leg of the Y-cable as shown in Figure 7-14.
- Step 5** Fasten the cable connector to the CONTROL port connector with the captive screws on the connector hood.
- Step 6** Plug the control terminal (or StrataView Plus) power cord into the appropriate wall receptacle (115 VAC or 240 VAC) and switch it on.
- Step 7** Set the port function for VT100/StrataView using the **cnftermfunc** command if connecting to a StrataView Plus workstation. If using a “dumb” terminal, select VT100 only (# 5).

Step 8 Make sure that the CONTROL port and the terminal or workstation are set to the same baud rate and check the other communication parameters using the **cnfterm** command.

Note When a node is powered up, it enters “boot mode” which has a default speed of 9600 bps. If the node’s control port has been previously configured to 19,200, the first messages will appear garbled because the terminal is at 19,200 bps, but the control port (in “boot mode”) is temporarily at 9,600 bps. When the “transition to on-line” occurs, then the speeds will match and the terminal display will be readable.

Figure 7-13 Connections to NMS (Single BCC), LM-BCC Backcard Shown

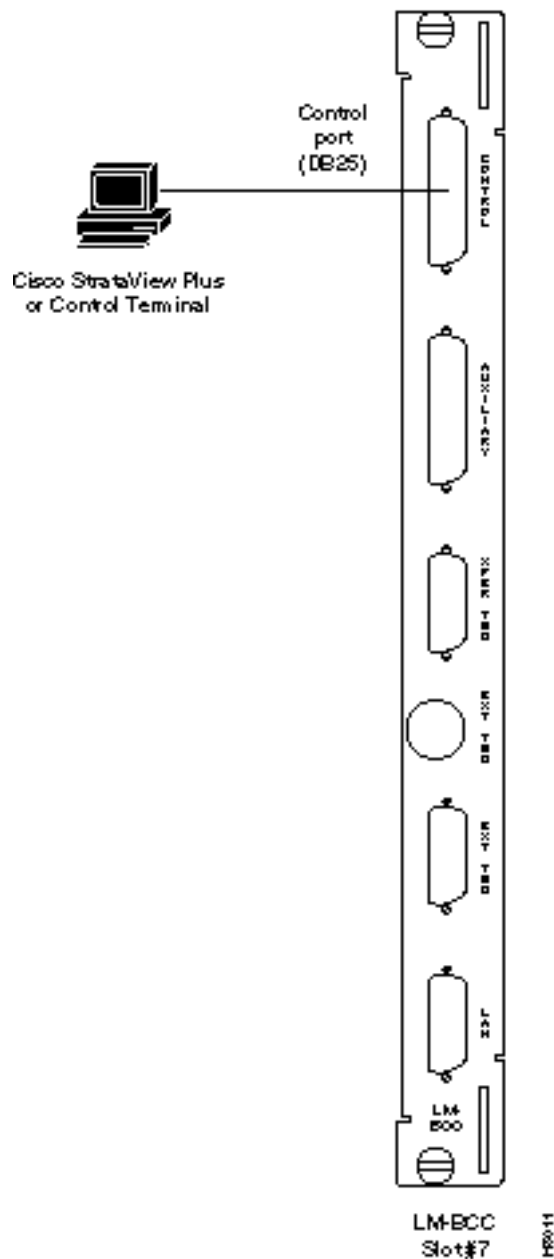
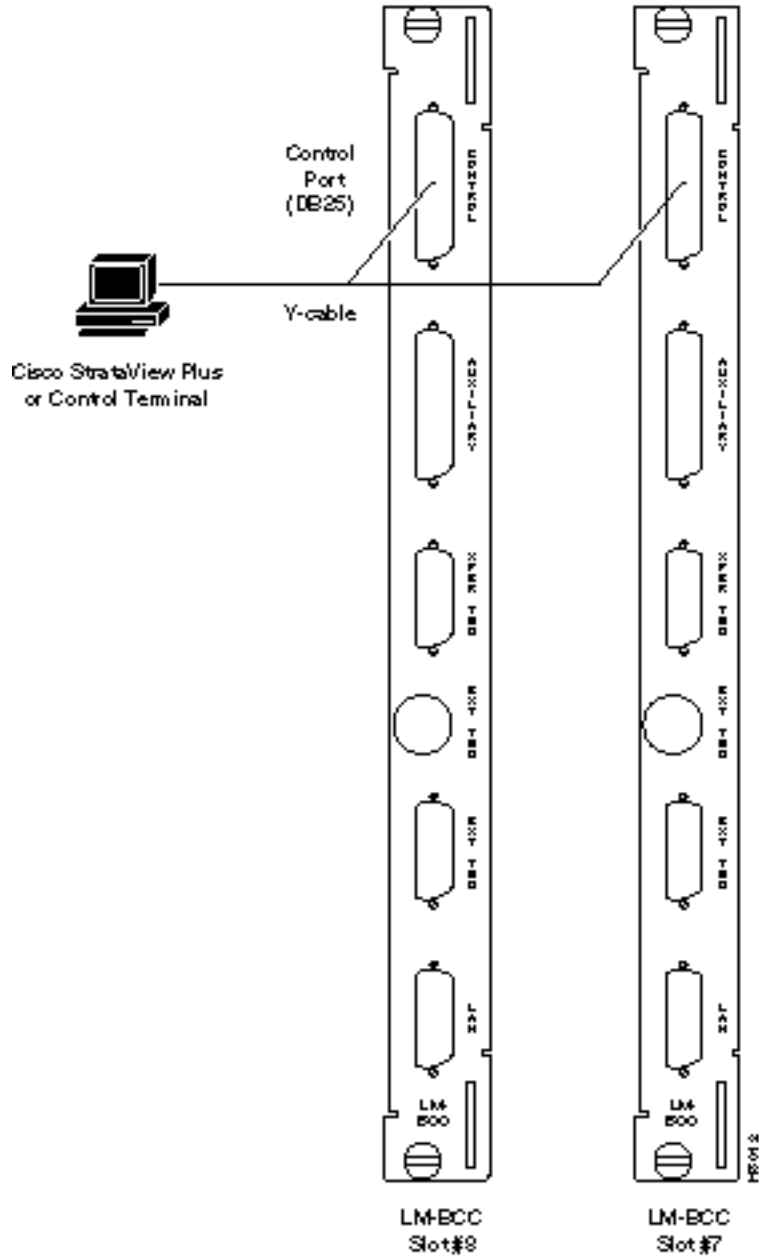


Figure 7-14 NMS Connections via Control Port (Redundant BCCs), LM-BCCs Shown

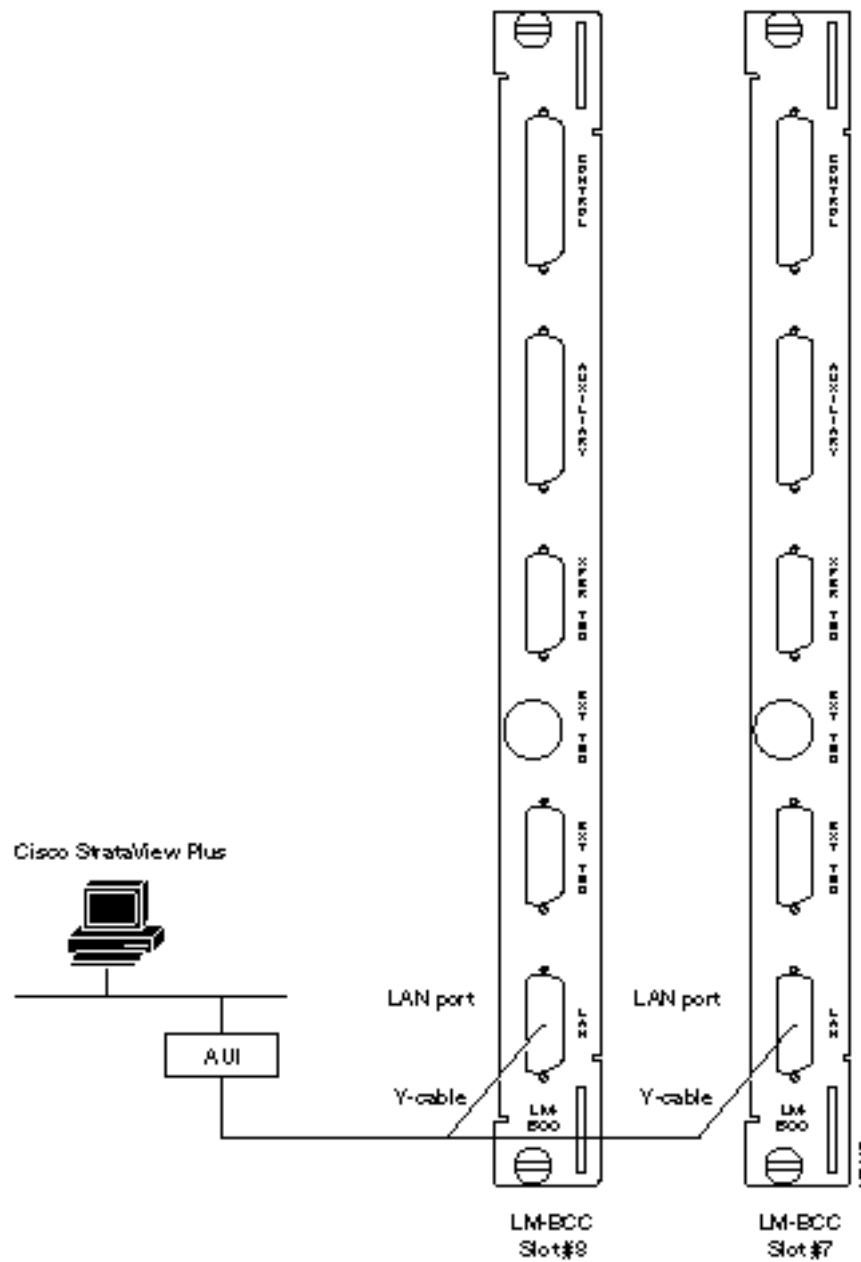


LAN Connection for the Network Management Station

The StrataView Plus NMS is connected to an Ethernet port (LAN port) on a node in the network for the purpose of network management. The LAN port provides the capacity necessary for the network management traffic and network statistics collection. See Figure 7-15 illustrating this connection.

For access to the node using an Internet connection, the Internet Protocol (IP) address, IP subnet mask, TCP service port, and gateway IP address must be entered by the user with the **cnflan** command.

Figure 7-15 LAN Connections to BCC Backcards, LM-BCCs Shown



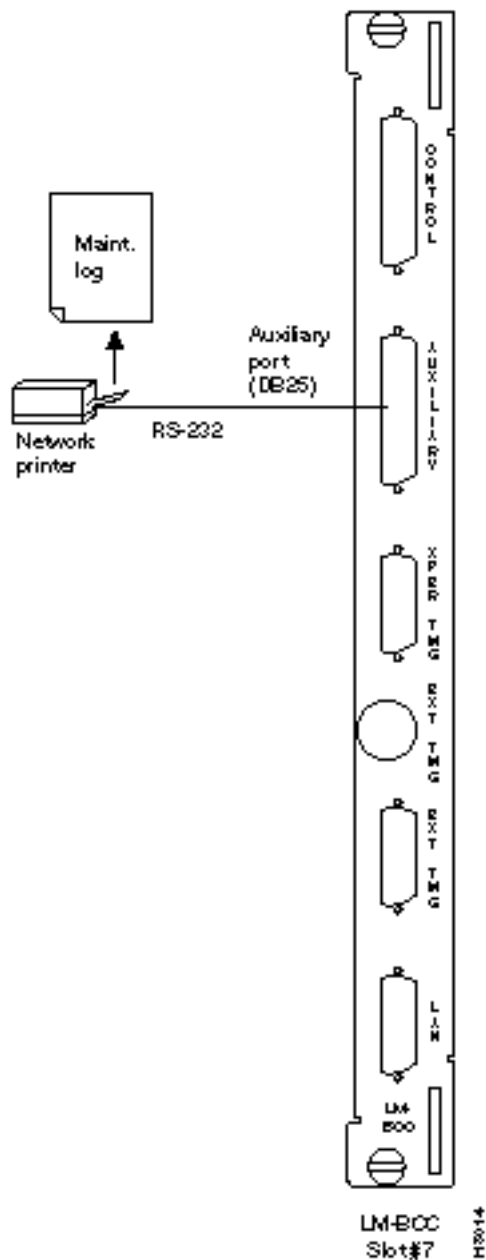
Connecting a Network Printer to the BPX Switch

In most systems, the network printer will be connected to a serial port on the StrataView Plus NMS terminal server. The maintenance log and all statistics data will reside on the StrataView Plus. However, it is possible to connect a printer to a node and use various BPX switch software print BPX Switch Peripherals commands to print locally. This may be helpful during the initial network installation phase.

Appendix C, BPX Switch Peripherals, lists the types of printers supported by the BPX switch along with configuration settings. Appendix B, BPX Switch Cabling Summary lists the pin assignments for the AUXILIARY port on the BPX switch and the recommended RS-232/V.24 cable pinout and printer DIP switch settings. Attach the printer to the BPX switch as follows:

- Step 1** Check the printer RS-232/V.24 cabling pinout, and if required adjust the DIP switches to the settings indicated for the type of printer to be connected to the BPX switch.
- Step 2 For nodes with single BCC:** Connect the RS-232/V.24 printer cable to the AUXILIARY port on the LM-BCC back card (Figure 7-16). Go to Step 4.
- Step 3 For nodes with redundant BCCs:** A Y-cable is required for this application. Connect one leg of the Y-cable to the AUXILIARY port connector on the LM-BCC in slot 7 and the other leg to the AUXILIARY port connector on the LM-BCC in slot 8.
- Step 4** Plug the printer power cord into the appropriate AC outlet (115 VAC or 240 VAC).
- Step 5** Set the port function for printer using the **cnftermfunc** command.
- Step 6** Make sure the control port and the printer are set to the same baud rate and check the other communication parameters using the **cnfterm** command.

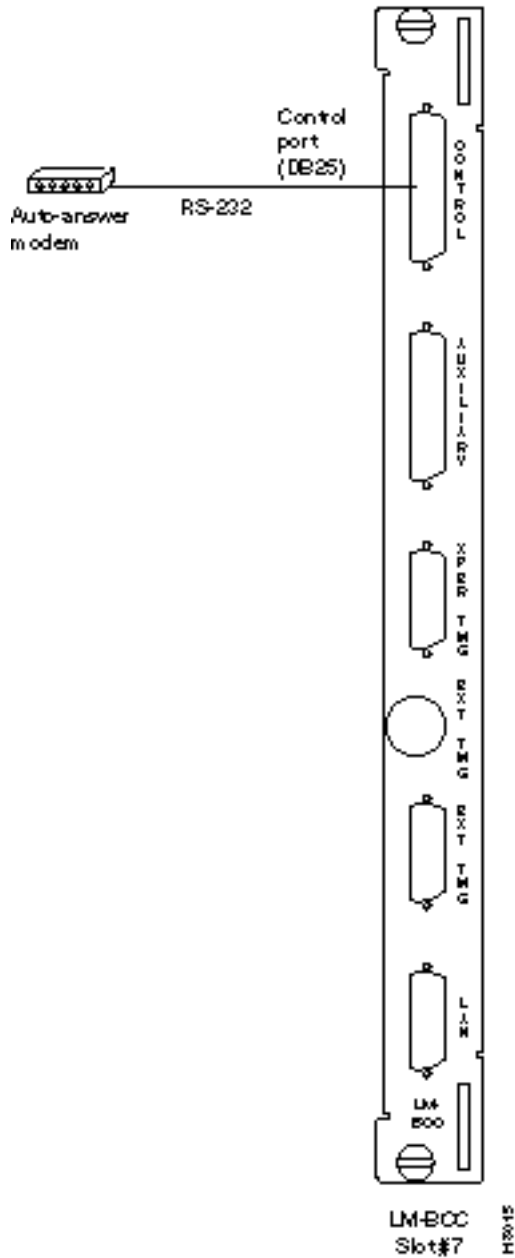
Figure 7-16 Connections to a Network Printer, LM-BCC Shown



Connecting Modems

A modem may be connected to each BPX switch to provide remote access by Customer Service (Figure 7-17). For information on connecting and configuring a modem refer to Appendix C, BPX Switch Peripherals.

Figure 7-17 Connecting Modems to the BPX Switch, LM-BCC Shown



- An auto-answer modem is used to provide access for remote access. It is connected to the CONTROL port connector. This port is bi-directional transmit and receive.

These modems connect to a standard telephone line wall jack. The modem connections require special cables and setup procedures. Refer to *Appendix C, BPX Switch Peripherals*, for instructions on connecting and setting up the modems. If the BPX switch is equipped with redundant BCCs, an RS-232 Y-cable must be used for these connections.

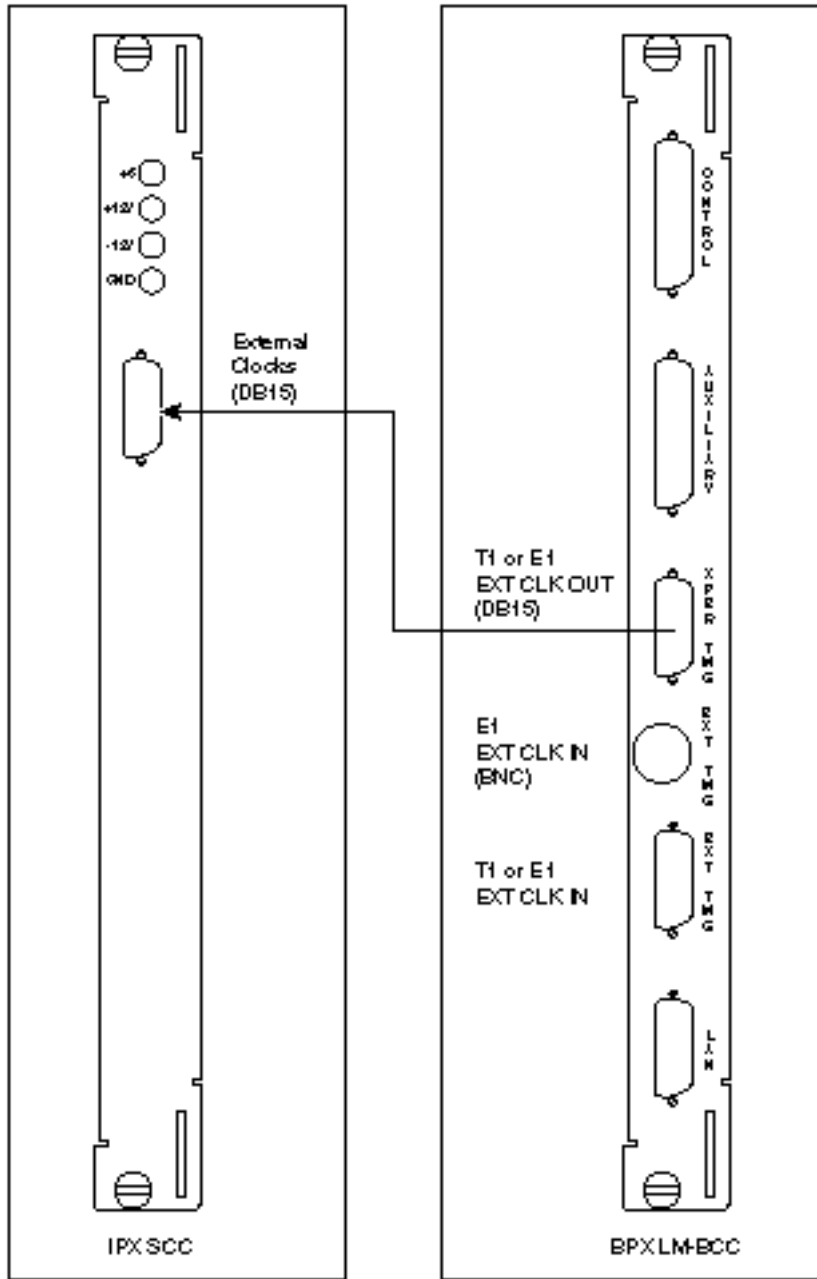
Making External Clock Connections

The BPX switch provides connections for supplying a timing signal to synchronize the operation of an adjacent IPX node. A connector on the BPX LM-BCC back card, labeled EXT CLK OUT supplies a clock signal at either a T1 or E1 rate which can be connected to the IPX EXTERNAL CLOCKS connector on the IPX SCC back card (Figure 7-18). This uses a straight-through DB15 to DB15 cable, male to male. See *Appendix B, BPX Switch Cabling Summary*, for pin-outs.

If the BPX switch is to be synchronized to some other external equipment or a local digital central office, one of two other connectors on the LM-BCC can be used to provide a clock input. A DB15 connector labeled EXT CLK IN can be used to connect a balanced T1 or E1 signal, synchronized from some higher-level source, to the BPX switch. If an unbalanced 75-ohm E1 signal is available as the timing source, a BNC EXT CLK IN connector is also provided. The BPX switch senses an active signal at any of these inputs and automatically synchronizes to this source rather than the internal Stratum 3 clock source.

Note Contact Customer Service for information on setting up either a 75-ohm or 120-ohm clock interface on the BCC backcard.

Figure 7-18 Synchronizing a Local IPX to a BPX Switch, LM-BCCs Shown



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Initial Power-Up of the BPX Switch

Before operating the BPX switch, check that the following procedures have been performed:

- Step 1** The BPX switch is connected to an appropriate power source with an isolated ground connection, per the procedures in Chapter 5, Installation, DC Shelf Initial Setup, or Chapter 6, Installation, AC Shelf Initial Setup, as applicable.
- Step 2** The BPX switch power cord is plugged into an appropriate power outlet.
- Step 3** The full complement of cards for the specific node are mounted in the correct slots, correctly seated, and locked in place.
- Step 4** The T3 or E3 connections are attached to the appropriate LM-3T3/3E3 faceplate.
- Step 5** A control terminal (or StrataView Plus Work Station) is connected to the CONTROL port on the LM-BCC in back slot 7/8, and the terminal's power cord plugged into the appropriate voltage wall outlet.
- Step 6** If needed, a printer may be connected to the AUXILIARY port on the LM-BCC in back slot 7/8 and the printer power cord plugged into the appropriate power outlet.
- Step 7** If needed, a modem(s) may be connected to the CONTROL port or AUXILIARY port, as applicable, on the LM-BCC in back slot 7/8, and the modem(s) power cord(s) plugged into the appropriate power wall outlet.
- Step 8** From the back of the BPX switch, turn the power switches to the ON position.
- Step 9** From the front of the BPX switch, observe the cards go through initial diagnostic self-tests.
 - The AC power supply(ies) –48V indicator will be on.
 - The standby BCCs red “FAIL” light flashes until self-testing and configuration updates are completed. The other BCC becomes active immediately, but also performs self-testing and configuration updating. The entire process may take several minutes to complete.
 - The remaining cards will show “FAIL” for a few seconds, then become active or standby.
 - The ASM dc LEDs should both be green indicating that the dc voltages on the two dc power busses are within tolerance.
 - There may or may not be alarms showing on the ASM, BXMs, BMEs, BNIs and ASIs. Alarms may be present on ATM trunk connectors that have not been physically connected to their associated lines.

BPX Switch Startup Diagnostic

The BPX switch software provides a group of diagnostic tests to be run on the system's hardware at power-up. The startup diagnostic either passes or fails the BCC(s) tests. The test result is displayed on the screen of a control terminal connected to the CONTROL port on the backcard in slot 7 of the BPX. A successful power up results in a pass message.

Note On power-up, the BCC in slot 7 is always the active BCC.

If a BCC fails the power-up diagnostic, it will not boot. When that happens, do the following:

- Step 1** Remove the failed BCC from its slot.
- Step 2** Reseat the BCC in the same slot.
- Step 3** Wait for the power-up diagnostic to run.
- Step 4** If the BCC fails the power-up diagnostics a second time, replace it with another BCC that is known to have passed the test.

Once the software has successfully booted up, a terminal connected to the CONTROL port or an NMS workstation connected via a telnet session to the LAN port will display the software on-line screen as shown in the following example. At this point, you may login as a user to the node.

Sample display:

```
pubsbpx1      TN      No User      BPX 15      9.1      May  21 1998      14:15 PDT
```

```
Enter User ID:
```

Provisioning the BPX Switch

For provisioning of the BPX switch, including configuring ports, lines, trunks, and adding connections refer to the following documents:

- *Cisco BPX 8600 Series Reference*
- *Cisco StrataView Plus Operations Guide*
- *Cisco WAN Service Node Extended Services Processor Installation and Operation*
- *Cisco WAN Command Reference*
- *Cisco WAN SuperUser Command Reference*

Configuration

Proceed to *Chapter 9, Configuration, General*, for configuration procedures for the BPX switch.

T3/E3 Cable Management Tray

This chapter provides instructions for the installation of the optional cable management tray that may be used to route cables in an open rack non-redundant configuration.

You'll need to obtain the optional cable management tray kit and one each BXM T3/E3 cable bracket kit for each BXM T3/E3 card.

This chapter contains the following:

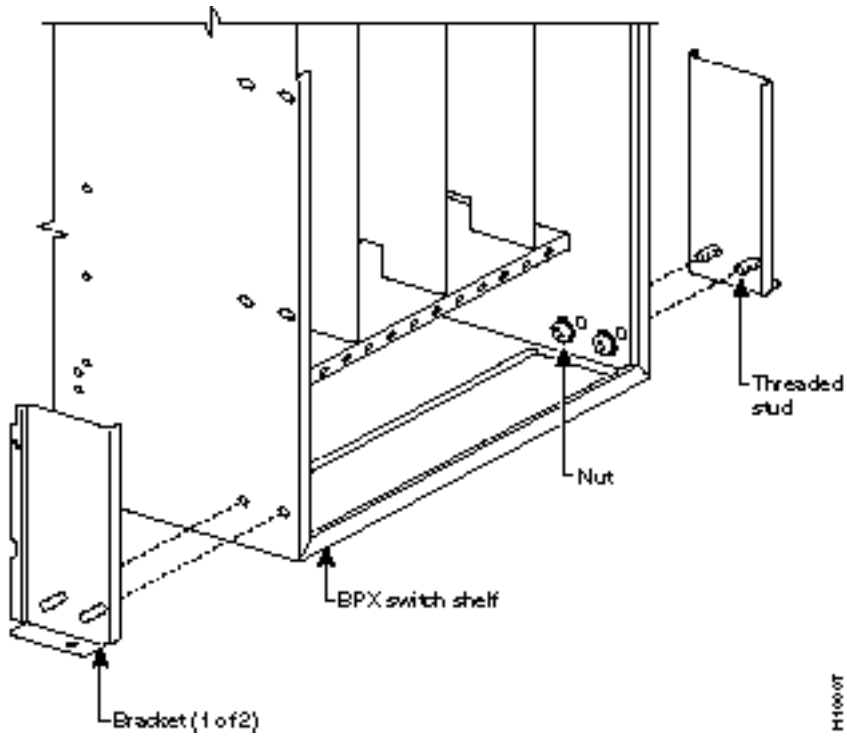
- Installation of Cable Management Tray
- Raising Tray for Access to PEMs
- Installing BXM T3/E3 Cable Management Bracket
- Connecting Cables to T3/E3 Cards
- Routing Cables from Cards through Cable Management Tray
- Tray Raised with Cables in Place

Installation of Cable Management Tray

Installing Tray Brackets

- Step 1** Obtain brackets and associated hardware from kit.
- Step 2** Install left and right brackets, using 2 nuts to secure each bracket, Figure 8-1.

Figure 8-1 Installation of Cable Management Tray Brackets



Installing Tray

- Step 1** Using two hands to hold cable management tray, slide over brackets Figure 8-2.
- Step 2** Lower tray into lower rest position Figure 8-3.

Figure 8-2 Sliding Cable Management Tray over Brackets

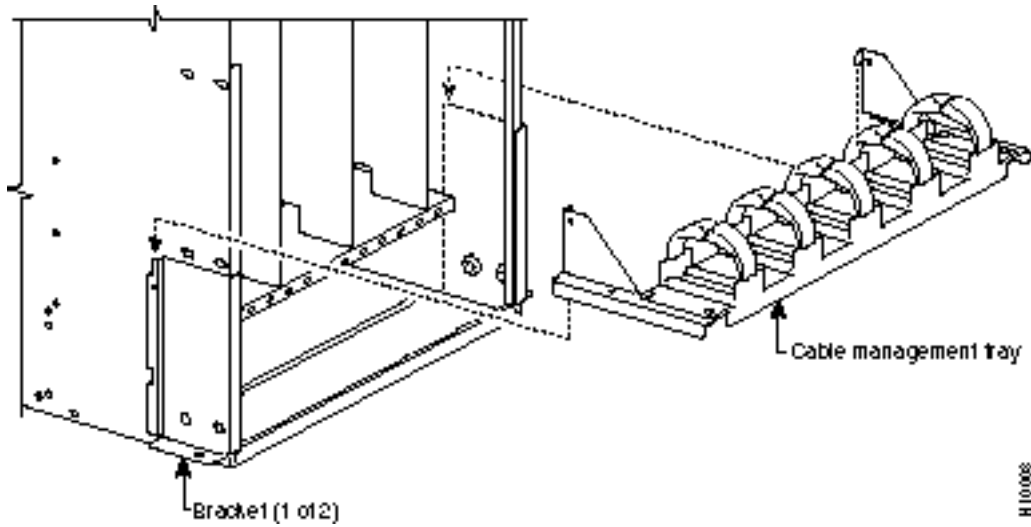
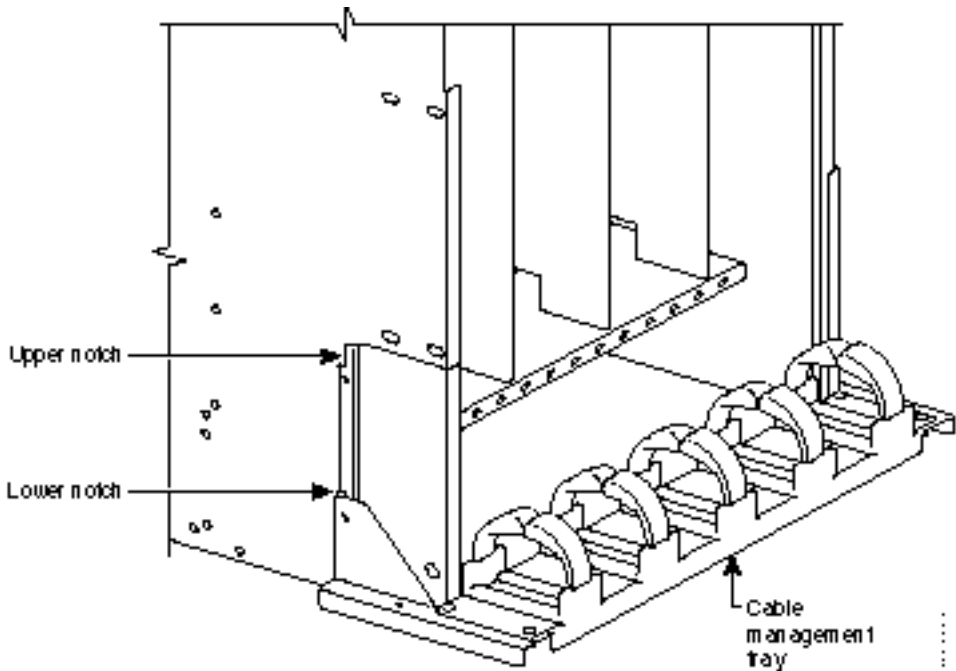


Figure 8-3 Cable Management Tray in Lowered Home Position

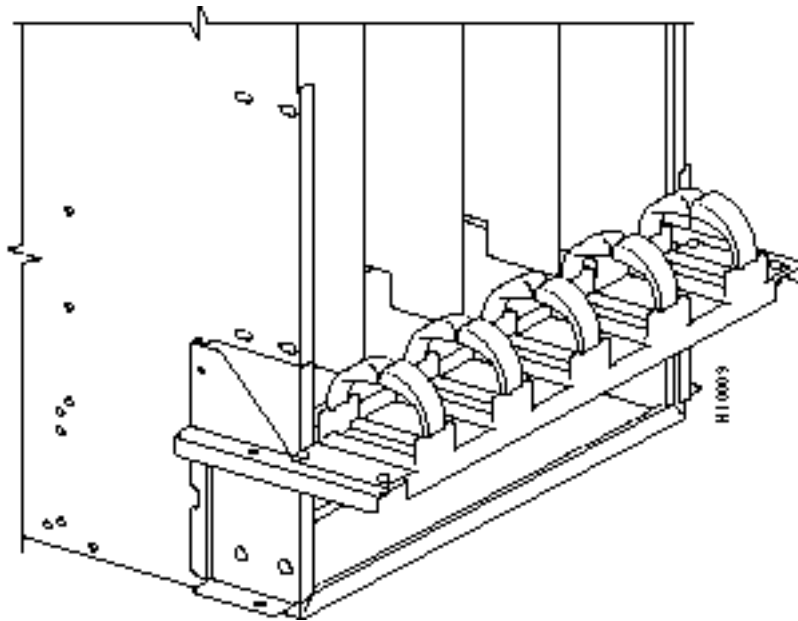


Raising Tray for Access to PEMs

The tray is raised only when necessary to access the Power Entry Modules (PEMs), typically for replacement or to install a second PEM. Figure 8-4 shows the tray in the raised position. To raise the tray to provide access to the PEMs proceed as follows:

- Step 1** Remove securing screws as necessary.
- Step 2** With two hands, pull tray towards you and up.
- Step 3** Raise tray to upper position and lower onto upper slots.

Figure 8-4 Cable Management Tray in Raised Position

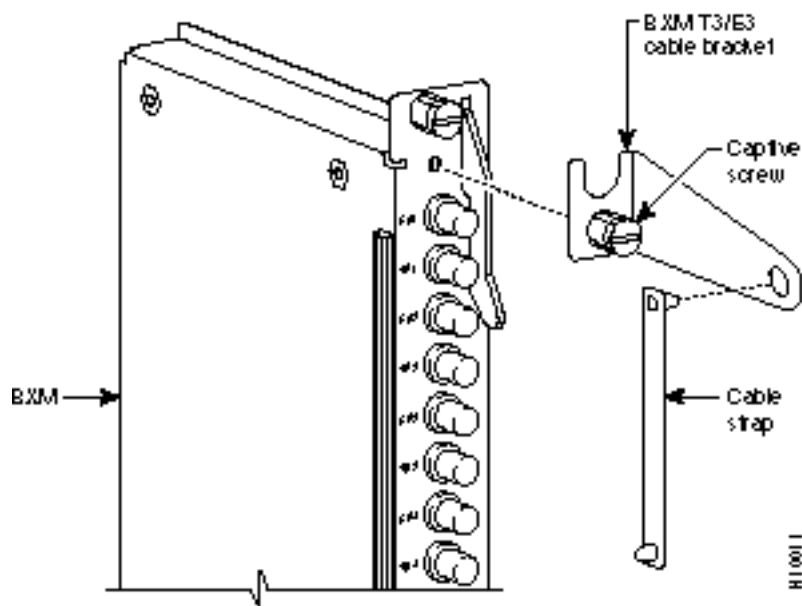


Installing BXM T3/E3 Cable Bracket

Attach the BXM T3/E3 cable bracket to each BXM T3/E3 card as follows, Figure 8-5:

- Step 1** Remove bracket from kit.
- Step 2** Place bracket in position as shown.
- Step 3** Screw in and tighten captive screw.
- Step 4** Insert one end of cable tie through hole in bracket.

Figure 8-5 Installing BXM T3/E3 Cable Bracket



Connecting Cables to BXM T3/E3 Cards

Route cables as follows, Figure 8-6 and Figure 8-7:

- Step 1** Connect cables to card by pushing on SMB connector locking sleeves as you push cable connectors on to card connectors.
- Step 2** Dress cables upward to provide service loop.
- Step 3** Bundle cables using cable ties.
- Step 4** Wrap cable strap around cables and secure to cable management bracket.

Note Cables are disconnected from a card by pulling on the cable connector locking sleeve as you pull cable connector away from card connector.

Figure 8-6 Connecting Cables to T3/E3 Card

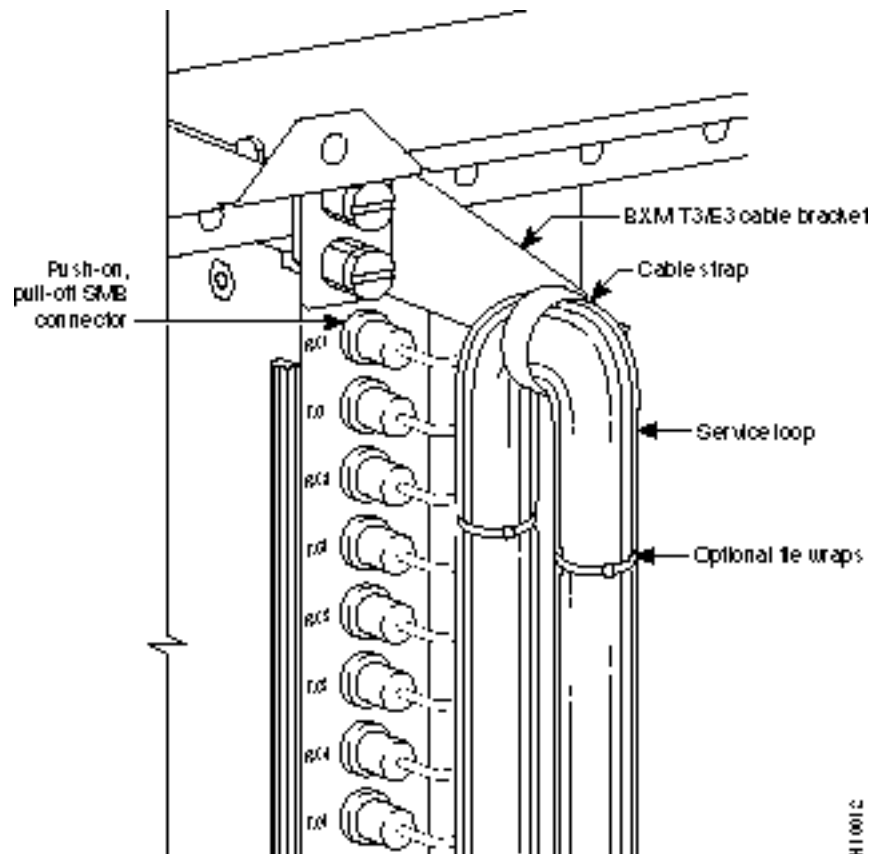
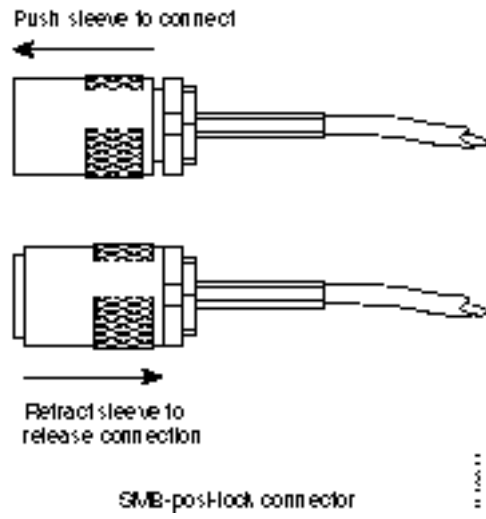


Figure 8-7 T3/E3 SMB Connector Detail

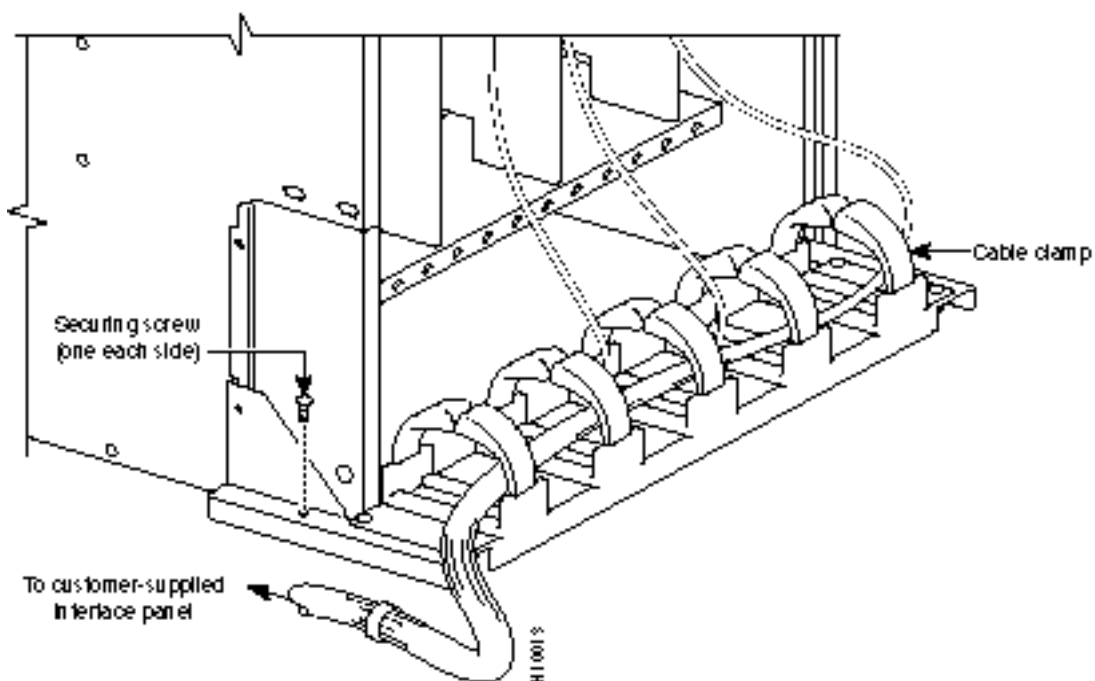


Routing Cables from Cards through Cable Management Tray

Route cables as follows, Figure 8-8:

- Step 1** Verify that cable management tray is in lowered home position.
- Step 2** Route cables from cards through cable clamps on cable management tray.
- Step 3** Secure cable management tray to cable tray brackets by inserted and tightening securing screw, one to each bracket.

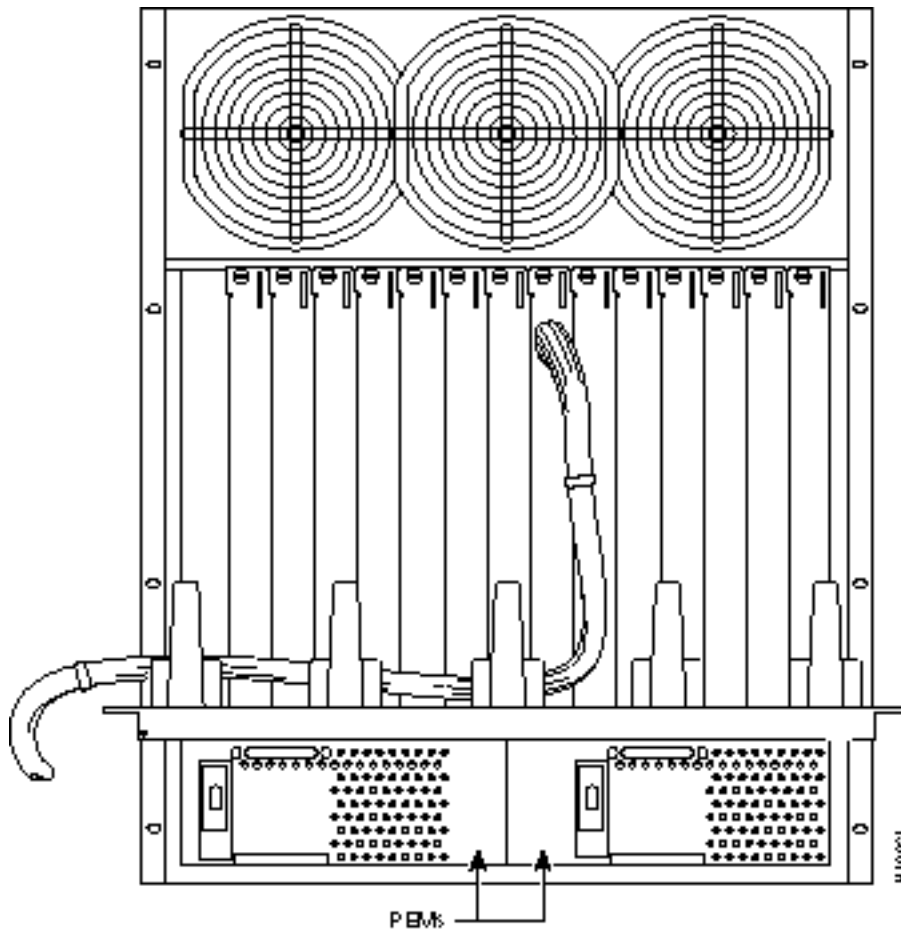
Figure 8-8 Cables Routed through Cable Management Tray in Lowered Position



Tray Raised with Cables in Place

Figure 8-9 shows how the cable management tray is raised with cables in place, to provide access to the Power Entry Modules (PEMs).

Figure 8-9 Tray Raised with Cables in Place



PART 2

Configuration



Configuration, General

Introduction

Configuration information is provided in this part of the document.

For additional information on the BPX switch, including card descriptions and additional information on configuration, refer to the *Cisco BPX 8600 Series Reference*. For a description of the commands used to operate a BPX switch, refer to the *Cisco WAN Switching Command Reference*. Refer to the Cisco StrataView Plus manuals for information on network management.

Configuration Procedures

Figure 9-1 shows the sequence of operations followed during the configuration of the BPX switch. A summary of this sequence is as follows:

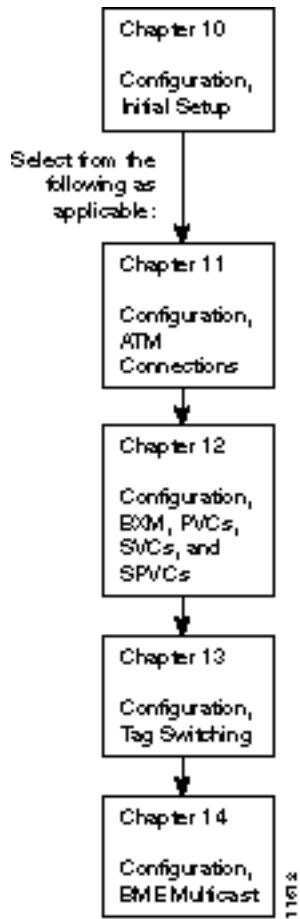
- *Chapter 10, Configuration, Initial Setup*, provides preliminary configuration instructions for the BPX switch including basic node configuration.

As a minimum, the nodes need to be configured with name (**cnfname**), date (**cnfdate**), time (**cnftime**), time zone (**cnftmzn**), and trunks upped (**uptrk**) and added (**addtrk** or **addshelf**), as applicable. In addition, instructions are provided for configuring the nodes for operation with the SV+ NMS manager.

The following chapters provide information and configuration examples for various types of ATM connections:

- *Chapter 11, Configuration, ATM Connections*
- *Chapter 12, Configuration, BXM, PVCs, SVCs, and SPVCs*
- *Chapter 13, Configuration, Tag Switching*
- *Chapter 14, Configuration, BME Multicasting*

Figure 9-1 Configuration Sequence



Configuration, Initial Setup

This chapter contains configuration procedures.

This chapter contains the following:

- BPX Switch Management
- Initial Node Configuration Summary
- IP Setup and IP Relay Configuration
- Configuring the LAN Port

The BPX switch can be accessed through a local control port (over an RS-232 or Ethernet TCP/IP link.) An administration screen from a control terminal or from the Cisco StrataView Plus Network Management Station (NMS) can issue BPX switch commands. Remote control terminal access is possible using a Virtual Terminal (vt) command if the node has been configured with a name and at least one trunk to the network has been established.

For frame relay connections in both tiered and non-tiered networks Cisco StrataView Plus provides end-to-end configuration management using the Connection Manager. When an IPX or IGX is configured as an Interface Shelf, it can not be reached by the vt command, and frame relay end-to-end connections are configured from StrataView Plus via the Connection Manager over an in-band LAN connection. (Telnet can be used to access an interface shelf (e.g., IPX or IGX shelf or MGX 8220 shelf) if a Cisco StrataView Plus workstation is not available to provide in-band management.)

BPX Switch Management

You can monitor, manage and troubleshoot the BPX switch using the Cisco StrataView Plus Network Management Station. Commands are issued to a BPX switch through the Node Administration window. Frame Relay connections are added via the StrataView Plus Connection Manager. You can display and monitor the network's topology, monitor alarms, events, and statistics. Refer to the *Cisco StrataView Plus Operations Guide* for more information.

For detailed configuration information, refer to the *Cisco WAN Switching Command Reference* publication.

Initial Node Configuration Summary

Adding Nodes, Adding Trunks, Shelves, etc.

Refer to the applicable reference publications, *Cisco IPX Reference*, *Cisco BPX 8600 Series Reference*, *Cisco IGX 8400 Series Reference*, and *Cisco MGX 8220 Reference*, for node installation and operation.

As a minimum, the nodes need to be configured with name (**cnfname**), date (**cnfdate**), time (**cnftime**), timezone (**cnftmzn**), and trunks upped (**uptrk**) and added (**addtrk** or **addshelf**), as applicable. Connections can also be added now or later, after configuring the nodes for operation with the Cisco StrataView Plus NMS manager.

The basic tasks to configure a BPX switch are as follows:

- Set up the node.
 - Configure the node name (**cnfname**).
 - Configure the time zone (**cnftmzn**).
 - Configure date (**cnfdate**).
 - Configure time (**cnftime**).
 - Configure the LAN interface (**cnflan**).
 - Configure the auxiliary or terminal ports to support any necessary external devices such as a local printer, an autodial modem, or an external multiplexer attached to the unit (**cnfprrt**, **cnfterm**, **cnftermfunc**).
- Set up the trunks to other routing nodes. Verify the correct cards are in both the local and remote nodes (**dspecds**).
 - Up the trunk(s) at each node (**uptrk**).
 - Configure any parameters required for the trunk at each node (**cnftrk**).
 - Add the trunk(s) at each node (**addtrk**).
 - Set up Y redundancy if desired (**addyred**).
- If using an IPX/IGX Interface Shelf, configure it as shelf.
 - Up the trunk from the AIT/BTM to the BPX switch using (**uptrk**). Shelf trunks for the IPX/IGX must be upped on both the BPX routing switch and the shelf before the shelf can be joined to the Routing Network.
 - Contact Customer Service to configure the IPX/IGX shelf option.
 - At the BPX switch, add the IPX/IGX switch as a shelf to the BPX (**addshelf**).

The following two examples are of the screens displayed when “**dspnode**” is entered at a BPX switch and at one of its IPX shelves, respectively. The “**dspnode**” screen displayed at the “**hubone**” BPX switch shows that it is connected to the “**shlf3ipx**” node via BNI trunk 3.3. The “**dspnode**” screen displayed at the “**shlf3ipx**” node show that it is connected to the BPX switch via AIT trunk 8.

Example of dspnode at node "hubone" BPX15 showing feeder shelves

```
hubone          TN    edgar      BPX 15    9.1      Nov. 20 1997 08:09 PST
```

BPX Interface Shelf Information

Trunk	Name	Type	Alarm
1.2	shlf1	MGX 8220	OK
1.3	shlf2	MGX 8220	OK
3.1	shlf1IPX	IPX/AF	OK
3.2	shlf2IPX	IPX/AF	OK
3.3	shlf3IPX	IPX/AF	OK
4.1	shlf4IPX	IPX/AF	OK
4.3	shlf5IPX	IPX/AF	OK

Last Command: dspnode

Example of dspnode at node Shlf3IPX showing connection to "hubone"

```
shlf3IPX       TN    edgar      IPX 8     9.1      Nov. 20 1997 09:24 PDT
```

BPX Switching Shelf Information

Trunk	Name	Type	Alarm
8	hubone	BPX	MAJ

Last Command: dspnode

Next Command:

- Adding the MGX 8220 Shelf.
 - At the BPX switch, add the MGX 8220 as a shelf to the BPX switch (**addshelf**).
- Set up ATM service lines and ports.
 - Activate the line (**upln**).
 - Configure the line (**cnfln**).
 - Activate the ports (**upport**).
 - Configure the ports (**cnfport**).
- Set up ATM connections.
 - Add connections (**addcon**).
 - Configure a connection type (**cnfcontyp**).

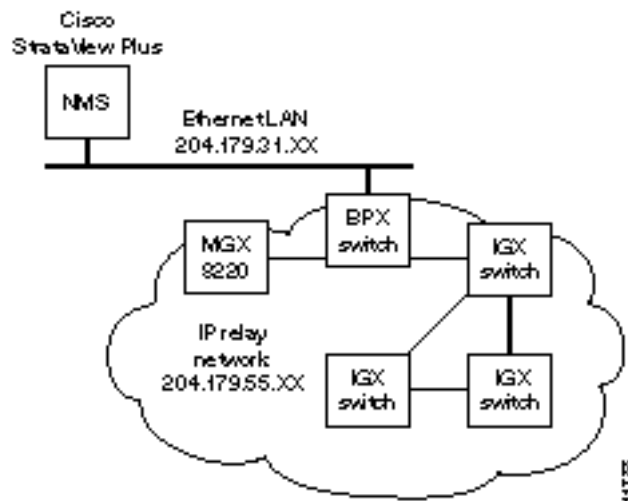
- Set up ATM to frame relay (ATF) connections.
 - Add the connections (**addcon**).
 - Configure connection classes (**cnfcls**).
 - Configure connection groups (**addcongrp**).
- Set up Interface Shelf Frame Relay Connections in Tiered Networks.
 - Refer to the *Cisco StrataView Plus Operations Guide*.
 - Only frame relay connections are supported from the IPX Interface Shelf and these are added and managed by the Cisco StrataView Plus Connection Manager via the SNMP protocol. All connections are treated as end-to-end.
 - Frame relay connections terminated at an MGX 8220 Shelf are added and managed by the Cisco StrataView Plus Connection Manager via the SNMP protocol. All connections are treated as end-to-end.
 - ATM connections terminated at an MGX 8220 Shelf are added and managed using the Cisco StrataView Plus Connection Manager via the SNMP protocol. All connections are treated as end-to-end.

IP Setup and IP Relay Configuration

In setting up network management for a network, both the Cisco StrataView Plus workstation and network nodes need to be configured. Cisco StrataView Plus communicates over a standard physical LAN network to a gateway node or nodes, but a separate in-band IP relay network is setup for all nodes via a gateway node for SNMP and TFTP in-band communication over the node trunks.

On IPX, BPX, IGX switches, the following commands are used to configure the nodes for operation with Cisco StrataView Plus: **cnflan**, **cnfnwip**, **cnfstasmast**, **cnfsnmp**. The MGX 8220 is configured with **cnfifip** and **cnfstasmgr**. The **cnflan** command is only necessary for nodes or shelves in which the LAN port is actually connected to a physical Ethernet LAN as shown in Figure 10-1.

Figure 10-1 Cisco StrataView Plus Physical LAN and IP Relay Network



Installing Cisco StrataView Plus and Associated Applications

Refer to the *Cisco StrataView Plus Operations Guide*, *Cisco StrataView Plus Installation Guide*, *Cisco WAN Switching Command Reference*, and *Cisco MGX 8220 Reference* publications for additional information.

Configuring the Cisco StrataView Plus Workstation (example)

Step 1 Contact your System Administrator to obtain IP addresses. Also, for the workstation to use `/etc/hosts`, it must not be able to access the NIS directory even though it may be linked to other LANs besides its own local network.

Step 2 Enter physical IP addresses and physical LAN node names (with a letter “p”, for example, such as “nw1bpx1p”, to differentiate from IP relay name) in `/etc/hosts` and also enter IP relay addresses with actual configured node names (“nw1bpx1”, for example).

```
beacon% more /etc/hosts
#
# Sun Host Database
#
# If the NIS is running, this file is only consulted when booting
#
127.0.0.1      localhost
#
204.179.61.121 beacon loghost

# node physical ethernet LAN addresses

204.179.61.104 nw1bpx1p
204.179.61.71  nw1axilp

# node ip relay addresses

204.179.55.101 nw1lipx1
204.179.55.102 nw1lipx2
204.179.55.103 nw1lipx3
204.179.55.123 nw1ligx1
204.179.55.111 nw1bpx1
204.179.55.105 nw1axil
```

If the workstation is connected to the corporate network for access to hosts on another network, add any IP addresses and associated names of the hosts that you may want to connect to your workstation, as the NIS is disabled.

Step 3 Enter the name or IP address of the gateway node in `config.sv`, using physical LAN name e.g., “nw1bpx1p”. Note; normally a BPX switch is used for the gateway node because of its greater processing power.

```
0|Network1|nw1bpx1p|9600|0|7|6|0|30|1024|9.1|
```

or

```
0|Network1|204.179.61.104|9600|0|7|6|0|30|1024|9.1|
```

Step 4 Enter IP Relay subnet mask in `/etc/rc2.d/S72inetsvc` file as follows:

```
vi /etc/rc2.d/S72inetsvc
/usr/sbin/route add "224.0.0.0 .....{this is already there
# route add for Cisco StrataView Plus
route add net 204.179.55.0 204.179.61.104 1
```

Note The route add command sets up the route for all nodes in the 204.179.55.0 IP relay subnetwork. In this example, the name “nw1bpx1p” is the name in the /etc/hosts table associated with the physical LAN port IP of 204.179.61.104 on the gateway node, e.g., “nw1bpx1”. In steps 2 and 3, either the name “nw1bpx1p” or the IP of “204.179.61.104” can be entered.

Configuring the LAN Port

Note Configure the LAN parameters of the nodes before connecting them to a LAN.

Note Refer to the *StrataView Plus Operations* document and the *Commands Reference* for additional information.

Step 1 Contact your System Administrator to obtain IP addresses for your workstation and for the BPX/IGX/IPX switches you are going to configure. Also, access to the NIS directories should be disabled so that the workstation will consult the /etc/hosts table for IP LAN and IPX relay addresses.

Step 2 Normally, the System Administrator will provide the IP addresses for the workstation and node. Refer to the Cisco StrataView Plus Operations manual for instructions on configuring the Cisco StrataView Plus workstation.

The addresses shown are just examples. Use the addresses obtained from your System Administrator. (This example is for a workstation named “hedgehog” at address 192.187.207.200. It also assumes that the BPX, IGX, or IPX switch LAN port for node sanfran has been assigned an IP address of 192.187.210.30 and a hostname of sanfran. Your own host name and addresses will be different.)

```
192.187.207.200 hedgehog
192.187.210.30 sanfran
```

Note If an NIS is being used (e.g., corporate network), you will need to contact the System Administrator.

Note 5120 is used for the LAN ports on all BPX/IPX switch ports.

Step 3 Configure the LAN port on the BPX/IPX switch using a dumb terminal or an RS-232 connection via the workstation (using the **vt** command, as applicable) to enter the appropriate **cnflan** parameters.

The **cnflan** command configures the node’s communication parameters so that the node can communicate with a StrataView Plus terminal over an Ethernet LAN using the TCP/IP protocol. The parameters contain address information about the Ethernet TCP/IP network

that is used to connect the StrataView Plus station to an IPX or BPX switch. The values used must conform to those of the network and should be supplied by the Ethernet network administrator.

The **cnflan** command has the following parameters:

- **Active IP Address** is the Internet Protocol address of the node used in the TCP/IP protocol.
- **IP Subnet Mask** is a 32-bit mask. The default for a Class C LAN network is 255.255.255.0. (Other than C Class masks may be used.)
- **IP Service Port** is the BPX/IGX/IPX switch LAN port number entered in the `/etc/service` file on the workstation. It is 5120 for all BPX/IGX/IPX switches.
- **Default Gateway IP Address** is the Internet gateway address. This is the gateway that traffic is routed through if the BPX, IGX, or IPX switch and workstation are on different networks. If they are on the same network, the gateway is not used. The default “none” is displayed in this case. (Note: If a gateway IP is entered and later you want to remove it, enter 255.255.255.255 opposite the “IP Subnet Mask” prompt and 192.0.0.0 opposite the “Default Gateway IP Address” prompt and “none” will again be displayed. (Note: The node will reset itself if you do this.)

A **cnflan** screen is shown in the following example for the LAN setup shown in Figure 10-2. An IP address of 192.187.210.30 has been entered as the active IP address for the node. The IP Subnet mask is entered as 255.255.255.0 for a Class C LAN network. The TCP service port is entered as 5120. Since the workstation and node are on different networks in this example, a gateway address of 192.187.207.1 (the address of the node serving as a gateway for Cisco StrataView Plus, in this example), which must be obtained from your System Administrator, has been entered. If the workstation and node are both on the same network, no gateway address is needed. The “Maximum LAN Transmit Unit” and “Ethernet Address” parameters are not configurable by the **cnflan** command. The “Ethernet Address” is a hardware address that is different for every node controller card, e.g., BCC.

Example: Configuring a Control Port (Gateway Router Example)

```
beta      TN      YourID.1      BPX 15      9.1      Dec. 3 1997  02:16 PST

Active IP Address:      192.187.210.30
IP Subnet Mask:        255.255.255.0
IP Service Port:       5120
Default Gateway IP Address: 192.187.207.1
Maximum LAN Transmit Unit: 1500
Ethernet Address:      00.C0.43.00.00.20

Type      State
TCP       UNAVAIL
UDP       READY
Telnet    READY

This Command: cnflan

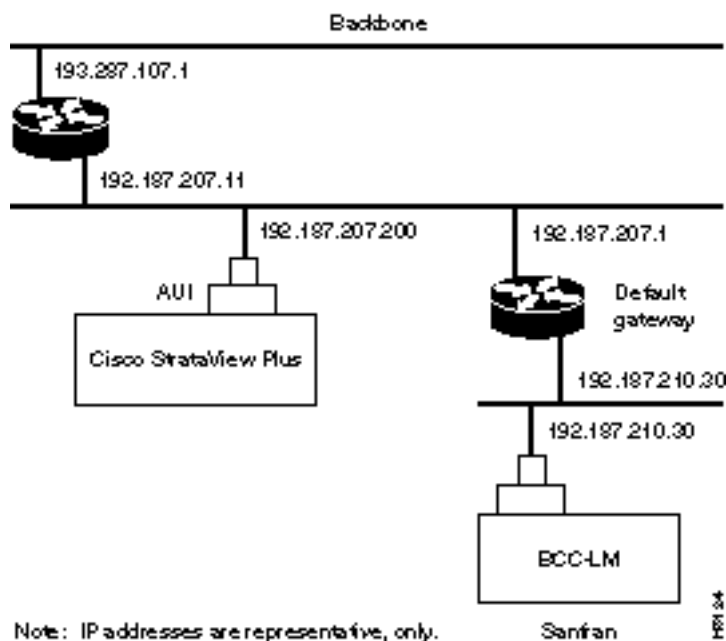
Enter IP Address:
```

Step 4 Connect the Cisco StrataView Plus workstation and the BPX switch to a LAN network. The LAN port on the BPX switch provides a DB-15 connector that can be connected to a Y-cable which in turn is connected to an AUI.

Step 5 To test that a LAN connection to the BPX switch LAN port is okay, for example, for a hostname of “sanfran” entered in the **config.sv** file, you could enter the following at the Cisco StrataView Plus workstation:

```
ping sanfran
```

Figure 10-2 Cisco StrataView Plus LAN Connection via Gateway Router to a BPX Switch



Note: IP addresses are representative, only.

Step 6 An IP Relay address needs to be configured for each node. The following example shows an example of using the **cnfnwip** command to configure the IP Relay address for a node. Also, at the workstation, the **/etc/hosts** table and routing need to be set up for each node in the network. This is so that network management using SNMP and statistics collection using TFTP via inband ILMI may be carried out. Also, assuming an isolated network for the nodes, the workstation must be isolated from the NIS reference pages in order that the Cisco StrataView Plus workstation consults the **/etc/hosts** table. Refer to the *Cisco StrataView Plus Installation and Operation* manuals for further information.

Example Display using **cnfnwip** to configure IP Relay address (required for each node):

```
beta      TN      YourID      BPX 15      9.1      Dec. 3 1997  02:11 PST

Active Network IP Address:      192.187.57.10
Active Network IP Subnet Mask:  255.255.255.192

Last Command: cnfnwip

Next Command:
```

Step 7 Once the workstation and BPX switch interface have been set up, Cisco StrataView Plus can be started. The following example shows the **dsplan** screen after Cisco StrataView Plus has been started and the communication sockets are active.

Note “Sockets” is the BSD Unix name for connections between processes, typically used in network communication.

Example of **dsplan** after Cisco StrataView Plus has been started:

```

beta      TN      YourID.1      BPX 15      9.1      Dec. 3 1997  02:16 PST

Active IP Address:          192.187.210.30
IP Subnet Mask:            255.255.255.0
IP Service Port:           5120
Default Gateway IP Address: 192.187.207.1
Maximum LAN Transmit Unit: 1500
Ethernet Address:          00.C0.43.00.00.20

Control Socket - Ready

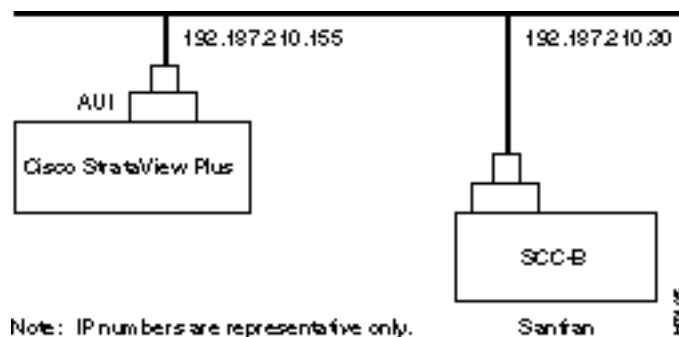
Open Socket Descriptor - 2

Last Command: dsplan

Next Command:
  
```

Figure 10-3 shows an example of a Cisco StrataView Plus workstation LAN connection to a BPX switch on a network with no gateway router, nor connection to another LAN. This type of LAN connection could also be connected through a “Hub” which is essentially a signal splitter (passive or active).

Figure 10-3 Cisco StrataView Plus LAN Connection to an IPX Node (no gateway)



Configuring the MGX 8220 for Cisco StrataView Plus NMS Operation (example)

Note The MGX 8220 was formerly sometimes referred to as the AXIS shelf.

At installation, initial access to the MGX 8220 is provided by the control port. The following is a brief overview of initial configuration. Refer to the *Cisco MGX 8220 Reference* manual for detailed information. Also refer to appropriate release notes for applicable firmware and software versions.

Step 1 Connect a terminal to the service port on the MGX 8220.

Step 2 Login.

```
login: "LoginID"

password:
card number: 3

xxxxAXIS.1.3.ASC.a >
```

Step 3 Name the shelf.

```
xxxxAXIS.1.3.ASC.a > cnfname nwlaxil
```

Step 4 Set the date.

```
nwlaxil.1.3.ASC.a > cnfdate 05/02/96
```

Step 5 Set the time.

```
nwlaxil.1.3.ASC.a > cnftime 15:31:00
```

Step 6 Enter Help for a list of commands.

```
nwlaxil.1.3.ASC.a > Help
```

Step 7 Check versions of ASC, and Service Module (e.g., FRSM, AUSM) Firmware.

```
nwlaxil.1.3.ASC.a > version
*****  AXIS ASC Card  *****
Firmware Version      = 2.1.12b_____
Backup Boot version = model-B BT_2.0.0_____
ASCFRSM Xilinx file = asc025.h
ASCBNM Xilinx file = bnmt3andsrefix
VxWorks version 5.1.1-R3000.
Kernel: WIND version 2.4.
Made on Thu May 2 16:42:36 PDT 1996.
Boot line:
sl(0,0)

cc
```

Step 8 Enter Ethernet LAN port IP address.

```
nwlaxil.1.3.ASC.a > cnfifip
cnfifip "-ip <ip addr> -if <Interface> -msk <NetMask> -bc <Brocast addr>
"
-ip <IP addr> where IP addr = nnn.nnn.nnn.nnn
-if <Interface> where Interface = 26,28,37, 26: Ethernet, 28: Slip 37: ATM
-msk <NetMask> where NetMask = nnn.nnn.nnn.nnn
-bc <BrocastAddr> where BrocastAddr = nnnnnnnn, n is hexadecimal, ethernet only
```



```
nwlaxil.1.3.ASC.a > cnfifip -ip 204.179.61.71 -if 26
```

You are configuring ethernet port are you sure? enter yes/no: yes

Step 9 Enter IP Relay Address for SNMP Management and Stats Collection.

```
nwlaxil.1.3.ASC.a > cnfifip -ip 204.179.55.105 -if 37
```

You are configuring atm port are you sure? enter yes/no: yes

Step 10 Configure stat master address (IP of Cisco StrataView Plus workstation).

```
cnfstatsmgr "<ip address>"
```

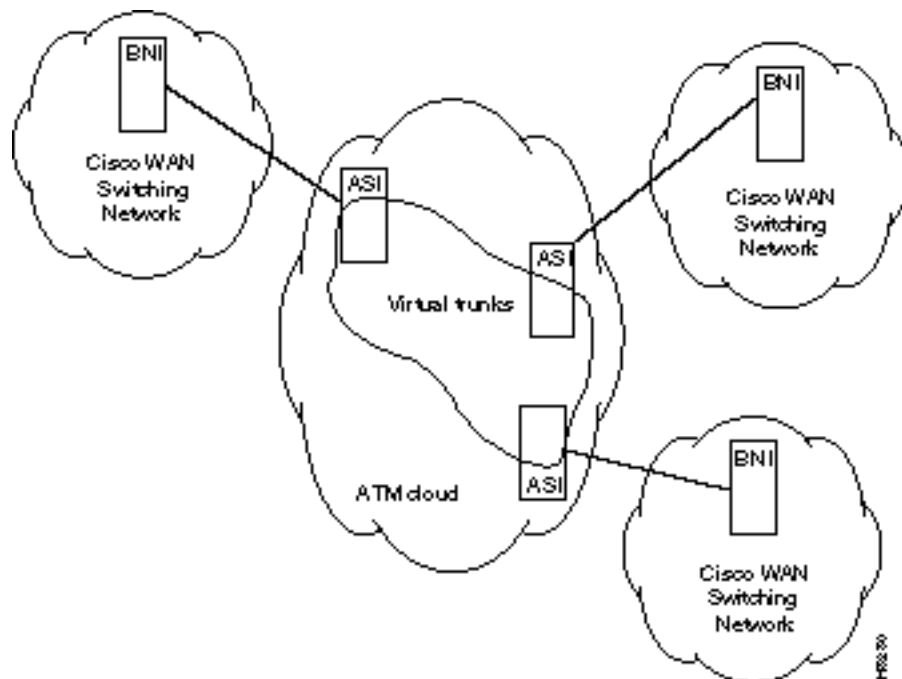
```
nwlaxil.1.3.ASC.a > cnfstatsmgr 204.179.61.121      {this is IP address of Cisco
                                                    StrataView Plus workstn}
```

Adding Virtual Trunks

This section details the steps for setting up a virtual trunk. Virtual trunking is an optional feature that must be enabled by Cisco prior to adding virtual trunks. Also, revision levels of ASI and BNI firmware must be current. The following procedure assumes that Cisco equipment is used in the ATM Cloud as well as in the Cisco WAN Switching subnetworks. In this case, a BNI output from the subnetwork is connected to an ASI UNI input at the ATM Cloud (Figure 10-4). Proceed as follows:

Step 1 In the ATM cloud network, physically connect an ASI port at the cloud edge to each BNI port in the Cisco WAN Switching Network that is intended to have virtual trunks.

Figure 10-4 Virtual Trunks across a Cisco Wan Switching ATM Cloud



Step 2 Configure the cloud ASI ports. For each ASI port connected to a BNI virtual trunk port, do the following:

upln <slot.port>

upport <slot.port>

cnfport <slot.port> and set the *shift* parameter to “N” for no shift if the cloud contains BPX switches.

Step 3 Execute **addcon**. In the cloud network, add a virtual path ASI connection for each virtual trunk that is to route through the cloud. An example of this syntax is:

addcon joker 5.1.1.* swstorm 6.2.10.*

Where 5.1 and 6.2 are ASI ports hooked up and configured for virtual trunking. Daxcons are acceptable.

Note that the third number is the VPI which must correspond to the virtual trunk VPI configured with **cnftrk** in step 4.

When the cloud is a public ATM service and not a Cisco WAN Switching cloud, the VPI is provided by the carrier, as well as the guaranteed BW associated with the VPI.

The CBR/VBR/ABR parameters must also correspond to the Virtual Trunk Type of the virtual trunk. For T3, set PCR to the bandwidth of the virtual trunk, and CDVT to 24000 for the connection so that the ASI does not drop cells. These are values that Cisco recommends based on testing.

Step 4 Configure BNI virtual trunks. On the BNIs that connect to the cloud ASI ports, configure up to 32 virtual trunks, as follows:

uptrk <slot.port.vtrk>

cnftrk <slot.port.vtrk>

For **cnftrk**, make sure that the virtual trunk type and the VPI correspond to the ASI Virtual Path connections that have been set up.

addtrk <slot.port.vtrk>

Configuration, ATM Connections

This chapter describes how ATM connection services are established by adding ATM connections between ATM service interface ports in the network using ATM standard UNI 3.1 and Traffic Management 4.0. It describes BXM and ASI card operation and summarizes ATM connection parameter configuration

The chapter contains the following:

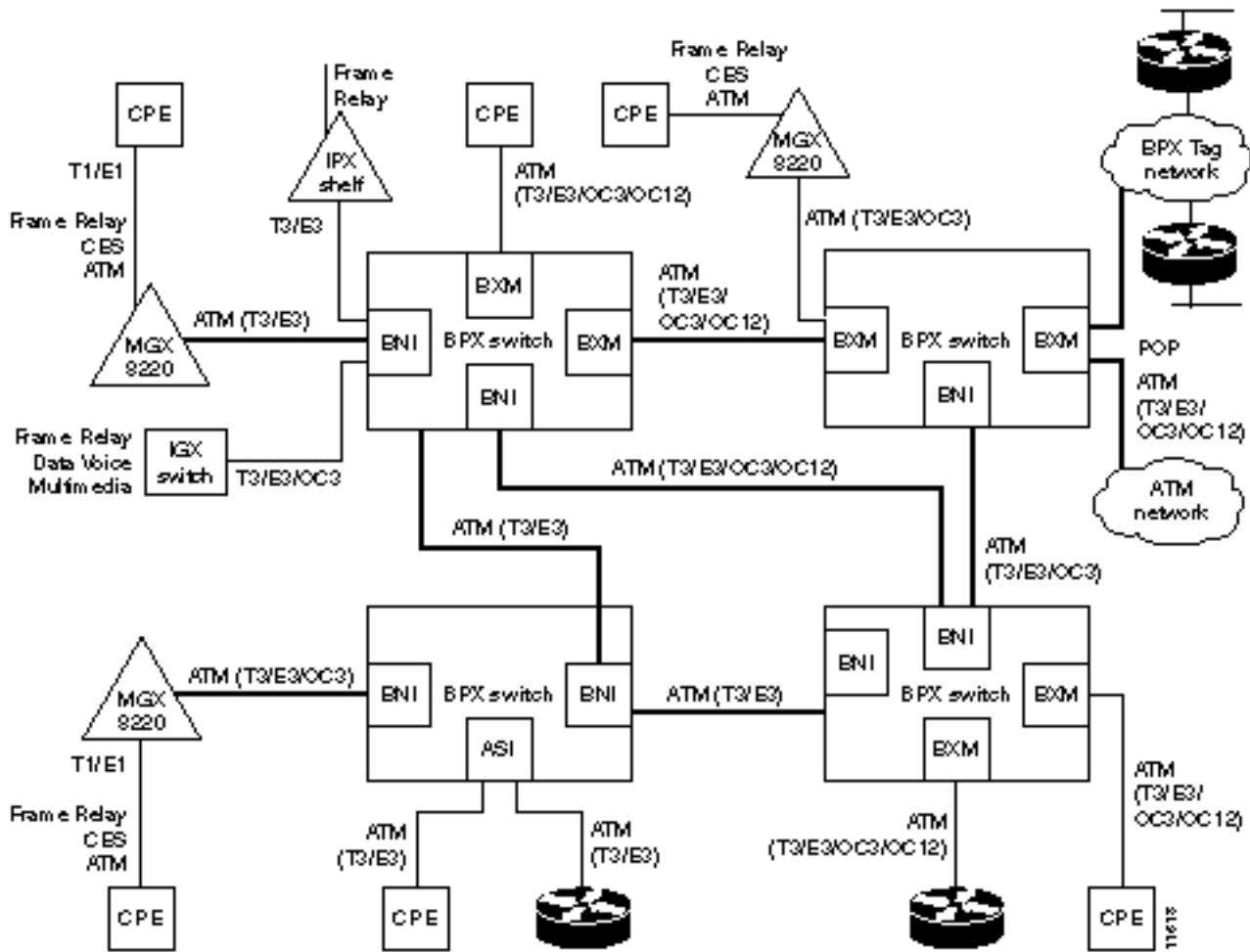
- ATM Connection Services
- SVCs
- Traffic Management Overview
- ATM Connection Requirements
- ATM Connection Configuration
- Traffic Policing Examples
- Traffic Shaping for CBR, VBR, and UBR
- LMI and ILMI Parameters

ATM Connection Services

ATM connection services are established by adding ATM connections between ATM service interface ports in the network. ATM connections can originate and terminate on the ASI (ATM Service Interface) cards, on BXM-T3/E3, BXM-155 (OC-3), and BXM-622 (OC-12) cards configured for port (service access) operation on the BPX switch, or on the MGX 8220 (using the AUSM card for the MGX 8220). Frame relay to ATM network interworking connections are supported between either BXM or ASI cards to the IPX, IGX, or MGX 8220. Frame relay to ATM service interworking connections are supported between either BXM or ASI cards to FRSM cards on the MGX 8220.

Figure 11-1 is a depiction of ATM connections over a BPX switch network. It shows ATM connections via BXM-T3/E3, BXM-155, BXM-622, ASI-1, and ASI-155 cards, as well as over MGX 8220 switches. It also shows frame relay to ATM interworking connections over the MGX 8220, IPX, and IGX shelves. For further information on the MGX 8220, refer to the *MGX 8220 Reference* document.

Figure 11-1 ATM Connections over a BPX Switch Network



SVCs

When an Extended Services Processor (ESP) is co-located with a BPX switch, ATM and Frame Relay Switched Virtual Circuits (SVCs) are supported in addition to Permanent Virtual Circuits (PVCs). For further information on ATM SVCs, refer to the *CiscoWAN Service Node Extended Services Processor Installation and Operation* document.

Traffic Management Overview

The ATM Forum Traffic Management 4.0 Specification defines five basic traffic classes:

- CBR (Constant Bit Rate)
- rt-VBR (Real-Time Variable Bit Rate)
- nrt-VBR (Non-Real Time Variable Bit Rate)
- UBR (Unspecified Bit Rate)
- ABR (Available Bit Rate)

Table 11-1 summarizes the major attributes of each of the traffic management classes:

Table 11-1 Standard ATM Traffic Classes

Attribute	CBR	rt-VBR	nrt-VBR	UBR	ABR
Traffic Parameters					
PCR & CDVT	x	x	x	x	x
SCR & MBS		x	x		
MCR					x
QoS Parameters					
Pk-to-Pk CDV	x	x			
Max CTD	x	x			
CLR	x	x	x		nw specific
Other Attributes					
Congestion Control Feedback					x

Traffic parameters are defined as:

- PCR (Peak Cell Rate in cells/sec): the maximum rate at which a connection can transmit
- CDVT (Cell Delay Variation Tolerance in usec): establishes the time scale over which the PCR is policed. This is set to allow for jitter (CDV) that is introduced for example, by upstream nodes.
- MBS (Maximum Burst Size in cells): is the maximum number of cells that may burst at the PCR but still be compliant. This is used to determine the BT (Burst Tolerance) which controls the time scale over which the SCR (Sustained Cell Rate) is policed.
- MCR (Minimum Cell Rate in cells per second): is the minimum cell rate contracted for delivery by the network.

QoS (Quality of Service) parameters are defined as:

- CDV (Cell Delay Variation): a measure of the cell jitter introduced by network elements
- Max CTD (Cell Transfer Delay): is the maximum delay incurred by a cell (including propagation and buffering delays).
- CLR (Cell Loss Ratio): is the percentage of transmitted cells that are lost.

Congestion Control Feedback:

- With ABR, provides a means to control flow based on congestion measurement.

Standard ABR notes:

Standard ABR uses RM (Resource Management) cells to carry feedback information back to the connection's source from the connection's destination.

ABR sources periodically interleave RM cells into the data they are transmitting. These RM cells are called forward RM cells because they travel in the same direction as the data. At the destination these cells are turned around and sent back to the source as Backward RM cells.

The RM cells contain fields to increase or decrease the rate (the CI and NI fields) or set it at a particular value (the explicit rate ER field). The intervening switches may adjust these fields according to network conditions. When the source receives an RM cell it must adjust its rate in response to the setting of these fields.

VSVD Description

ABR sources and destinations are linked via bi-directional connections, and each connection termination point is both a source and a destination; a source for data that it is transmitting, and a destination for data that it is receiving. The forward direction is defined as from source to destination, and the backward direction is defined as from destination to source. Figure 11-2 shows the data cell flow in the forward direction from a source to its destination along with its associated control loop. The control loop consists of two RM cell flows, one in the forward direction (from source to destination) and the other in the backward direction (from destination to source).

The data cell flow in the backward direction from destination to source is not shown, nor are the associated RM cell flows. However, these flows are just the opposite of that shown in the diagram for forward data cell flows.

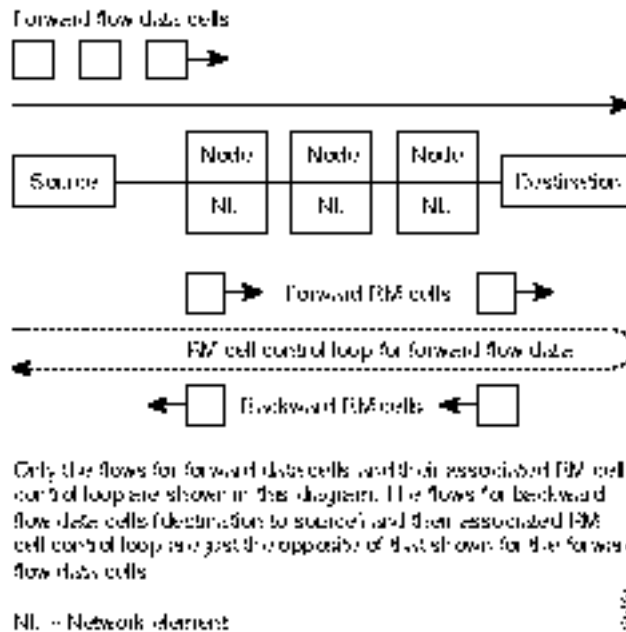
A source generates forward RM cells which are turned around by the destination and returned to the source as backward RM-cells. These backward RM-cells may carry feedback information from the network elements and/or the destination back to the source.

The parameter N_{rm} is defined as the maximum number of cells a source may send for each forward RM cell, i.e., one RM cell must be sent for every $N_{rm}-1$ data cells. Also, in the absence of $N_{rm}-1$ data cells, as an upper bound on the time between forward RM cells for an active source, an RM cell must be sent at least once every T_{rm} msecs.

BXM Connections

The BXM-T3/E3, BXM-155, and BXM-622 cards support ATM Traffic Management 4.0. The BXM cards are designed to support all the following service classes: Constant Bit Rate (CBR), Variable Bit Rate (VBR), Available Bit Rate (ABR with VS/VD, ABR without VS/VD, and ABR using Foresight), and Unspecified Bit Rate (UBR). ABR with VS/VD supports explicit rate marking and Congestion Indication (CI) control.

Figure 11-2 ABR VSVD Flow Control Diagram



ForeSight Congestion Control

ForeSight may be used for congestion control across BPX/IGX/IPX switches for connections that have one or both end points terminating on ASI-T3/E3 or BXM cards. The ForeSight feature is a proprietary dynamic closed-loop, rate-based, congestion management feature that yields bandwidth savings compared to non-ForeSight equipped trunks when transmitting bursty data across cell-based networks. The BXM cards also support the VSVD congestion control mechanism as specified in the ATM Traffic Management 4.0 standards.

ATM Connection Requirements

There are two connection addressing modes supported. The user may enter a unique VPI/VCI address in which case the BPX switch functions as a virtual circuit switch. Or the user may enter only a VPI address in which case all circuits are switched to the same destination port and the BPX switch functions as a virtual path switch in this case. The full ATM address range for VPI and VCI is supported. Virtual Path Connections are identified by an * in the VCI field. Virtual Circuit Connections specify both the VPI and VCI fields.

The VPI and VCI fields have significance only to the local BPX switch, and are translated by tables in the BPX switch to route the connection. Connections are automatically routed by the AutoRoute feature once the connection endpoints are specified.

ATM connections can be added using either the Cisco StrataView Plus Connection Manager or a node's command line interface (CLI). Typically, the Cisco StrataView Plus Connection Manager is the preferred method as it has an easy to use GUI interface. The CLI may be the method of choice in some special cases or during initial node setup for local nodes.

When adding ATM connections, first the access port and access service lines connecting to the customer CPE need to be configured. Also, the trunks across the network need to be configured appropriately for the type of connection. Following that the **addcon** command may be used to add a connection, first specifying the service type and then the appropriate parameters for the connection.

For example, when configuring a BXM for CPE connections, the BXM is configured for port mode, a line is upped with the **upln** command and configured with the **cnfln** command. Then the associated port is configured with the **cnfport** command and upped with the **upport** command. Following this, the ATM connections are added via the **addcon** command with the syntax.

Connection Routing

ATM connections for a BXM or ASI card are identified as follows:

- slot number (in the BPX switch shelf where the BXM or ASI is located)
- port number (one of the ATM ports on the BXM or ASI)
- Virtual Path Identifier (VPI)
- Virtual Circuit Identifier (VCI) – (* for virtual path connections)

The slot and port are related to the BPX switch hardware. Virtual path connections (VPCs) are identified by a "*" for the VCI field. Virtual circuit connections (VCCs) are identified by both a VPI and VCI field.

Connections added to the network are automatically routed once the end points are specified. This AutoRoute feature is standard with all BPX, IGX, and IPX switches. The network automatically detects trunk failures and routes connections around the failures.

Addcon Command Syntax

The following parameters are entered for BXM **addcon** command. Depending upon the connection type, the user is prompted for the appropriate parameters as shown in the following:

```
addcon local_addr node remote_addr traffic_type...extended parameters
```

Field	Value	Description
local/remote_addr	slot.port.vpi.vci	desired VCC or VPI connection identifier
node		slave end of connection
traffic_type		Type of traffic, chosen from CBR, VBR, ABR, and UBR
extended parameters		The traffic management and performance parameters associated with an ATM connection.

Note The range of VPIs and VCIs reserved for PVC traffic and SVC traffic is configurable using the **cnfport** command. While adding connections, the system checks the entered VPI/VPC against the range reserved for SVC traffic. If there is a conflict, the **addcon** command fails with the message "VPI/VCI on selected port is reserved at local/remote end".

ATM Connection Configuration

The following figures and tables describe the parameters used to configure ATM connections:

- Table 11-2, Traffic Policing Definitions.
 - This table describes the policing options that may be selected for ATM connection types: CBR, UBR, and VBR. The policing options for ABR are the same as for VBR.
- Table 11-3, Connection Parameters with Default Settings and Ranges
 - This table specifies the ATM connection parameter ranges and defaults. Not all the parameters are used for every connection type. When adding connections, you are prompted for the applicable parameters, as specified in the prompt sequence diagrams included in Figure 11-3 through Figure 11-10.
- Table 11-4, Connection Parameter Descriptions
 - This table defines the connection parameters listed in Table 11-3.

The following figures list the connection parameters in the same sequence as they are entered when a connection is added:

- Figure 11-3, CBR Connection Prompt Sequence
- Figure 11-4, VBR Connection Prompt Sequence
- Figure 11-5, ATFR Connection Prompt Sequence
- Figure 11-6, ABR Standard Connection Prompt Sequence

The following figure shows the VSVD network segment and external segment options available when ABR Standard or ABR ForeSight is selected. ForeSight congestion control is useful when both ends of a connection do not terminate on BXM cards. At present, FCES (Flow Control External Segment) as shown in Figure 11-7 is not available for ABR with ForeSight.

- Figure 11-7, Meaning of VSVD and Flow Connection External Segments

The following figures list the connection parameters in the same sequence as they are entered when a connection is added:

- Figure 11-8, ABR ForeSight Connection Prompt Sequence
- Figure 11-9, ATFST Connection Prompt Sequence
- Figure 11-10, UBR Connection Prompt Sequence

Table 11-2 Traffic Policing Definitions

Connection Type	ATM Forum TM spec. 4.0 conformance definition	PCR Flow (1st leaky bucket)	CLP tagging (for PCR flow)	SCR Flow (2nd leaky bucket)	CLP tagging (for SCR flow)
CBR	CBR.1 when policing set to 4 (PCR Policing only)	CLP(0+1)	no	off	n/a
CBR	When policing set to 5 (off)	off	n/a	off	n/a
UBR	UBR.1 when CLP setting = no	CLP(0+1)	no	off	n/a
UBR	UBR.2 when CLP setting = yes	CLP(0+1)	no	CLP(0)	yes
VBR, ABR, ATFR, ATFST	VBR.1 when policing set to 1	CLP(0+1)	no	CLP(0+1)	no
VBR, ABR, ATFR, ATFST	VBR.2 when policing set to 2	CLP(0+1)	no	CLP(0)	no
VBR, ABR, ATFR, ATFST	VBR.3 when policing set to 3	CLP(0+1)	no	CLP(0)	yes
VBR, ABR, ATFR, ATFST	when Policing set to 4	CLP(0+1)	no	off	n/a
VBR, ABR, ATFR, ATFST	when Policing set to 5 for off)	off	n/a	off	n/a

Note 1: - For UBR.2, SCR = 0

Note 2:

- CLP = Cell Lost Priority
- CLP(0) means cells that have CLP = 0
- CLP(1) means cells that have CLP = 1
- CLP(0+1) means both types of cells: CLP = 0 & CLP = 1
- CLP(0) has higher priority than CLP(1)
- CLP tagging means to change CLP = 0 to CLP = 1, where CLP= 1 cells have lower priority

Table 11-3 Connection Parameters with Default Settings and Ranges

PARAMETER WITH [DEFAULT SETTING]	BXM T3/E3, OC3 & OC12 RANGE	ASI T3/E3 RANGE	ASI-155 RANGE
PCR(0+1)[50/50]	50- T3/E3 cells/sec 50 - OC3 50 - OC12	T3: MCR – 96000 E3: MCR – 80000 Limited to MCR – 5333 cells/sec for ATFR connections.	OC3 (STM1): 0 – 353200
%Util [100/100] for UBR [1/1]	0 - 100%	1 - 100%	1 - 100%
MCR[50/50]	cells/sec 6 - T3/E3OC3/OC12	T3: 0 – 96000 cells/sec E3: 0 – 80000 cells/sec	N/A
FBTC (AAL5 Frame Base Traffic Control): for VBR [disable] for ABR/UBR [enable] for Path connection [disable]	enable/disable	enable/disable	enable/disable
CDVT(0+1): for CBR [10000/10000], others [250000/250000]	0 - 5,000,000 usec	T3/E3 1 – 250,000 usecs.	OC3/STM1: 0 – 10000 usecs.
VSVD[disable]	enable/disable	enable/disable	Select disable, as only ABR w/o VSVD is supported.
FCES (Flow Control External Segment) [disable]	enable/disable	enable/disable	N/A
Default Extended Parameters[enable]	enable/disable	enable/disable	N/A
CLP Setting[enable]	enable/disable	enable/disable	enable/disable
SCR [50/50]	cells/sec 50 - T3/E3OC3/OC12	T3: MCR – 96000:T3 E3: MCR – 80000: E3 Limited to MCR – 5333 cells/sec for ATFR connections.	OC3/STM1: 0 – 353200
MBS [1000/1000]	1 - 5,000,000cells	T3/E3: 10 – 24000 cells	OC3 (STM1): 10 – 1000 cells
Policing[3] For CBR: [4]	1 - VBR.1 2 - VBR.2 3 - VBR.3 4 - PCR policing only 5 - off	1 - VBR.1 2 - VBR.2 3 - VBR.3 4 - PCR policing only 5 - off	1 - VBR.1 2 - VBR.2 3 - VBR.3 4 - PCR policing only 5 - off

ATM Connection Configuration

Table 11-3 Connection Parameters with Default Settings and Ranges (Continued)

PARAMETER WITH [DEFAULT SETTING]	BXM T3/E3, OC3 & OC12 RANGE	ASI T3/E3 RANGE	ASI-155 RANGE
ICR: max[MCR, PCR/10]	MCR - PCR cells/sec	MCR - PCR cells/sec	N/A
ADTF[1000]	62 - 8000 msec	1000 – 255000 msec.	N/A
Trm[100]	ABRSTD: 1 - 100 msec ABRFST: 3 - 255 msec	20 – 250 msec.	N/A
VC QDepth [16000/16000] For ATFR/ATFST [1366/1366]	0 - 61440 cells	Applies to T3/E3 only ABR: 1 – 64000 cells ATFR: 1 – 1366 cells	ATFR: 1 – 1366 cells
CLP Hi [80/80]	1 - 100%	1 – 100%	N/A
CLP Lo/EPD [35/35]	1 - 100%	1 – 100%	N/A
EFCI [30/30] For ATFR/ATFST [100/100]	1 - 100%	1 – 100%	0 - 100%
RIF: For ForeSight: max[PCR/128, 10]	If ForeSight, then in absolute (0 - PCR)	If ForeSight, then in absolute (0 – PCR)	N/A
For ABR STD[128]	If ABR then 2 ⁿ (1 - 32768)	If ABR, then 2 ⁿ (1 – 32768)	
RDF: For ForeSight [93]	If ForeSight, then % (0% - 100%)	If ForeSight, then % (0% – 100%)	N/A
For ABR STD [16]	If ABR then 2 ⁿ (1 - 32768)	If ABR, then 2 ⁿ (1 – 32768)	
Nrm[32], BXM only	2 - 256 cells	N/A	N/A
FRTT[0], BXM only	0 - 16700 msec	N/A	N/A
TBE[1,048,320], BXM only	0 - 1,048,320 cells (different max range from TM spec. but limited by firmware for CRM(4095 only) where CRM=TBE/Nrm	N/A	N/A
IBS[1/1]	0 - 24000 cells	T3/E3 ABR: 0 - 24000 cells ATFR: 1 - 107 cells	0 - 999 cells
Trunk cell routing restrict (Y/N) [Y]	Y/N	Y/N	Y/N

Table 11-4 Connection Parameter Descriptions

Parameter	Description
PCR	Peak cell rate: The cell rate which the source may never exceed
%Util	% Utilization; bandwidth allocation for: VBR, CBR, UBR it's PCR*%Util, for ABR it's MCR*%Util
MCR	Minimum Cell Rate: A minimum cell rate committed for delivery by network
CDVT	Cell Delay Variation Tolerance: Controls time scale over which the PCR is policed
FBTC (AAL5 Frame Basic Traffic Control)	To enable the possibility of discarding the whole frame, not just one non-compliant cell. This is used to set the Early Packet Discard bit at every node along a connection.
VSVD	Virtual Source Virtual Destination: (see Meaning of VSVD and Flow Control External Segments, Figure 11-7)
FCES (Flow Control External Segments)	(see Meaning of VSVD and Flow Control External Segments, Figure 11-7)
SCR	Sustainable Cell Rate: Long term limit on the rate a connection can sustain
MBS	Maximum Burst Size: Maximum number of cells which may burst at the PCR but still be compliant. Used to determine the Burst Tolerance (BT) which controls the time scale over which the SCR is policed
Policing	(see definitions of Traffic Policing, Table 11-2)
VC QDepth	VC Queue Depth
CLP Hi	Cell Loss Priority Hi threshold (% of VC QMax)
CLP Lo/EPD	Cell Loss Priority Low threshold (% of VC QMax)/Early Packet Discard. If AAL5 FBTC = yes, then for the BXM card this is the EPD threshold setting. For ASI cards, regardless of the FBTC setting, this is the CLP Lo setting.
EFCI	Explicit Forward Congestion Indication threshold (% of VC QMax)
ICR	Initial Cell Rate: The rate at which a source should send initially and after an idle period
ADTF (ATM Forum TM 4.0 term)	The Allowed-Cell-Rate Decrease Factor: Time permitted between sending RM-cells before the rate is decreased to ICR
Trm (ATM Forum TM 4.0 term)	An upper bound on the time between forward RM-cells for an active source, i.e., RM cell must be sent at least every Trm msec
RIF (ATM Forum TM 4.0 term)	Rate Increase Factor: Controls the amount by which the cell transmission rate may increase upon receipt of an RM cell
RDF (ATM Forum TM 4.0 term)	Rate Decrease Factor: Controls the amount by which the cell transmission rate may decrease upon receipt of an RM cell

Table 11-4 Connection Parameter Descriptions (Continued)

Parameter	Description
Nrm (ATM Forum TM 4.0 term), BXM only.	Nrm Maximum number of cells a source may send for each forward RM cell, i.e. an RM cell must be sent for every Nrm-1 data cells
FRTT (ATM Forum TM 4.0 term), BXM only.	Fixed Round Trip Time: the sum of the fixed and propagation delays from the source to a destination and back
TBE (ATM Forum TM 4.0 term), BXM only.	Transient Buffer Exposure: The negotiated number of cells that the network would like to limit the source to sending during start-up periods, before the first RM-cell returns.
IBS	Initial Burst Size
Trunk cell routing restriction (Y/N) [Y]	The default (Y) restricts ATM connection routes to include only ATM trunks. Selecting (N) allows the network to route these connections over non-ATM trunks (e.g., Fastpacket trunks).

CBR Connections

The **CBR** (constant bit rate) category is a fixed bandwidth class. CBR traffic is more time dependent, less tolerant of delay, and generally more deterministic in bandwidth requirements. CBR is used by connections that require a specific amount of bandwidth to be available continuously throughout the duration of a connection. Voice, circuit emulation, and high-resolution video are typical examples of traffic utilizing this type of connection. A CBR connection is allowed to transmit cells at the peak rate, below the peak rate, or not at all. CBR is characterized by peak cell rate (PCR).

The parameters for a CBR connection are shown in Figure 11-3 in the sequence in which they occur during the execution of the **addcon** command. The CBR policing definitions are summarized in Table 11-5.

Figure 11-3 CBR Connection Prompt Sequence

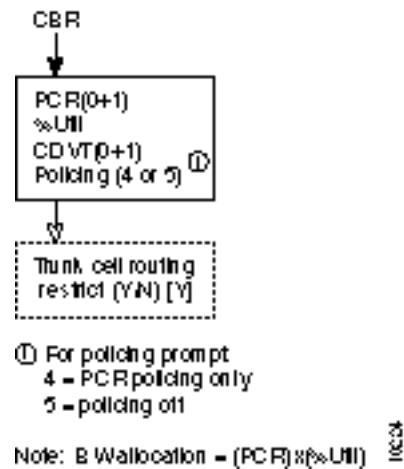


Table 11-5 CBR Policing Definitions

Connection Type	ATM Forum TM spec. 4.0 conformance definition	PCR Flow (1st leaky bucket)	CLP tagging (for PCR flow)	SCR Flow (2nd leaky bucket)	CLP tagging (for SCR flow)
CBR	CBR.1 when policing set to 4 (PCR Policing only)	CLP(0+1)	no	off	n/a
CBR	When policing set to 5 (off)	off	n/a	off	n/a

VBR and ATFR Connections

VBR Connections

VBR (variable bit rate) connections may be classified as rt-VBR or nrt-VBR connections.

The rt-VBR (real-time variable bit rate) category is used for connections that transmit at a rate varying with time and that can be described as bursty, often requiring large amounts of bandwidth when active. The rt-VBR class is intended for applications that require tightly constrained delay and delay variation. An example of rt-VBR is video conferencing which requires real-time data transfer with bandwidth requirements that can vary in proportion to the dynamics of the video image at any given time. The rt-VBR category is characterized in terms of PCR, SCR (sustained cell rate), and MBS (maximum burst size).

The nrt-VBR (non-real time variable bit rate) category is used for connections that are bursty but are not constrained by delay and delay variation boundaries. For those cells in compliance with the traffic contract, a low cell loss is expected. Non-time critical data file transfers are an example of an nrt-VBR connection. A nrt-VBR connection is characterized by PCR, SCR, and MBS.

Configuring VBR connections. The characteristics of rt-VBR or nrt-VBR are supported by appropriately configuring the parameters of the VBR connection.

The parameters for a VBR connection are shown in Figure 11-4 in the sequence in which they occur during the execution of the **addcon** command. The VBR policing definitions are summarized in Table 11-6.

Figure 11-4 VBR Connection Prompt Sequence

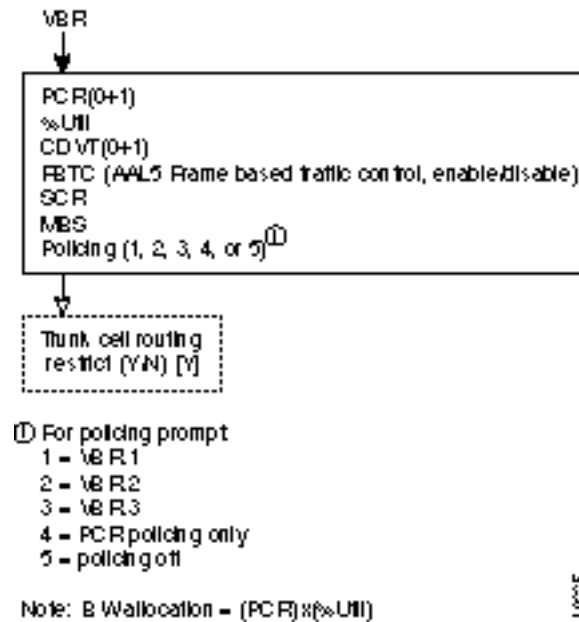


Table 11-6 VBR Policing Definitions

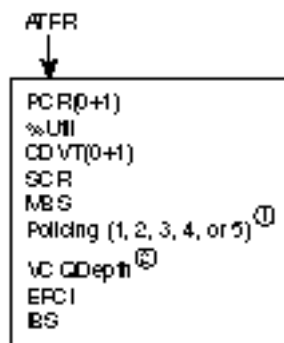
Connection Type	ATM Forum TM spec. 4.0 conformance definition	PCR Flow (1st leaky bucket)	CLP tagging (for PCR flow)	SCR Flow (2nd leaky bucket)	CLP tagging (for SCR flow)
VBR, ABR, ATFR, ATFST	VBR.1 when policing set to 1	CLP(0+1)	no	CLP(0+1)	no
VBR, ABR, ATFR, ATFST	VBR.2 when policing set to 2	CLP(0+1)	no	CLP(0)	no
VBR, ABR, ATFR, ATFST	VBR.3 when policing set to 3	CLP(0+1)	no	CLP(0)	yes
VBR, ABR, ATFR, ATFST	when Policing set to 4	CLP(0+1)	no	off	n/a
VBR, ABR, ATFR, ATFST	when Policing set to 5 for off	off	n/a	off	n/a

ATFR Connections

An **ATFR** (ATM to Frame Relay) connection is a frame relay to ATM connection and is configured as a VBR connection, with a number of the ATM and frame relay connection parameters being mapped between each side of the connection.

The parameters for an ATFR connection are shown in Figure 11-5 in the sequence in which they occur during the execution of the **addcon** command.

Figure 11-5 ATFR Connection Prompt Sequence



① For policing prompt:

- 1 = VBR1
- 2 = VBR2
- 3 = VBR3
- 4 = PCR policing only
- 5 = policing off

② VC QDepth maps to VC Queue Max for frame relay
EPCl maps to ECN for frame relay
BS maps to Cmax for frame relay

Note: FBTC (Frame based traffic control - AAL5, same as FGCR) is automatically set to yes.

11/18/98

ABR Notes

The term ABR is used to specify one of the following:

- ABR standard without VSVD (This is ABR standard without congestion flow control.)
 - Supported by BXM, ASI-T3 (& ASI-E3), and ASI OC3 cards.
- ABR standard with VSVD. (This is ABR standard with congestion flow control as specified by the ATM Traffic Management, Version 4.0)
 - Also, referred to as ABR.1
 - Supported only by BXM cards
 - Feature must be ordered.
- ABR with ForeSight congestion control
 - Also, referred to as ABR.FST
 - Supported by BXM and ASI-T3 (& ASI-E3) cards
 - Feature must be ordered.

ABR and ATFST Connections

ABR Connections

The **ABR** (available bit rate) category utilizes a congestion flow control mechanism to control congestion during busy periods and to take advantage of available bandwidth during less busy periods. The congestion flow control mechanism provides feedback to control the connections flow rate through the network in response to network bandwidth availability. The ABR service is not restricted by bounding delay or delay variation and is not intended to support real-time connections. ABR is characterized by: PCR and MCR.

Policing for ABR connections is the same as for VBR connections which are summarized in .

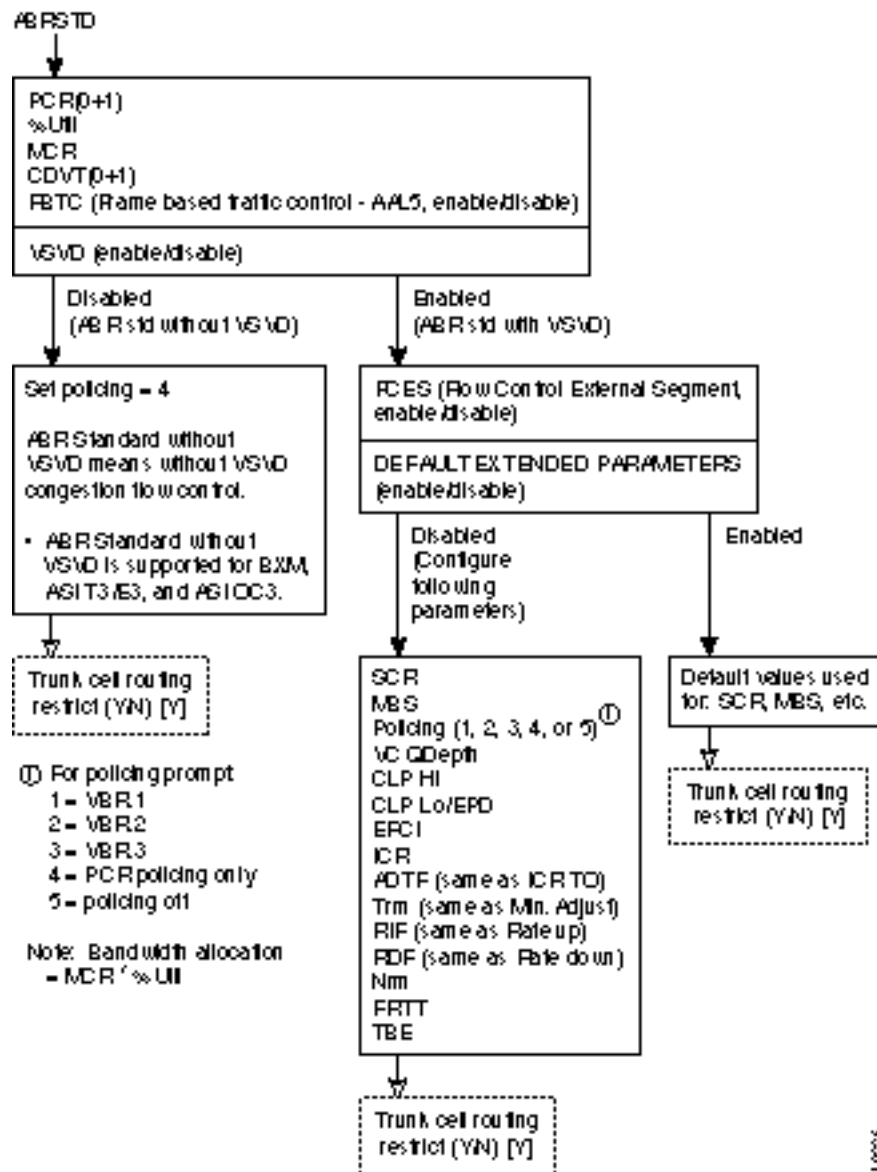
The ABR connections are configured as either ABR Standard (**ABRSTD**) connections or as ABR ForeSight (**ABRFST**) connections.

The parameters for an ABRSTD connection are shown in Figure 11-6 in the sequence in which they occur during the execution of the **addcon** command.

The ABRSTD connection supports all the features of ATM Standards Traffic Management 4.0 including VSVD congestion flow control.

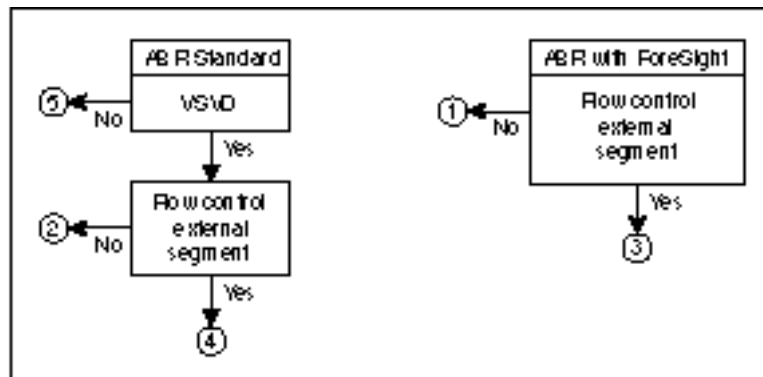
VSVD and flow control with external segments are shown in Figure 11-7.

Figure 11-6 ABR Standard Connection Prompt Sequence

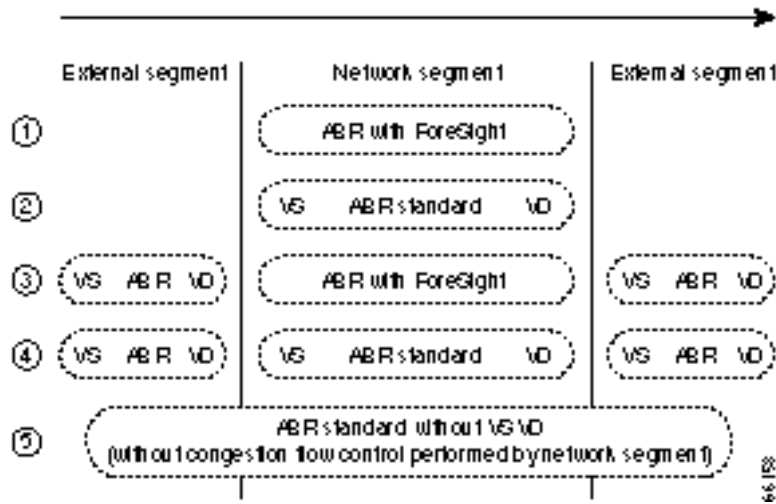


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Figure 11-7 Meaning of VSVD and Flow Control External Segments



VS and VD shown below are for traffic flowing in direction of arrow. For the other direction of traffic, VS and VD are in the opposite direction.

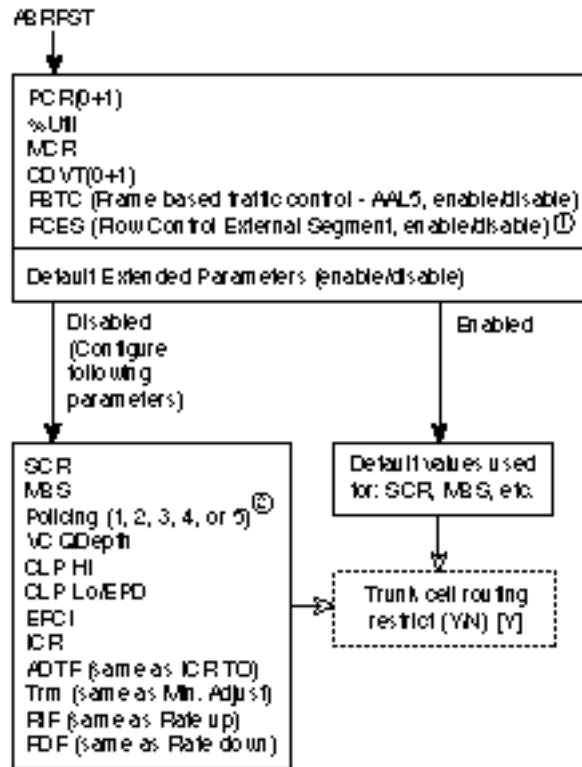


ATFST Connections

The **ABRFST** connection uses the propriety ForeSight congestion control and is useful when configuring connections on which both ends do not terminate on BXM cards.

The parameters for an ABRFST connection are shown in Figure 11-8 in the sequence in which they occur during the execution of the **addcon** command.

Figure 11-8 ABR ForeSight Connection Prompt Sequence



① At present, PCES is not available for ABR with ForeSight

- ② For policing prompt:
- 1 = VBR.1
 - 2 = VBR.2
 - 3 = VBR.3
 - 4 = PCR policing only
 - 5 = policing off

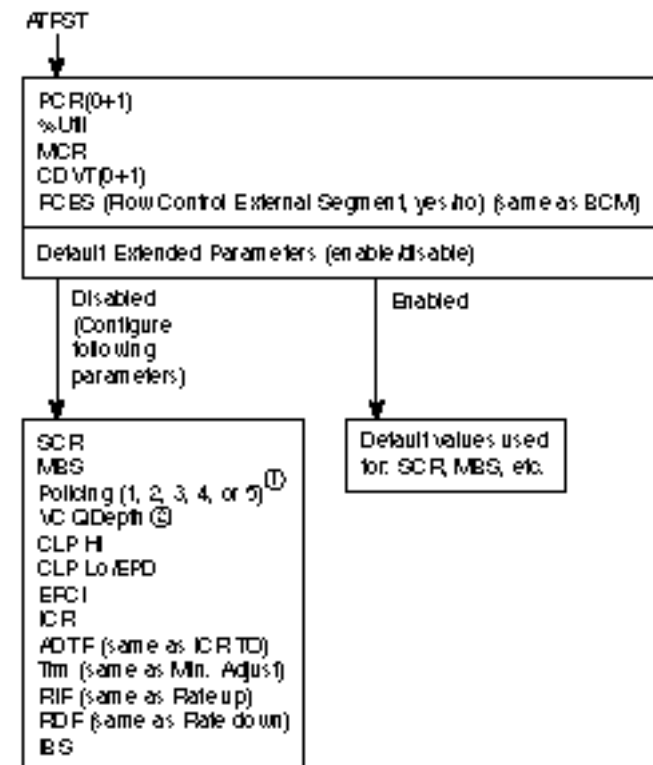
Note: Bandwidth allocation
= (MCR) x (%UII)

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An **ATFST** connection is a frame relay to ATM connection that is configured as an ABR connection with ForeSight. ForeSight congestion control is automatically enabled when connection type ATFST is selected. A number of the ATM and frame relay connection parameters are mapped between each side of the connection.

The parameters for an ATFST connection are shown in Figure 11-9 in the sequence in which they occur during the execution of the **addcon** command.

Figure 11-9 ATFST Connection Prompt Sequence



① For policing prompt

- 1 = VBR1
- 2 = VBR2
- 3 = VBR3
- 4 = PCR policing only
- 5 = policing off

② VC QDepth maps to VC Queue max for frame relay.

EFCI maps to ECN for frame relay.

BS maps to C max for frame relay.

Note: FBTC (Frame based traffic control - AAL5, same as FGCRA) is automatically set to yes.

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UBR Connections

The unspecified bit rate (**UBR**) connection service is similar to the ABR connection service for bursty data. However, UBR traffic is delivered only when there is spare bandwidth in the network. This is enforced by setting the CLP bit on UBR traffic when it enters a port.

Therefore, traffic is served out to the network only when no other traffic is waiting to be served first. The UBR traffic does not affect the trunk loading calculations performed by the switch software.

The parameters for a UBR connection are shown in Figure 11-10 in the sequence in which they occur during the execution of the **addcon** command.

The UBR policing definitions are summarized in Table 11-7.

Figure 11-10 UBR Connection Prompt Sequence

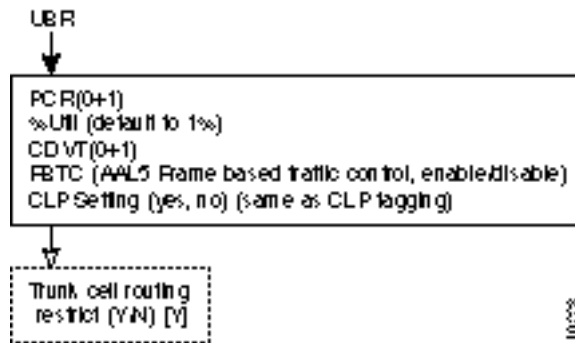


Table 11-7 UBR Policing Definitions

Connection Type	ATM Forum TM spec. 4.0 conformance definition	PCR Flow (1st leaky bucket)	CLP tagging (for PCR flow)	SCR Flow (2nd leaky bucket)	CLP tagging (for SCR flow)
UBR	UBR.1 when CLP setting = no	CLP(0+1)	no	off	n/a
UBR	UBR.2 when CLP setting = yes	CLP(0+1)	no	CLP(0)	yes

Traffic Policing Examples

Traffic Policing, also known as Usage Parameter Control (UPC), is implemented using either an ATM Forum single or dual-leaky bucket algorithm. The buckets represent a GCRA (Generic Cell Rate Algorithm) defined by two parameters:

- Rate (where I , expected arrival interval is defined as $1/\text{Rate}$)
- Deviation (L)

If the cells are clumped too closely together, they are non-compliant and are tagged or discarded as applicable. If other cells arrive on time or after their expected arrival time, they are compliant, but there is no accrued credit.

Dual-Leaky Bucket (An Analogy)

A GCRA viewpoint is as follows:

- For a stream of cells in an ATM connection, the cell compliance is based on the theoretical arrival time (TAT).
- The next TAT should be the time of arrival of the last compliant cell plus the expected arrival interval (I) where $I = 1/\text{rate}$.
- If the next cell arrives before the new TAT, it must arrive no earlier than new TAT - CDVT to be compliant.
- If the next cell arrives after the new TAT, it is compliant, but there is no accrued credit.

CBR Traffic Policing Examples

CBR traffic is expected to be at a constant bit rate, have low jitter, and is configured for a constant rate equal to Peak Cell Rate (PCR). The connection is expected to be always at peak rate.

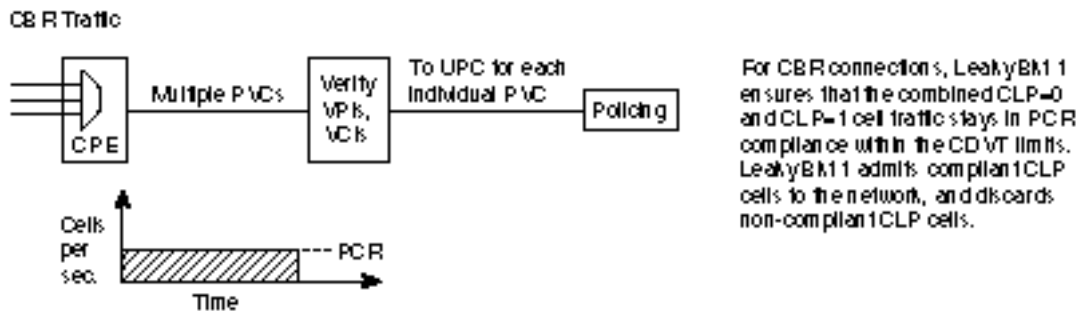
When a connection is added, a VPI.VCI address is assigned, and the UPC parameters are configured for the connection. For each cell in an ATM stream seeking admission to the network, the VPI.VCI addresses are verified and each cell is checked for compliance with the UPC parameters. The CBR cells are not enqueued, but are processed by the policing function and then sent to the network unless discarded.

For CBR, traffic policing is based on:

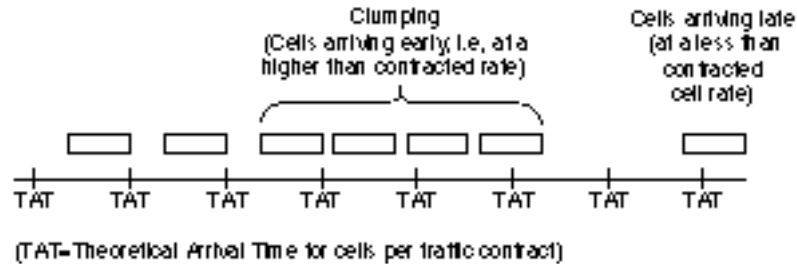
- Bucket 1
 - PCR(0+1), Peak Cell Rate
 - CDVT(0+1), Cell Delay Variation

The CBR connection may be configured with policing selected as either 4 or 5. With policing set to 5, there is no policing. With policing set to 4, there is single leaky bucket PCR policing as shown in Figure 11-11. The single leaky bucket polices the PCR compliance of all cells seeking admission to the network, both those with CLP = 0 and those with CLP = 1. Cells seeking admission to the network with CLP set equal to 1 may have either encountered congestion along the user's network or may have lower importance to the user and have been designated as eligible for discard in the case congestion is encountered. If the bucket depth CDVT (0+1) limit is exceeded, it discards all cells seeking admission. It does not tag cells. If leaky bucket 1 is not full, all cells (CLP = 0 and CLP = 1) are admitted to the network.

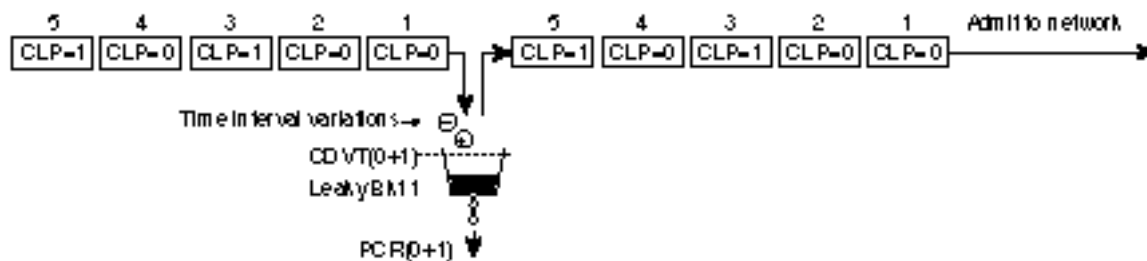
Figure 11-11 CBR Connection, UPC Overview



Policing: 4 = PCR Policing only
5 = off



Example: Policing = 4



Discards incoming CLP(0+1) cells if BM1 depth > CDVT(0+1). Does not tag cells. If BM1 depth < CDVT(0+1), passes CLP=0 and CLP=1 cells on to network.

Note: The notation 0, 1, and 0+1 refers to the types of cell being specified: cells with CLP set to 0, CLP set to 1, or both types of cells, respectively. For example, CLP(0), CLP(1), and CLP(0+1).

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Figure 11-12 shows a CBR.1 connection policing example, with policing set to 4, where the CDVT depth of the single leaky bucket is not exceeded, and all cells, CLP(0) and CLP(1) are admitted to the network.

Figure 11-12 CBR.1 Connection with Bucket Compliant

Connection setup and compliance status:

CBR.1
 policing=4
 BM1 depth < CDVT (0+1)

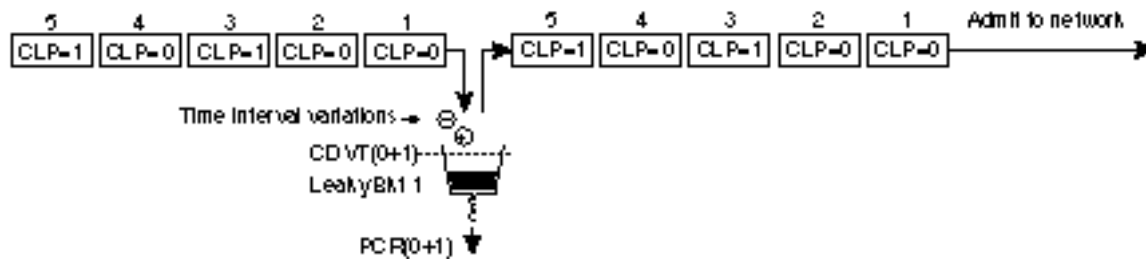
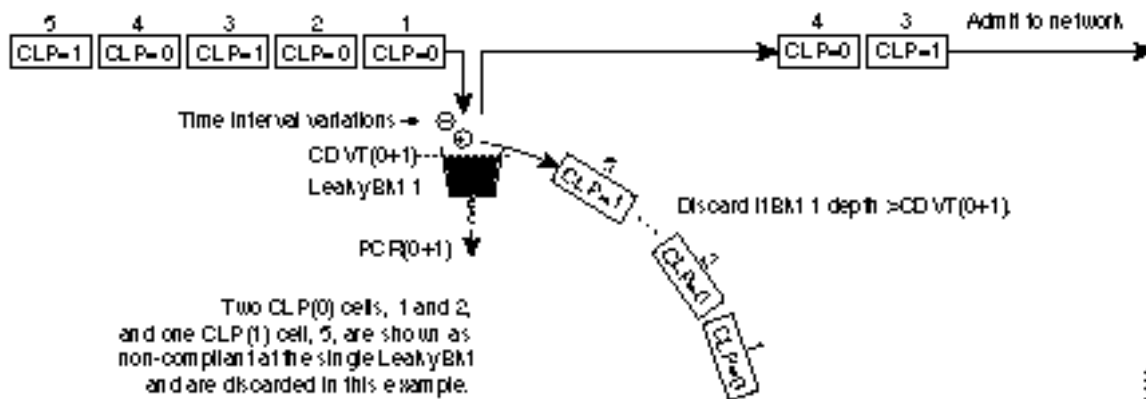


Figure 11-13 shows a CBR connection policing example, with policing =4, where the CDVT(0+1) of the single leaky bucket is exceeded and non-compliant cells are discarded. The leaky bucket only discards cells; it does not tag them.

Figure 11-13 CBR.1 Connection, with Bucket Discarding non-Compliant Cells

Connection setup and compliance status:

CBR.1
 policing=4
 BM1 depth > CDVT (0+1)



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VBR Dual-Leaky Bucket Policing Examples

The contract for a variable bit rate connection is set up based on an agreed upon sustained cell rate (SCR) with allowance for occasional data bursts at a Peak Cell Rate (PCR) as specified by maximum burst size MBS.

When a connection is added, a VPI.VCI address is assigned, and UPC parameters are configured for the connection. For each cell in an ATM stream, the VPI.VCI addresses are verified and each cell is checked for compliance with the UPC parameters as shown in Figure 11-14.

The VBR cells are not enqueued, but are processed by the policing function and then sent to the network unless discarded.

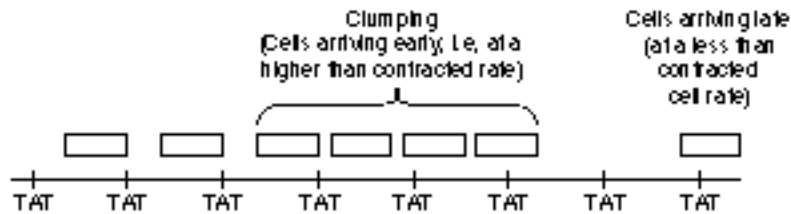
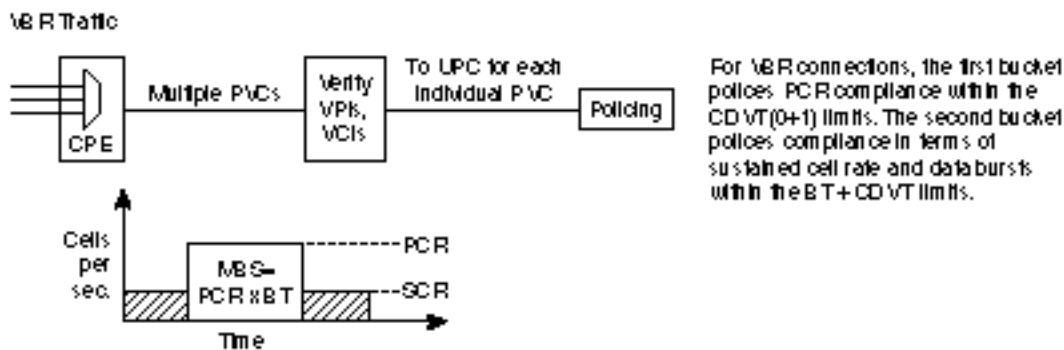
For VBR, traffic policing, depending on selected policing option, is based on:

- Leaky bucket 1, PCR and CDVT
- Leaky bucket 2, SCR, CDVT, and MBS

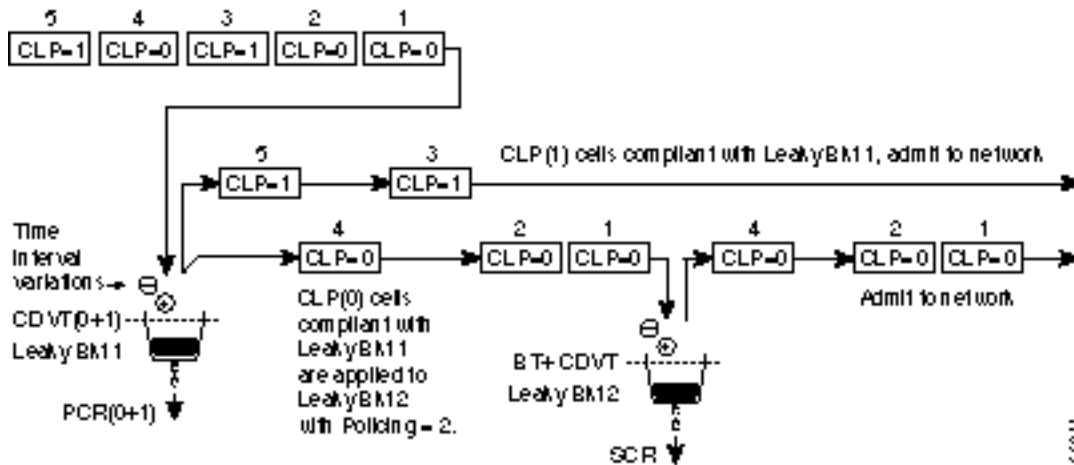
The policing options, selected by entering 1-5 in response to the policing choice prompt, are as follows for VBR connections:

VBR.1 VBR with policing set to 1.	CLP(0+1) cells compliant with leaky bucket 1 are passed to leaky bucket 2; non-compliant cells are discarded. CLP(0+1) cells compliant with leaky bucket 2 are admitted to the network; non-compliant cells are discarded.
VBR.2 VBR with policing set to 2.	CLP(1) cells compliant with leaky bucket 1 are admitted to the network; non-compliant CLP(0+1) cells are dropped. CLP(0) cells compliant with leaky bucket 1 are applied to leaky bucket 2; non-compliant cells are dropped. CLP(0) cells compliant with leaky bucket 2 are admitted to the network; non-compliant cells are dropped.
VBR.3 VBR with policing set to 3.	CLP(1) cells compliant with leaky bucket 1 are admitted to the network; non-compliant CLP(0+1) cells are dropped. CLP(0) cells compliant with leaky bucket 1 are applied to leaky bucket 2; non-compliant cells are dropped. CLP(0) cells compliant with leaky bucket 2 are admitted to the network; non-compliant cells are tagged and admitted to the network.
VBR with policing set to 4.	CLP(0+1) cells compliant with leaky bucket 1 are admitted to the network; non-compliant cells are dropped. Leaky bucket 2 is not active.
VBR with policing set to 5.	Policing is off, so there is no policing of cells on ingress.

Figure 11-14 VBR Connection, UPC Overview



Example: VBR2
Policing = 2



Leaky Bucket 1

Leaky bucket 1 polices for the PCR compliance of all cells seeking admission to the network, both those with CLP = 0 and those with CLP = 1. For example, cells seeking admission to the network with CLP set equal to 1 may have either encountered congestion along the user's network or may have lower importance to the user and have been designated as eligible for discard in the case congestion is encountered. If the bucket depth in the first bucket exceeds CDVT (0+1), it discards all cells seeking admission. It does not tag cells.

With policing set to 1 (VBR.1), all cells (CLP=0 and CLP=1) that are compliant with leaky bucket 1, are sent to leaky bucket 2. With policing set to 2 (VBR.2) or to 3 (VBR.3), all CLP=1 cells compliant with leaky bucket 1 are admitted directly to the network, and all CLP=0 cells compliant with leaky bucket 1 are sent to leaky bucket 2.

Leaky Bucket 2

For VBR connections, the purpose of leaky bucket 2 is to police the cells passed from leaky bucket 1 for conformance with maximum burst size MBS as specified by BT and for compliance with the SCR sustained cell rate. The types of cells passed to leaky bucket 2 depend on how policing is set:

- For policing set to 5, cells bypass both buckets.
- For policing set to 4, leaky bucket 2 sees no traffic.
- For policing set to 2 or 3, the CLP(0) cells are admitted to the network if compliant with BT + CDVT of leaky bucket 2. If not compliant, cells may either be tagged (policing set to 3) or discarded (policing set to 2).
- For policing set to 1, the CLP(0) and CLP(1) cells are admitted to the network if compliant with BT + CDVT of leaky bucket 2. If not compliant, the cells are discarded. There is no tagging option.

Examples

Figure 11-15 shows a VBR connection policing example, with policing set to 4, leaky bucket 1 compliant, and all cells being admitted to the network

Figure 11-15 VBR Connection, Policing = 4, Leaky Bucket 1 Compliant

Connection setup
and compliance status:

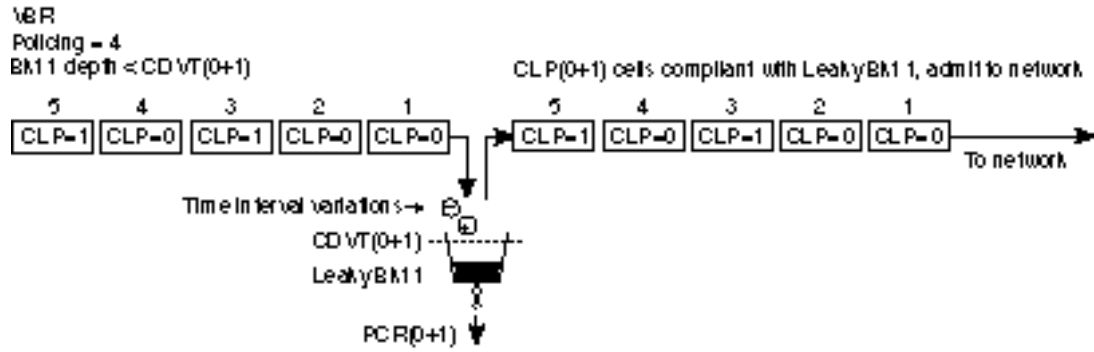


Figure 11-16 shows a VBR connection policing example, with the policing set to 4, and leaky bucket 1 non-compliant which indicates that the connection has exceeded the PCR for a long enough interval to exceed the CDVT (0+1) limit. Non-compliant cells with respect to leaky bucket 1 are discarded.

Figure 11-16 VBR Connection, Policing = 4, Leaky Bucket 1 Non-Compliant

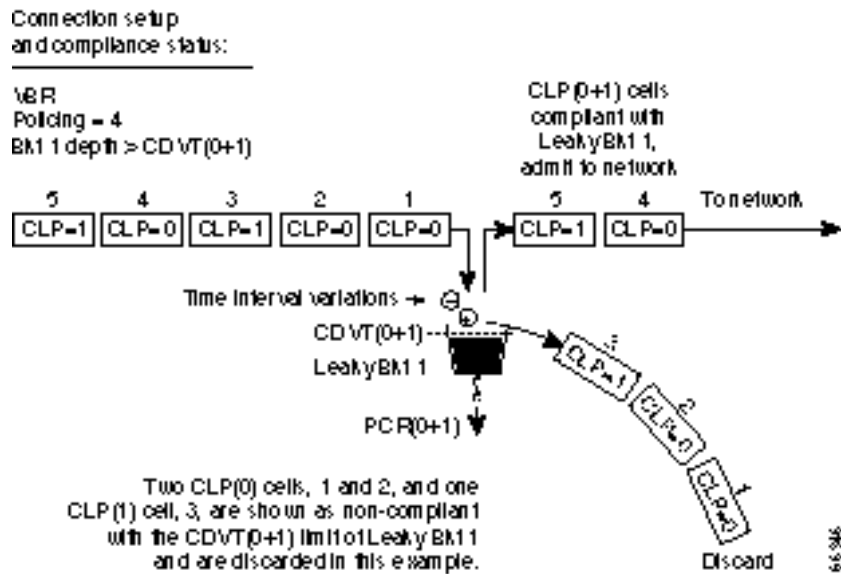


Figure 11-17 shows a VBR.2 connection policing example, with policing = 2, and both buckets compliant. Leaky bucket two is policing the CLP(0) cell stream for conformance with maximum burst size MBS (as specified by BT), and for compliance with the SCR sustained cell rate.

Figure 11-17 VBR.2 Connection, Policing = 2, with Buckets 1 and 2 Compliant

Connection setup
and compliance status:

VBR.2
Policing = 2
BK1 depth \leq CDVT(0+1)
BK2 depth \leq BT + CDVT

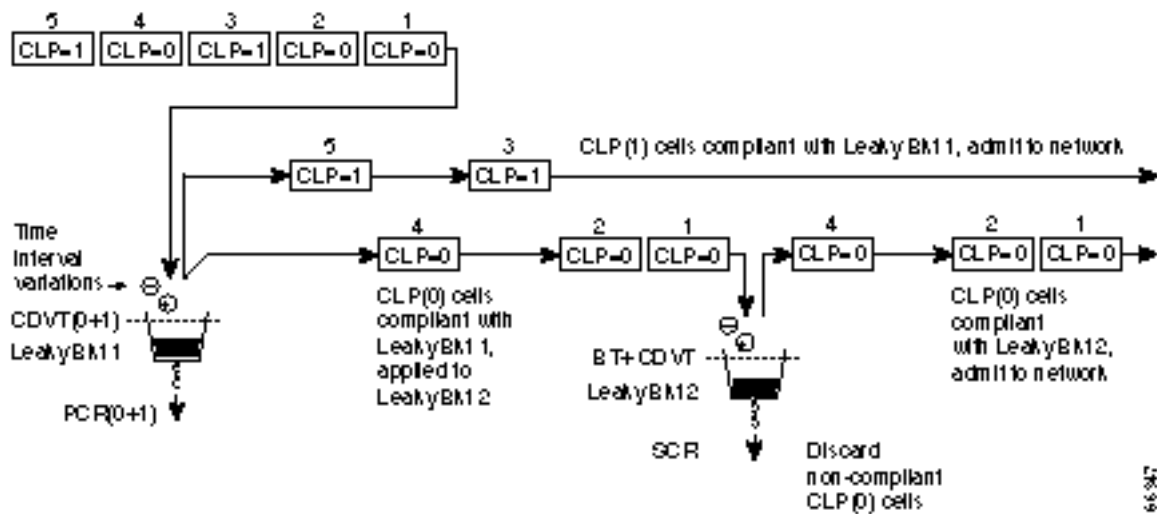
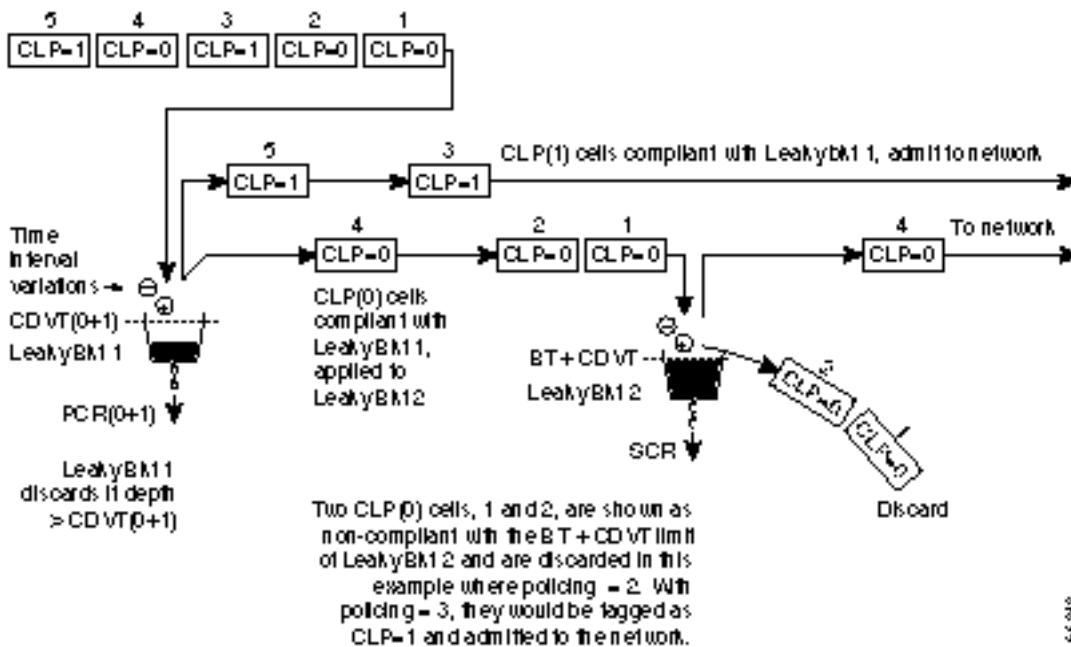


Figure 11-18 shows a VBR.2 connection policing example, with policing set to 2, and leaky bucket 2 non-compliant. Leaky bucket 2 is shown policing the CLP(0) cell stream for conformance with maximum burst size MBS (as specified by BT), and for compliance with SCR (sustained cell rate). In this example (policing set to 2), CLP tagging is not enabled, so the cells that have exceeded the BT + CDVT limit are discarded. In the example, either the sustained cell rate could have been exceeded for an excessive interval, or a data burst could have exceeded the maximum allowed burst size.

Figure 11-18 VBR.2 Connection, Leaky Bucket 2 Discarding CLP (0) Cells

Connection setup
and compliance status:

VBR.2
Policing = 2
BM1 depth < CDVT(0+1)
BM2 depth > BT + CDVT



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Figure 11-19 shows a VBR.1 connection policing example, with policing set to 1, and both buckets compliant. Leaky bucket 1 is policing the CLP (0+1) cell stream for conformance with the PCR limit. Leaky bucket 2 is policing the CLP (0+1) cell stream for conformance with CDVT plus maximum burst size MBS (as specified by BT), and for compliance with SCR sustained cell rate.

Figure 11-19 VBR.1 Connection, Policing = 1, with Buckets 1 and 2 Compliant

Connection setup
and compliance status:

VBR.1
Policing = 1
BM1 depth < CDVT(0+1)
BM2 depth < BT + CDVT

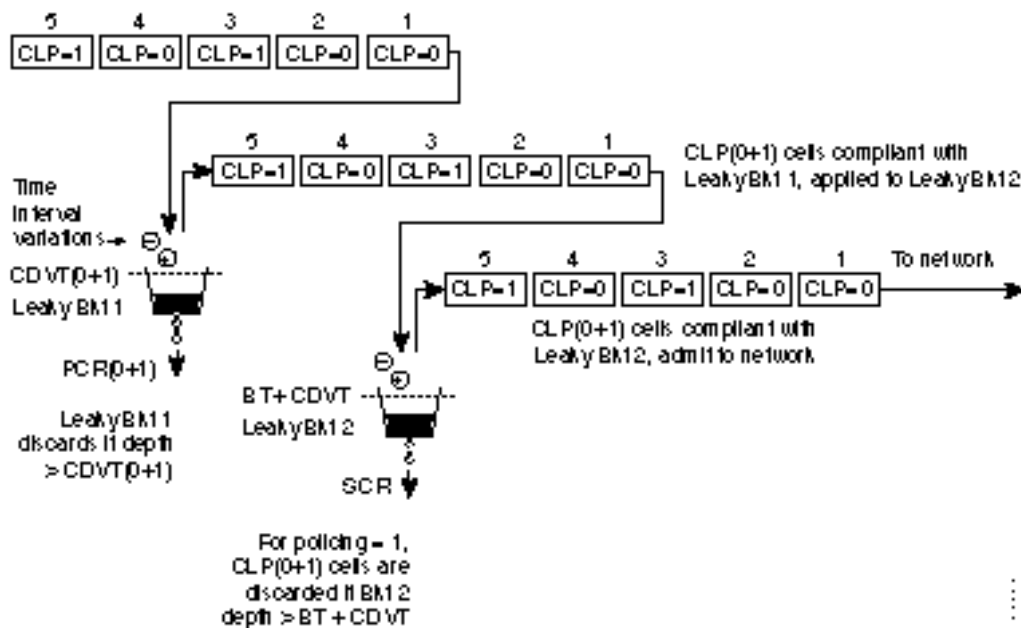
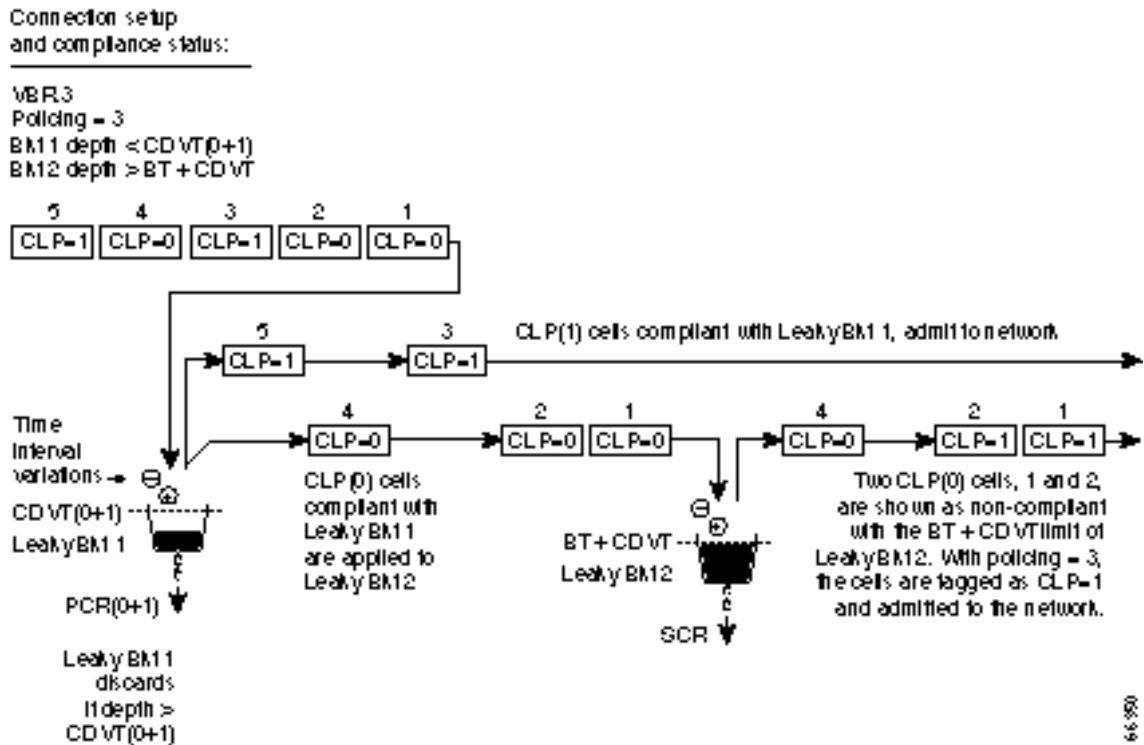


Figure 11-20 shows a VBR.3 connection policing example, with policing set to 3, and Leaky bucket 2 shown as non-compliant. Leaky bucket 2 is shown policing the CLP(0) cell stream for conformance with maximum burst size MBS (as specified by BT), and for compliance with SCR sustained cell rate. For the policing = 3 selection, CLP tagging is enabled, so the cells that have exceeded the BT + CDVT(0+1) limit are tagged as CLP=1 cells and admitted to the network. In this example, either the sustained cell rate could have been exceeded for an excessive interval, or a data burst could have exceeded the maximum burst size allowed.

Figure 11-20 VBR.3 Connection, Policing = 3, with Bucket 2 non-compliant



ABR Connection Policing

Available Bit Rate (ABR) connections are policed the same as the VBR connections, but in addition use either the ABR Standard with VSVD congestion flow control method or the ForeSight option to take advantage of unused bandwidth when it is available.

UBR Connection Policing

The contract for a unspecified bit rate connection is similar to the ABR connection service for bursty data. However, UBR traffic is delivered only when there is spare bandwidth in the network.

When a connection is added, a VPI.VCI address is assigned, and UPC parameters are configured for the connection. For each cell in an ATM stream, the VPI.VCI addresses are verified and each cell is checked for compliance with the UPC parameters as shown in Figure 11-21.

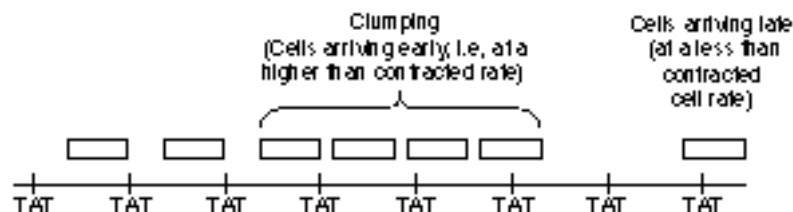
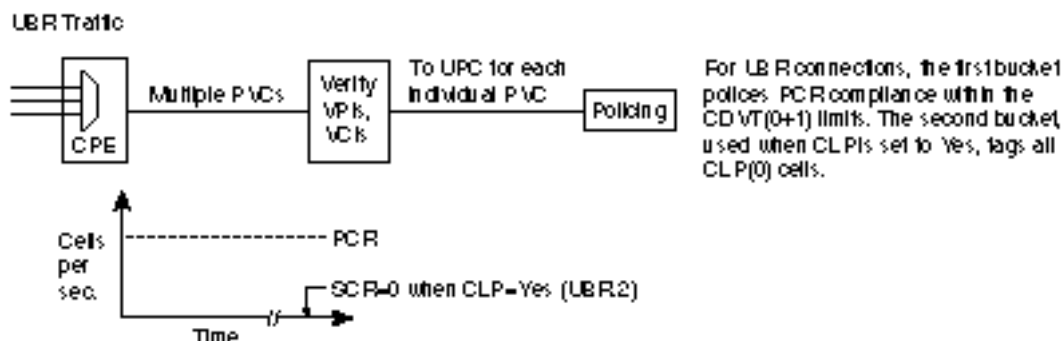
Leaky Bucket 1

Leaky bucket 1 polices the UBR connection for PCR compliance. When CLP=No (UBR.1), all cells that are compliant with leaky bucket 1 are applied to the network. However, these cells are treated with low priority in the network with % utilization default of 1%.

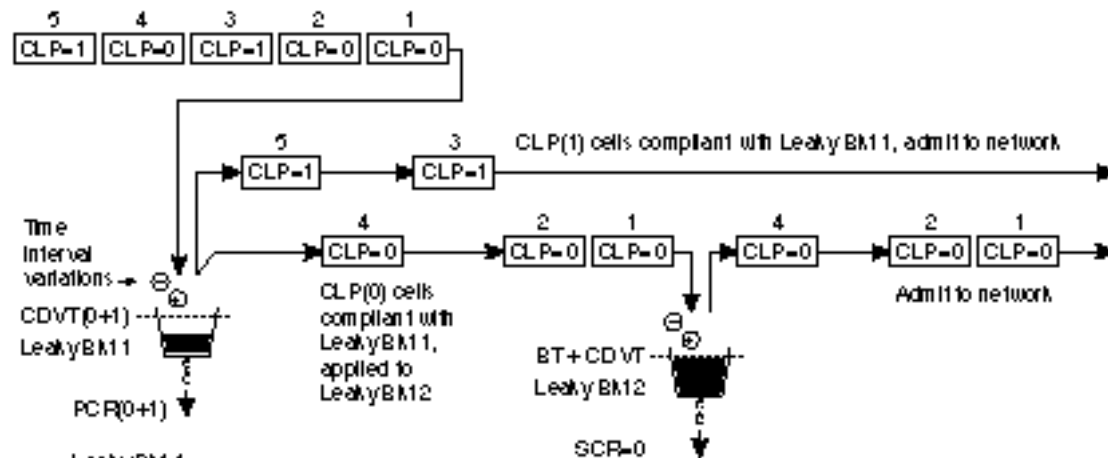
Leaky Bucket 2

When CLP=Yes (UBR.2), CLP(0) cells that are compliant with leaky bucket 1 are sent to leaky bucket 2. Since SCR=0 for leaky bucket 2, the bucket is essentially always full, and all the CLP(0) cells sent to leaky bucket 2 are therefore tagged with CLP being set to 1. This allows the network to recognize these UBR cells as lower priority cells and available for discard in the event of network congestion.

Figure 11-21 UBR Connection, UPC Overview



CLP(0+1) cells to LeakyBM1



For CLP = No, (i.e., UBR1), LeakyBM2 sees no traffic.

For CLP = Yes, (i.e., UBR2), CLP(0) cells that were compliant with LeakyBM1 are sent to LeakyBM2. Since SCR=0 for LeakyBM2, the bucket is essentially always full, and all cells are therefore tagged with CLP being set to 1. This allows the network to recognize these UBR cells as lower priority and available for discard in the event of network congestion.

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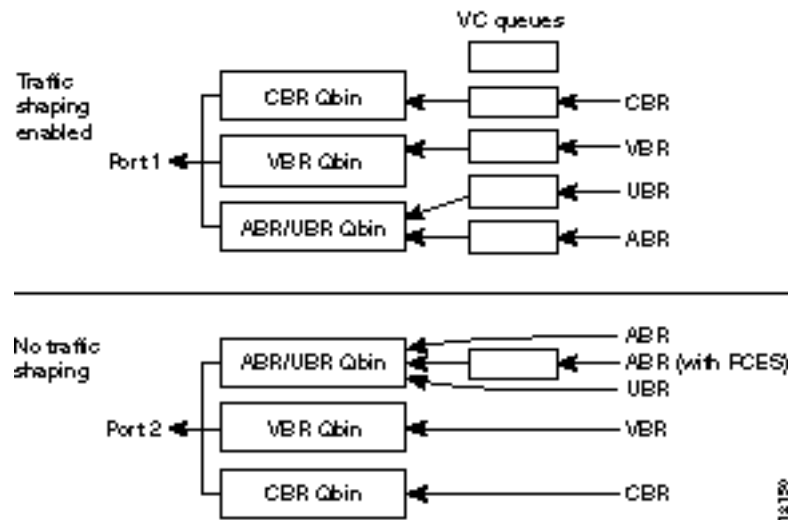
Traffic Shaping for CBR, VBR, and UBR

With the introduction of traffic shaping for CBR, VBR, and UBR, the user has the option to provide traffic shaping for these connection types on the BXM. Previously, only ABR utilized traffic shaping. Traffic shaping involves passing CBR, VBR, or UBR traffic streams through VC queues for scheduled rate shaping.

Traffic shaping is performed on a per port basis. When traffic shaping is enabled, all traffic exiting the port (out to the network) is subject to VC scheduling based on the parameters configured by the user for the connection.

Figure 11-22 shows an example of traffic shaping. In this example, port 1 is configured to perform traffic shaping. Note that all the ATM cells regardless of class of service pass through the VC queues before leaving the card when traffic shaping is enabled. In the example, port 2 is not configured for traffic shaping, and only the ABR traffic with FCES (flow control external segment) passes through the VC queues.

Figure 11-22 Traffic Shaping Example



Configuration

Traffic shaping is disabled by default. The **cnfport** command is used to enable and disable the function on a per port basis. No connections should be enabled on the port prior to changing the port traffic shaping parameter. If there are existing connections when the port is toggled, then these connections will not be updated unless the card is reset, connections are rerouted, a switchcc occurs, or the user modifies the connection parameters.

Traffic Shaping Rates

Traffic shaping rates are listed in Table 11-8.

Table 11-8 Traffic Shaping Rates

Service Type	MCR	PCR
CBR	PCR	PCR
VBR	SCR * %Util	PCR
UBR	0	PCR
ABR	MCR * % Util	PCR

LMI and ILMI Parameters

The following is a listing of the LMI and ILMI parameters for the ASI and BXM:

For ILMI information, refer to Table 11-9.

Table 11-9 ILMI Parameters

Parameter	Description
VPI.VCI	VCCI for ILMI signaling channel equal 0.16
Polling Enabled	Keep-alive polling
Trap Enabled	VCC change of state traps
Polling Interval	Time between GetRequest polls
Error Threshold	Number of failed entries before ILMI link failure is declared.
Event Threshold	Number of successful polls before ILMI link failure is cancelled.
Addr Reg Enab	SVC Address Registration procedures enabled.

For the LMI information, refer to Table 11-10.

Table 11-10 LMI Parameters

Parameter	Description
VPI.VCI	VCCI for LMI signaling channel equal 0.31
Polling Enable	Keep-alive polling
T393	Status Enquiry timeout value
T394	Update Status timeout value
T396	Status Enquiry polling timer
N394	Status Enquiry retry count
N395	Update Status retry count

Configuration, BXM, PVCs, SVCs, and SPVCs

This chapter includes a brief overview of the BXM card sets and instructions for configuring the BXM. It also describes resource partitioning for the BPX switch. The resource partitioning section provides procedures for UNI port resource partitioning for the BXM and ASI and procedures for NNI or trunk resource partitioning for the BXM and BNI.

The chapter includes the following:

- Tag Switching
- Dynamic Resource Partitioning for SPVCs
- BXM Cards
- User Commands
- Configuring Connections
- Command Line Interface Examples
- Configuring the BPX Switch for SVCs
- Configuring the MGX 8220
- Resource Partitioning

Tag Switching

Starting with switch software release 9.1, the BXM also supports tag switching. Partitions for the BXM can be allocated either between:

- SVCs and PVCs, or
- Tag switching virtual circuits (TVCs) and PVCs.

For information on Tag Switching, refer to *Chapter 13, Configuration, Tag Switching*.

Dynamic Resource Partitioning for SPVCs

Also, for switch software Release 9.1, the BXM card supports dynamic resource partitioning to support the conversion of PVCs to soft permanent virtual circuits (SPVCs). This feature is described in the:

Cisco WAN Service Node Extended Services Processor Installation and Operations for Release 2.2 document.

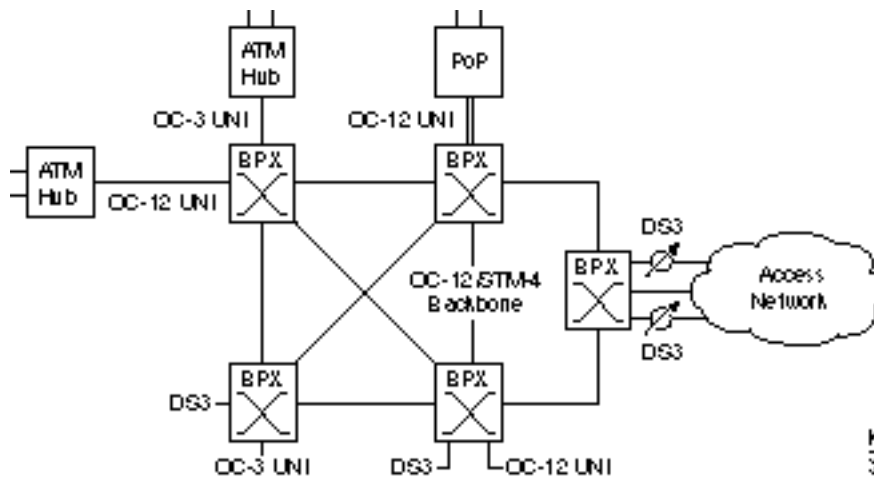
BXM Cards

A BXM card set, using Application Specific Integrated Circuit (ASIC) technology, provides high speed ATM connectivity, flexibility, and scalability. The card set is comprised of a front card that provides the processing, management, and switching of ATM traffic and of a back card that provides the physical interface for the card set. An example of a BPX switch network provisioned with BXM-622 cards is shown in Figure 12-1.

The BXM card group includes the BXM-T3/E3, BXM-155, and BXM-622. These cards may be configured to support either trunk (network) or port (service access) interfaces. The BXM T3/E3 is available in 8 or 12 port versions with T3/E3 interfaces. The BXM-155 is available in 4 or 8 port versions with OC3/STM-1 interfaces. The BXM-622 is available in 1 or 2 port versions with OC-12/STM-4 interfaces. The BXM card sets are compliant with ATM UNI 3.1 and Traffic Management 4.0 including ABR VS/VD and provide the capacity to meet the needs of emerging bandwidth driven applications.

For additional information on ATM Connections, refer to *Chapter 11, Configuration, ATM Connections*.

Figure 12-1 A BPX Switch Network with BXM Cards



The BXM cards are designed to support all the following service classes: Constant Bit Rate (CBR), Variable Bit Rate (VBR), Available Bit Rate (ABR with VS/VD, ABR without VS/VD, and ABR using Foresight), and Unspecified Bit Rate (UBR). ABR with VS/VD supports explicit rate marking and Congestion Indication (CI) control.

All software and administration firmware for the BXM card is downloadable from the BCC and is operated by the BXM on-board sub-system processor.

A BXM card set consists of a front and back card. The BXM T3/E3 is available with a universal BPX-T3/E3 backcard in 8 or 12 port versions. The BXM-OC3 is available with 4 or 8 port multi-mode fiber (MMF), single mode fiber (SMF), or single mode fiber long reach (SMFLR) back cards. The BXM-OC12 is available with 1 or 2 port SMF or SMFLR back cards,

Any of the 12 general purpose slots can be used for the BXM cards. The same backcards are used whether the BXM ports are configured as trunks or lines. Table 12-1 and Table 12-2 list the available front and back card options for the BXM-T3/E3, BXM-155, and BXM-622.

Table 12-1 BXM T3/E3, BXM-155, and BXM 622 Front Card Options

Front Card Model Number	No. of Ports	Cell Buffer (ingress/egress)	Connections per card	Back Cards
T3/E3 (45 Mbps/34Mbps)				
BXM-T3-8	8	100k/130k	16k/32k	BPX-T3/E3-BC
BXM-E3-8	8	100k/130k	16k/32k	BPX-T3/E3-BC
BXM-T3-12	12	100k/230k	16k/32k	BPX-T3/E3-BC
BXM-E3-12	12	100k/230k	16k/32k	BPX-T3/E3-BC
OC3/STM-1 (155.52 Mbps)				
BXM-155-8	8	230k/230k	16k	MMF-155-8 SMF-155-8 SMFLR-155-8
BXM-155-4	4	100k/230k	16K	MMF-155-4 SMF-155-4 SMFLR-155-4
OC12/STM-4 (622.08 Mbps)				
BXM-622-2	2	230k/230k	16K	SMF-622-2 SMFLR-622-2 SMFXLR-622-2
BXM-622	1	130k/230k	16K/32K	SMF-622 SMFLR-622 SMFXLR-622

*The BXM cards can be configured for either, but not both, trunk or service access (UNI) on a card by card basis. Once a card is so configured, all ports are either trunk or service interfaces until the card is reconfigured.

**The BPX-T3/E3-BC universal backcard supports 8 or 12 ports.

Table 12-2 BXM-T3/E3, BXM-155, and BXM-622 Back Cards

Back Card Model Number	No. of Ports	Description	Optical Range (less than or equal to)
T3/E3 (45 Mbps/34 Mbps)			
BPX-T3/E3-BC	8/12	Universal T3/E3 backcard for 8 or 12 port card configurations	n/a
OC3/STM-1 (155.520 Mbps)			
MMF-155-8	8	Multi-Mode Fiber	2km
MMF-155-4	4	Multi-Mode Fiber	2km
SMF-155-8	8	Single-Mode Fiber	20km
SMF-155-4	4	Single-Mode Fiber	20km
SMFLR-155-8	8	Single-Mode Fiber Long Reach	40km
SMFLR-155-4	4	Single-Mode Fiber Long Reach	40km
OC12/STM-4 (622.08 Mbps)			
SMF-622-2	2	Single-Mode Fiber	20km
SMF-622	1	Single-Mode Fiber	20km
SMFLR-622-2	2	Single-Mode Fiber Long Range	40km
SMFLR-622	1	Single-Mode Fiber Long Range	40km

User Commands

This section provides a preliminary summary of configuration, provisioning, and monitoring commands associated with the BXM cards. These commands apply to initial card configuration, line and trunk configuration and provisioning, and connection configuration and provisioning.

New or modified commands include but are not limited to:

Connection Provisioning

- **addcon**-add connection
- **cnfcon**-configure connection
- **dspon**-display connection

Diagnostics

- **addlnloclp**-add local loopback to line
- **addlnlocrmtlp**-add local remote loopback to line
- **dellnlp**-delete local or remote loopback

Test

- **tstconseg**-test connection externally with OAM segment loopback cells
- **tstdelay**-test connection round trip delay

Statistics

- Line and Trunk statistics
 - **cnflnstats**-configure line statistics collection
 - **dsplnstatcnf**-display statistics enabled for a line
 - **dsplnstathist**-display statistics data for a line
 - **cnftrkstats**-configure trunk statistics collection
 - **dsptrkstatcnf**-display statistics enabled for a trunk
 - **dsptrkstathist**-display statistics data for a trunk
- Channel Statistics
 - **cnfchstats**-configure channel statistics collection
 - **dspchstatcnf**-display statistics configuration for a channel
 - **dspchstathist**-display statistics data for a channel
 - **dspchstats**-display channel statistics (multisession permitted)
- Line Statistics
 - **cnfslotalm**-configure slot alarm threshold
 - **dspslotalms**-display slot alarms
 - **clrslotalm**-clear slot alarm
 - **dspsloterrs**-display slot errors
- Statistical Trunk/Line Alarms
 - **cnflnalrm**-configure line alarm threshold
 - **dsplnerrs**-display line errors
 - **dsplnalrmcnf**- display line alarm configuration
 - **clrlnalrm**-clear line alarm

Configuring Connections

Connections are typically provisioned and configured using Cisco StrataView Plus. However, the connections can also be added using the BPX switch command line interface (CLI). This may be appropriate during initial local node setup and when a Strata View Plus workstation is not available.

There are two connection addressing modes supported. The user may enter a unique VPI/VCI address in which case the BPX switch functions as a virtual circuit switch. Or the user may enter only a VPI address in which case all circuits are switched to the same destination port and the BPX switch functions as a virtual path switch in this case. The full ATM address range for VPI and VCI is supported.

Connections are routed between CPE connected to BXM ports. Before adding connections, the BXM is configured for port mode.

Note The initial command to up a trunk (**uptrk**) or to up a line (**upln**) on the BXM card configures all the ports of the card to be either trunks or lines (UNI port access). Following the **uptrk** command at each port, the **addtrk** command is used to activate a trunk for network access.

A line is upped with the **upln** command and configured with the **cnfln** command. Then the associated port is configured with the **cnfport** command and upped with the **upport** command. Following this, the ATM connections are added via the **addcon** command.

The slot number is the BXM card slot on the BPX switch. The port number is one of the ports on the BXM, the VPI is the virtual path identifier, and the VCI is the virtual circuit identifier.

The VPI and VCI fields have significance only to the local BPX switch, and are translated by tables in the BPX switch to route the connection. Connections are automatically routed by the AutoRoute feature once the connection endpoints are specified.

Connections can be either Virtual Path Connections (VPC) or Virtual Circuit Connections (**VCC**). Virtual Path Connections are identified by an * in the VCI field. Virtual Circuit Connections specify both the VPI and VCI fields.

Configuration Management

The following parameters are entered for the BXM **addcon** command. Depending upon the connection type, the user is prompted with appropriate parameters as shown below.

Syntax:

addcon local_addr node remote_addr traffic_type ...extended parameters

Field	Value	Description
local/remote_addr	slot.port.vpi.vci	card slot, port, and desired VCC or VPI connection identifier
node		slave end of connection
traffic_type		type of traffic, chosen from CBR, VBR, ABR, and UBR
extended parameters		parameters associated with each connection type

Note The range of VPIs and VCIs reserved for PVC traffic and SVC traffic is configurable using the **cnfport** command. While adding connections, the system checks the entered VPI/VPC against the range reserved for SVC traffic. If there is a conflict, the **addcon** command fails with the message “VPI/VCI on selected port is reserved at local/remote end”.

Command Line Interface Examples

The following pages have a number of command examples, including configuring BXM lines and trunks and adding connections terminating on BXM cards.

An example of the **uptrk** command for trunk 1 on a BXM in slot 4 of a BPX switch follows:

```
pubsbpx1      TN      SuperUser      BPX 15      9.1      Jan. 11 1998 18:52 GMT

TRK      Type      Current Line Alarm Status      Other End
1.1      T3      Clear - OK      pubsax11 (AXIS)
1.3      T3      Clear - OK      pubsipx1/8
4.1      OC3      Clear - OK      -
```

Last Command: uptrk 4.1

Next Command:

Note The initial command to up a trunk (**uptrk**) or to up a line (**upln**) on the BXM card configures all the ports of the card to be either trunks or lines (UNI port access). Following the **uptrk** command at each port, the **addrk** command is used to activate a trunk for network access.

Command Line Interface Examples

An example of the **cnftrk** command for trunk 4.1 of a BXM card follows:

```
pubsbpx1      TN      SuperUser      BPX 15      9.1      Jan. 11 1998 18:50 GMT

TRK 4.1 Config OC3 [353207cps]      BXM slot:      4
Transmit Rate:      353208      Restrict CC traffic: No
Subrate interface:  --      Link type:      Terrestrial
Subrate data rate:  --      Line framing:   STS-3C
Line DS-0 map:      --      coding:         --
Pass sync:          Yes      CRC:            --
Loop clock:         No      recv impedance: --
Statistical Reserve: 1000 cps      cable type:     --
Idle code:          7F hex      length:         --
Max Channels/Port:  256      HCS Masking:    Yes
Connection Channels: 256      Payload Scramble: Yes
Valid Traffic Classes:      Frame Scramble:  Yes
      V,TS,NTS,FR,FST,CBR,VBR,ABR      Virtual Trunk Type: --
SVC Channels:       --      Virtual Trunk VPI: --
SVC Bandwidth:     --      cps      Deroute delay time: 0

This Command: cnftrk 4.1
```

```
Transmit Rate [T2=14490, E3=80000, T3=96000, OC3 = 353208, OC12=1412830](353208)
```

An example of the **addrk** command follows:

```
pubsbpx1      TN      SuperUser      BPX 15      9.1      Jan. 11 1998 18:54 GMT

TRK      Type      Current Line Alarm Status      Other End
1.1      T3      Clear - OK      pubsaxil(Axis)
1.3      T3      Clear - OK      pubsipx1/8
4.1      OC3      Clear - OK      -
```

```
Last Command: dsptrks
```

```
Next Command: addrk 4.1
```


An example of the **upln** command for UNI port access on a BXM card follows:

```
pubsbsp1      TN      YourID:1      BPX 15      9.1      Jan. 11 1998 02:18 GMT

Line   Type   Current Line Alarm Status
3.1    OC3    Clear - OK
3.2    OC3    Clear - OK
3.3    OC3    Clear - OK
5.1    T3     Clear - OK
5.2    T3     Clear - OK
```

Last Command: upln 3.3

Next Command:

Note The initial command to up a trunk (**uptrk**) or to up a line (**upln**) on the BXM card configures all the ports of the card to be either trunks or lines (UNI port access). Following the **upln** command at each port, the **uport** command is used to activate a port for UNI access.

An example of the **cnfln** command follows:

```
pubsbsp1      TN      YourID:1      BPX 15      9.1      Jan. 11 1998 02:24 GMT

LN   3.3 Config   OC3   [353208cps]      BXM slot:   3
Loop clock:           No           Idle code:           7F hex

Line framing:         --
coding:               --
CRC:                  --
recv impedance:      --
E1 signalling:        --
encoding:              --
T1 signalling:        --
                    cable type:      --
                    length:          --
                    HCS Masking:      Yes
                    Payload Scramble:  Yes
                    Frame Scramble:    Yes
                    Cell Framing:     STS-3C

56KBS Bit Pos:       --
pct fast modem:      --
```

This Command: cnfln 3.3

Loop clock (N):

An example of the **cnfport** command for port 3 of a BXM card in slot 3 follows:

```
pubsbpx1      TN      YourID:1      BPX 15      9.1      Jan. 11 1998 02:25 GMT

Port:         3.3      [INACTIVE]
Interface:    LM-BXM
Type:         UNI
Speed:        353208 (cps)
Shift:        SHIFT ON HCF (Normal Operation)
VBR Queue Depth: 5000

%Util Use:    Disabled

Protocol:     NONE
SVC Channels: 0
SVC VPI Min: 0
SVC VPI Max: 0
SVC Bandwidth: 0 (c/s)
```

This Command: `cnfport 3.3`

NNI Cell Header Format? [N]:

An example of the **cnfportq** command follows:

```
pubsbpx1      TN      YourID:1      BPX 15      9.1      Jan. 11 1998 02:27 GMT

Port:         3.3      [INACTIVE]
Interface:    LM-BXM
Type:         UNI
Speed:        353208 (cps)

SVC Queue Pool Size: 0
CBR Queue Depth: 600
CBR Queue CLP High Threshold: 80%
CBR Queue CLP Low Threshold: 60%
CBR Queue EFCI Threshold: 80%
VBR Queue Depth: 5000
VBR Queue CLP High Threshold: 80%
VBR Queue CLP Low Threshold: 60%
VBR Queue EFCI Threshold: 80%
ABR Queue Depth: 20000
ABR Queue CLP High Threshold: 80%
ABR Queue CLP Low Threshold: 60%
ABR Queue EFCI Threshold: 80%
```

This Command: `cnfportq 3.3`

SVC Queue Pool Size [0]:

An example of the **upport** command follows:

```
pubsbpx1      TN      YourID:1      BPX 15      9.1      Jan. 11 1998 02:28 GMT

Port:        3.3      [ACTIVE  ]
Interface:    LM-BXM
Type:        UNI      %Util Use:      Disabled
Speed:       353208 (cps)
Shift:       SHIFT ON HCF (Normal Operation)
VBR Queue Depth: 5000

Protocol:    NONE
SVC Channels:      0
SVC VPI Min:      0
SVC VPI Max:      0
SVC Bandwidth:    0 (c/s)
```

Last Command: upport 3.3

Next Command:

An example of the **cnfcls** command for class 1 follows:

```
pubsbpx1      TN      YourID:1      BPX 15      9.1      Jan. 11 1998 02:31 GMT

                        ATM Connection Classes
Class: 1
  PCR(0+1)    % Util      MCR      CDVT(0+1)      AAL5 FBTC FST  VSVD
96000/96000  100/100 96000/96000  10000/10000      n      n      n
Description: "Default ABR 96000"
```

This Command: cnfcls 1

Enter class type (VBR, CBR, UBR, ABR, ATFR):

Command Line Interface Examples

An example of the **cnfcls** command for class 2 follows:

```
pubsbpx1      TN      YourID:1      BPX 15      9.1      Jan. 11 1998 02:33 GMT

                        ATM Connection Classes

Class: 2                                Type: VBR
  PCR(0+1)    % Util    CDVT(0+1)    AAL5 FBTC    SCR
1000/1000    100/100    10000/10000    n            1000/1000

  MBS          Policing
1000/1000          3

Description: "Default VBR 1000 "
```

This Command: cnfcls 2

Enter class type (VBR, CBR, UBR, ABR, ATFR):

An example of the **addcon** command for a VBR connection 3.1.105.55 that originates at port 1 of a BXM card in slot 3 follows:

```
pubsbpx1      TN      YourID:1      BPX 15      9.1      Jan. 11 1998 02:39 GMT

From          Remote      Remote      State  Type      Route
3.1.105.55    NodeName    Channel      Ok     vbr      Avoid COS 0
3.1.105.55    pubsbpx1    3.2.205.65   Ok     vbr
3.2.201.61    pubsbpx1    3.1.101.51   Ok     abr
3.2.201.62    pubsbpx1    3.1.101.52   Ok     abr
3.2.203.63    pubsbpx1    3.1.103.53   Ok     abr
3.2.204.64    pubsbpx1    3.1.104.54   Ok     abr
3.2.205.65    pubsbpx1    3.1.105.55   Ok     vbr
5.1.30.120    pubsbpx1    5.2.60.240   Ok     abr
5.1.31.121    pubsbpx1    5.2.61.241   Ok     abr
5.1.32.122    pubsbpx1    5.2.62.242   Ok     abr
5.1.33.123    pubsbpx1    5.2.63.242   Ok     abr
5.2.60.240    pubsbpx1    5.1.30.120   Ok     abr
5.2.61.241    pubsbpx1    5.1.31.121   Ok     abr
5.2.62.242    pubsbpx1    5.1.32.122   Ok     abr
```

Last Command: addcon 3.1.105.55 pubsbpx1 3.2.205.65 v * * * * *

Next Command:

An example of the **cnfcon** command for a VBR connection 3.1.105.55 follows.

```
pubsbpx1      TN      YourID:1      BPX 15      9.1      Jan. 11 1998 02:41 GMT

Conn: 3.1.105.55      pubsbpx1      3.2.205.65      vbr
Description:

      PCR(0+1)      % Util      CDVT(0+1)      AAL5 FBTC      SCR
      50/50      100/100      250000/250000      n      50/50

      MBS      Policing
      1000/1000      3
```

This Command: `cnfcon 3.1.105.55`

PCR(0+1) [50/50]:

An example of the **addcon** command for an ABR connection follows. In this case, the choice to accept the default parameters was not accepted, and individual parameters were configured for a connection using ABR standard VSVD flow control.

```
pubsbpx1      TN      YourID      BPX 15      9.1      Jan. 11 1998 01:10 GMT

From      Remote      Remote      State      Type      Route
3.1.104.54      RemoteName      Channel      State      Type      Avoid COS O
3.1.104.54      pubsbpx1      3.2.204.64      Ok      abr
3.2.201.61      pubsbpx1      3.1.101.51      Ok      abr
3.2.201.62      pubsbpx1      3.1.101.52      Ok      abr
3.2.203.63      pubsbpx1      3.1.103.53      Ok      abr
3.2.204.64      pubsbpx1      3.1.104.54      Ok      abr
5.1.30.120      pubsbpx1      5.2.60.240      Ok      abr
5.1.31.121      pubsbpx1      5.2.61.241      Ok      abr
5.1.32.122      pubsbpx1      5.2.62.242      Ok      abr
5.1.33.123      pubsbpx1      5.2.63.242      Ok      abr
5.2.60.240      pubsbpx1      5.1.30.120      Ok      abr
5.2.61.241      pubsbpx1      5.1.31.121      Ok      abr
5.2.62.242      pubsbpx1      5.1.32.122      Ok      abr
5.2.63.242      pubsbpx1      5.1.33.123      Ok      abr
```

This Command: `addcon 3.1.104.54 pubsbpx1 3.2.204.64 abr 100/100 95/95 50/50 * e d e d 70/70 * 3 * 80/80 60/60 30/30 65/65 * 100 16 16 32 10 *`

Add these connections (y/n)? `y`

Command Line Interface Examples

An example of the **cnfcon** command for an ABR connection follows:

```
pubsbpx1      TN      YourID:1      BPX 15      9.1      Jan. 11 1998 01:10 GMT
Conn: 3.1.104.54      pubsbpx1      3.2.204.64      abr
Description:
      PCR(0+1)      % Util      MCR      CDVT(0+1)      AAL5 FBTC FST      VSVD
      100/100      95/95      50/50      250000/250000      y      n      y
FCES      SCR      MBS      Policing      VC Qdepth      CLP Hi      CLP Lo      EFCI
n      70/70      1000/1000      3      16000/16000      80/80      60/60      30/30
      ICR      ADTF Trm      RIF      RDF      Nrm      FRTT      TBE
      65/65      1000 100      16      16      32      10      1048320
```

This Command: cnfcon 3.1.104.54

PCR(0+1) [100/100]:

An example of the **cnfabrparm** command follows:

```
pubsbpx1      TN      YourID:1      BPX 15      9.1      Feb. 8 1998 00:21 GMT
ABR Configuration for BXM in slot 3
Egress CI Control : N
ER Stamping      : N
Weighted Queueing : N
```

Last Command: cnfabrparm 3

Next Command:

An example of the **dsplns** command follows:

```
pubsbpx1      TN      YourID      BPX 15      9.1      Feb. 8 1998  00:22 GMT
```

```
Line   Type   Current Line Alarm Status
3.1    OC3    Clear - OK
3.2    OC3    Clear - OK
3.3    OC3    Clear - OK
3.4    OC3    Clear - OK
5.1    T3     Clear - OK
5.2    T3     Clear - OK
```

Last Command: dsplns

Next Command:

Configuring the BPX Switch for SVCs

During the configuration of BPX switch interfaces, you must make sure that the BPX switch IP address, SNMP parameters, and Network IP address are set consistent with your local area network (Ethernet LAN). Use the following BPX switch commands to set these parameters:

- **cnflan**—This is a Super User level command and must be used to configure the BPX switch BCC LAN port IP address and subnet mask.
- **cnfsnmp**—This command is used to configure the SNMP Get and Set community strings for the BPX switch as follows:
 - Get Community String = public
 - Set Community String = private
 - Trap Community String = public.
- **cnfnwip**—This is a Super User level command which is used to configure the virtual IP network (IP relay) among BPX switches.
- **cnfstatmast**—This command is used to define the IP address for routing messages to and from the Statistics Manager in Cisco StrataView Plus.

The use of these commands is covered in the *Cisco WAN Switching Command Reference* or the *Cisco WAN Switching Super User Command Reference*. Super User commands must be used only by authorized personnel, and must be used carefully.

Configuring the MGX 8220

MGX 8220 installation and configuration are covered in the *Cisco MGX 8220 Reference*. During the configuration of BPX switch interfaces, you must make sure that the MGX 8220 IP address is set up consistent with your local area network (Ethernet LAN). Use the following MGX 8220 command to set the proper IP addresses:

cnfifip -ip <ip address> -if <interface type> -msk <subnet mask address> -bc <broadcast address>

The use of this command is covered in the *Cisco MGX 8220 Command Reference*.

Resource Partitioning

Starting with switch software Release 8.4, resources on BPX switch UNI ports and NNI trunks can be divided between SVCs and PVCs. This is known as resource partitioning and is done through the Command Line Interface for the BPX switch and the MGX 8220.

These resources for BXM, ASI, and BNI cards can be partitioned appropriately between SVCs or PVCs.

Tag Switching

Starting with switch software release 9.1, the BXM also supports tag switching. Partitions for the BXM can be allocated either between:

- SVCs and PVCs, or
- Tag switching virtual circuits (TVCs) and PVCs.

For information on Tag Switching, refer to *Chapter 13, Configuration, Tag Switching*.

Dynamic Resource Partitioning for SPVCs

Also, for switch software Release 9.1, the BXM card supports dynamic resource partitioning to support the conversion of PVCs to soft permanent virtual circuits (SPVCs). This feature is described in the *Cisco WAN Service Node Extended Services Processor Installation and Operations for Release 2.2* document.

Summary

This section provides procedures for:

- UNI Port Resource Partitioning, BXM and ASI
- NNI or Trunk Resource Partitioning, BXM and BNI

Note Resource partitioning also has to be done for the line between the ESP ATM NIC and the BXM in the BPX switch. Refer to the *Cisco WAN Service Node Extended Services Processor Installation and Operation for Release 2.2* document.

ASI SVC Resource Partitioning

A BPX switch ATM Service Interface (ASI) card which will support ATM SVCs will have to be added and upped like a standard PVC port. Before adding connections, an ASI line is upped with the **upln** command and configured with the **cnfport** command and upped with the **upport** command. Complete details on using the BPX switch command line interface and applicable commands are described in the *Cisco WAN Switching Command Reference* manuals. These procedures will concentrate on those commands that are specific to SVC resource partitioning.

Before partitioning SVC resources, you must have determined which ASI will support ATM SVCs. The ASI will have to have its resources partitioned to support SVCs. The following resources must be partitioned for each ASI UNI port:

- SVC Channels
- SVC VPI Min
- SVC VPI Max
- SVC Bandwidth
- SVC Queue Depth

To partition the ASI UNI port, follow these steps:

- Step 1** Log in to the BPX switch
- Step 2** Using the **upln** and **upport** commands, up the line and port which are going to be connected to ATM CPE.
- Step 3** Make sure the port is configured as UNI.
- Step 4** Enter the **cnfport <port num>** command, as illustrated in the following example:

Example: ASI cnfport Command

```

spvc21          VT   SuperUser          BPX 15   9.1   Sep. 24 1997 07:49 GMT

Port:           2.1   [ FAILED ]
Interface:      MMF-2
Type:           UNI           %Util Use:      Disabled
Speed:         353208 (cps)
Shift:         SHIFT ON HCF (Normal Operation)
SIG Queue Depth: 10

Protocol:      NONE
SVC Channels:  500
SVC VPI Min:   0
SVC VPI Max:   10
SVC Bandwidth: 300000 (cps)
    
```

This Command: cnfport 2.1

NNI Cell Header Format? [N]:

Virtual Terminal

Note The preceding example displays a screen with the Protocol parameter set to None. If Protocol had been set to LMI or ILMI, the LMI parameters would also appear on the screen. The SVC parameters that need to be configured will remain the same, however.

Step 5 Configure the desired SVC Channels, SVC VPI Min, SVC VPI Max, and SVC Bandwidth as desired.

Step 6 Next configure the SVC Port Queue depth with the **cnfportq** <port num> command shown in the following example:

Example: ASI cnfportq Command

```

spvc21          VT      SuperUser      BPX 15      9.1      Sep. 24 1997 07:50 GMT

Port:          2.1      [ FAILED ]
Interface:     MMF-2
Type:          UNI
Speed:         353208 (cps)

SVC Queue Pool Size:          400
CBR Queue Depth(64-cell blks):16
CBR Queue CLP High Threshold: 80%
CBR Queue CLP Low Threshold:  60%
CBR Queue EFCI Threshold:     80%
VBR Queue Depth(64-cell blks):50
VBR Queue CLP High Threshold: 80%
VBR Queue CLP Low Threshold:  60%
VBR Queue EFCI Threshold:     80%
UBR/ABR Queue Depth(64-cells blks):28
UBR/ABR Queue CLP High Threshold: 80%
UBR/ABR Queue CLP Low Threshold:  60%
UBR/ABR Queue EFCI Threshold:     80%
```

This Command: cnfportq 2.1

SVC Queue Pool Size [400]:

Virtual Terminal

Step 7 Configure the SVC Queue Pool Size with this menu. Other parameters are for PVCs.

Step 8 Repeat SVC resource partitioning for every ASI port that you want to support SVCs in the BPX Switch.

BXM SVC Resource Partitioning

A BXM card used as a UNI port can be configured to support ATM SVCs. The BXM will have to be added and upped like a standard PVC port. The BXM port will have to be upped as a line (upln) to function as a UNI port.

Note The initial command to up a trunk (**uptrk**) or to up a line (**upln**) on the BXM configures all the physical ports on a BXM card to be either trunks or ports. They can not be inter-mixed.

For additional information on using the BPX switch command line interface and applicable commands, refer to the *Cisco WAN Switching Command Reference* manual. These procedures will concentrate on those commands that are specific to SVC resource partitioning.

Before partitioning SVC resources, you must determine which BXM UNI ports will support ATM SVCs. The BXM must have its resources partitioned to support SVCs. The following resources must be partitioned:

- SVC Channels
- SVC VPI Min
- SVC VPI Max
- SVC Bandwidth
- SVC Queue Pool Size.

To partition the BXM port, follow these steps:

- Step 1** Log in to the BPX switch.
- Step 2** Using the upln and upport commands, up the line and port which is going to be connected to ATM CPE.
- Step 3** Make sure the port is configured as UNI.
- Step 4** Enter the **cnfport <port num>** command, shown in the following example:

Example: BXM cnfport Command

```

ins-bpx6      TN      SuperUser      BPX 15      9.1      Sep. 24 1997 07:37 GMT

Port:         13.1      [ACTIVE  ]
Interface:    LM-BXM
Type:         UNI
Speed:        353208 (cps)
Shift:        SHIFT ON HCF (Normal Operation)
SIG Queue Depth: 640

Protocol:     NONE
SVC Channels: 1000
SVC VPI Min:  0
SVC VPI Max:  10
SVC Bandwidth: 300000 (cps)
    
```

This Command: cnfport 13.1

NNI Cell Header Format? [N]:

Step 5 Configure the SVC Channels, SVC VPI Min, SVC VPI Max, and SVC Bandwidth as desired.

Step 6 Next you need to configure the SVC Port Queue depth with the `cnfportq <portnum>` command shown in the following example.

Example: BXM `cnfportq` Command

```

ins-bpx6      TN      SuperUser      BPX 15      9.1      Sep. 24 1997 07:39 GMT

Port:         13.1      [ACTIVE  ]
Interface:    LM-BXM
Type:         UNI
Speed:        353208 (cps)

SVC Queue Pool Size:      5000
CBR Queue Depth:         600
CBR Queue CLP High Threshold: 80%
CBR Queue CLP Low Threshold: 60%
CBR Queue EFCI Threshold: 80%
VBR Queue Depth:         5000
VBR Queue CLP High Threshold: 80%
VBR Queue CLP Low Threshold: 60%
VBR Queue EFCI Threshold: 80%
UBR/ABR Queue Depth:      20000
UBR/ABR Queue CLP High Threshold: 80%
UBR/ABR Queue CLP Low Threshold: 60%
UBR/ABR Queue EFCI Threshold: 30%

```

This Command: `cnfportq 13.1`

SVC Queue Pool Size [5000]:

Step 7 Configure the SVC Queue Pool Size parameter to a value greater than 0 (zero); the default is 0 and needs to be changed for SVCs to operate.

Step 8 Partition the SVC resources for every BXM which is to support ATM SVCs in the BPX switch.

NNI Trunk SVC Resource Partitioning

The BPX switch has two types of trunk cards which may have their resources partitioned to support SVCs.

- BNI
- BXM

Note It is important to reserve the maximum number of channels before SVCs or PVCs are in use, because SVC partitioning parameters may not be changed if any SVC or PVC is in use on the entire card.

BNI Trunk SVC Resource Partitioning

When the BNI is used as a trunk in a BPX switch network, it will have to have its resources partitioned to support SVCs. The BNI is described in the *Cisco BPX 8600 Series Reference*. Complete details on using the BPX switch command line interface and applicable commands are described in the *Cisco BPX 8600 Series Reference and WAN Switching Command Reference manuals*. These procedures will concentrate on those commands that are specific to SVC resource partitioning.

The following BNI trunk resources must be partitioned for SVCs:

- SVC Channels
- SVC VPI Min
- SVC VPI Max
- SVC Bandwidth
- SVC Queue Pool Size.

To partition the BNI trunk resources, follow these steps:

- Step 1** Log in to the BPX switch
- Step 2** Up the trunk with **uptrk <trunk_num>** command.
- Step 3** Enter the **cnftrk <trk num>** command as shown in the following example:

Example: BNI cnftrk Command

```

swongl35      VT      SuperUser      BPX 15      9.1      Sep. 24 1997 07:42 GMT

TRK 5.1 Config T3      [96000 cps]      BNI-T3 slot: 5
Transmit Rate:      96000      Line framing:      PLCP
Subrate data rate:  --      coding:      --
Line DS-0 map:      --      CRC:      --
Statistical Reserve: 1000 cps      rcv impedance:  --
Idle code:      7F hex      cable type:
Max Channels/Port:  --      length:      0-225 ft.
Connection Channels: 1771      Pass sync:      Yes
Traffic: V,TS,NTS,FR,FST,CBR,VBR,ABR      Loop clock:      No
SVC Vpi Min:      --      HCS Masking:      Yes
SVC Channels:      --      Payload Scramble:  No
SVC Bandwidth:      -- cps      Frame Scramble:  --
Restrict CC traffic: No      Virtual Trunk Type:  --
Link type:      Terrestrial      Virtual Trunk VPI:  --
Routing Cost:      10      Deroute delay time: 0 seconds

This Command: cnftrk 5.1

Stat Reserve (1000):

Virtual Terminal
    
```

- Step 4** Configure the SVC Vpi Min, SVC Channels, and SVC Bandwidth as desired.
- Step 5** Next configure the SVC Queue depth with **cnftrkparms <trunk_num>** command shown in the following example:

Example: BNI cnftrkparm Command

```

swongl35      VT      SuperUser      BPX 15      9.1      Sep. 24 1997 07:44 GMT

TRK 5.1 Parameters
 1 Q Depth - Voice      [ 242] (Dec)      15 Q Depth - CBR      [ 600] (Dec)
 2 Q Depth - Non-TS     [ 360] (Dec)      16 Q Depth - VBR      [ 1000] (Dec)
 3 Q Depth - TS         [ 1000] (Dec)     17 Q Depth - ABR      [ 9070] (Dec)
 4 Q Depth - BData A    [ 1000] (Dec)     18 Low CLP - CBR      [ 100] (%)
 5 Q Depth - BData B    [ 8000] (Dec)     19 High CLP - CBR     [ 100] (%)
 6 Q Depth - High Pri   [ 1000] (Dec)     20 Low CLP - VBR      [ 100] (%)
 7 Max Age - Voice      [ 20] (Dec)       21 High CLP - VBR     [ 100] (%)
 8 Red Alm - I/O (Dec)  [ 2500 / 15000]  22 Low CLP - ABR      [ 60] (%)
 9 Yel Alm - I/O (Dec) [ 2500 / 15000]  23 High CLP - ABR     [ 80] (%)
10 Low CLP - BData A    [ 100] (%)        24 EFCN - ABR         [ 30] (%)
11 High CLP - BData A   [ 100] (%)        25 SVC Queue Pool Size [ 0] (Dec)
12 Low CLP - BData B    [ 25] (%)
13 High CLP - BData B   [ 75] (%)
14 EFCN - BData B       [ 30] (Dec)

```

This Command: cnftrkparm 5.1

Which parameter do you wish to change:

Virtual Terminal

- Step 6** Configure the SVC Queue Pool Size as desired.
- Step 7** Partition the SVC resources for all the other BNIs in your BPX switch. This includes the BNI that is used to connect an MGX 8220 shelf to a BPX switch when they are to be used for SVC connections.

BXM Trunk SVC Resource Partitioning

When the BXM is used as a trunk in a BPX switch network, it needs to have its resources partitioned to support SVCs. The BXM card will have to be upped as a trunk (**uptrk**).

Note The initial command to up a trunk (**uptrk**) or to up a line (**upln**) on the BXM configures all the physical ports on the card to be either lines or trunks. They can not be inter-mixed.

For additional information on using the BPX switch command line interface and applicable commands refer to the *Cisco WAN Switching Command Reference* manual. In addition, the *Cisco System Overview* provides conceptual information about ATM connections and services. These procedures concentrate on those commands that are specific to SVC resource partitioning.

The following BXM trunk resources must be partitioned for SVCs:

- SVC Channels
- SVC Bandwidth
- SVC Queue Pool Size.

To partition the BXM trunk resources for SVCs, follow these steps:

- Step 1** Log in to the BPX switch
- Step 2** Make sure the BXM has been upped as a trunk with **uptrk <trunk_num>** command.
- Step 3** Enter the **cnftrk <trk num>** command, shown in the following example:

Example: BXM cnftrk Command

```

ins-bpx6      TN      SuperUser      BPX 15      9.1      Sep. 24 1997 07:45 GMT

TRK 3.1 Config  OC3  [304301cps]      BXM slot:      3
Transmit Rate:      353208      Line framing:      STS-3C
Subrate data rate:  --      coding:      --
Line DS-0 map:      --      CRC:      --
Statistical Reserve: 1000 cps      recv impedance:  --
Idle code:      7F hex      cable type:      --
Max Channels/Port:  256      length:      --
Connection Channels: 256      Pass sync:      Yes
Traffic:  V,TS,NTS,FR,FST,CBR,VBR,ABR      Loop clock:      No
SVC Vpi Min:      0      HCS Masking:      Yes
SVC Channels:      2000      Payload Scramble:  Yes
SVC Bandwidth:      300000 cps      Frame Scramble:      Yes
Restrict CC traffic: No      Virtual Trunk Type:  --
Link type:      Terrestrial      Virtual Trunk VPI:  --
Routing Cost:      10      Deroute delay time: 0 seconds

This Command: cnftrk 3.1

Stat Reserve (1000):

```

- Step 4** Configure the SVC Vpi Min, SVC Channels and SVC Bandwidth as desired.
- Step 5** Next configure the SVC Queue depth with **cnftrkparms <trunk_num>** command shown in the following example:

Example: BXM cnftrkparm Command

```

ins-bpx6      TN      SuperUser      BPX 15      9.1      Sep. 24 1997 07:46 GMT

TRK 3.1 Parameters
1 Q Depth - Voice      [ 885] (Dec)      15 Q Depth - CBR      [ 600] (Dec)
2 Q Depth - Non-TS     [ 1324] (Dec)     16 Q Depth - VBR      [ 5000] (Dec)
3 Q Depth - TS         [ 1000] (Dec)     17 Q Depth - ABR      [20000] (Dec)
4 Q Depth - BData A    [10000] (Dec)     18 Low CLP - CBR      [ 100] (%)
5 Q Depth - BData B    [10000] (Dec)     19 High CLP - CBR     [ 100] (%)
6 Q Depth - High Pri   [ 1000] (Dec)     20 Low CLP - VBR      [ 100] (%)
7 Max Age - Voice      [ 20] (Dec)       21 High CLP - VBR     [ 100] (%)
8 Red Alm - I/O (Dec)  [ 2500 / 10000]  22 Low CLP - ABR      [ 60] (%)
9 Yel Alm - I/O (Dec) [ 2500 / 10000]  23 High CLP - ABR     [ 80] (%)
10 Low CLP - BData A   [ 100] (%)        24 EFCN - ABR         [ 30] (%)
11 High CLP - BData A [ 100] (%)        25 SVC Queue Pool Size [ 5000] (Dec)
12 Low CLP - BData B   [ 25] (%)
13 High CLP - BData B [ 75] (%)
14 EFCN - BData B     [ 30] (Dec)

This Command: cnftrkparm 3.1

```


- Step 6** Configure the SVC Queue Pool Size as desired.
- Step 7** Partition the SVC resources for all the other BXMs in the BPX switch.

Configuration, Tag Switching

This chapter contains an overview of tag switching and instructions for configuring the BPX 8650 for the tag switching feature:

This chapter contains the following:

- Introduction
- Tag Switching Benefits
- Tag Switching Overview
- Elements in a Tag Switching Network
- Tag Switching Operation at Layer 3
- Tag Switching in an ATM WAN
- Tag Switching and the BPX 8650
- Tag Switching Resource Configuration Parameters
- Requirements
- List of Terms
- Related Documents
- Configuration Management
- Configuration Criteria
- Configuration Example
- Checking and Troubleshooting
- Provisioning and Managing Connections
- Statistics
- Command Reference

Introduction

Tag switching enables routers at the edge of a network to apply simple tags to packets (frames), allowing devices in the network core to switch packets according to these tags with minimal lookup activity. Tag switching in the network core can be performed by switches, such as ATM switches, or by existing routers.

Tag Switching Benefits

For multi-service networks, tag switching enables the BPX switch to provide ATM, frame relay, and IP Internet service all on a single platform in a highly scalable way. Support of all these services on a common platform provides operational cost savings and simplifies provisioning for multi-service providers.

For internet service providers (ISPs) using ATM switches at the core of their networks, tag switching enables the Cisco BPX 8600 series and the Lightstream 1010 ATM switches to provide a more scalable and manageable networking solution than just overlaying IP over an ATM network. Tag switching avoids the scalability problem of too many router peers and provides support for a hierarchical structure within an ISP's network, improving scalability and manageability.

By integrating the switching and routing functions, tag switching combines the reachability information provided by the router function with the traffic engineering optimizing capabilities of the switches.

When integrated with ATM switches, tag switching takes advantage of switch hardware that is optimized to take advantage of the fixed length of ATM cells, and to switch these cells at wire speeds.

Tag Switching Overview

Tag switching is a high-performance, packet (frame) forwarding technology. It integrates the performance and traffic management capabilities of data link layer 2 with the scalability and flexibility of network layer 3 routing.

Tag switching enables switch networks to perform IP forwarding. It is applicable to networks using any layer 2 switching, but has particular advantages when applied to ATM networks. It integrates IP routing with ATM switching to offer scalable IP-over-ATM networks.

Tag switching is based on the concept of label switching, in which packets or cells are assigned short, fixed length labels. Switching entities perform table lookups based on these simple labels to determine where data should be forwarded.

In conventional layer 3 forwarding, as a packet traverses the network, each router extracts all the information relevant to forwarding from the layer 3 header. This information is then used as an index for a routing table lookup to determine the packet's next hop. This is repeated at each router across a network.

In the most common case, the only relevant field in the header is the destination field. However, as other fields could be relevant, a complex header analysis must be done at each router through which the packet travels.

In tag switching the complete analysis of the layer 3 header is performed just once, at the tag edge router at each edge of the network. It is here that the layer 3 header is mapped into a fixed length label, called a tag.

At each router across the network, only the tag needs to be examined in the incoming cell or packet in order to send the cell or packet on its way across the network. At the other end of the network, a tag edge router swaps the label out for the appropriate header data linked to that label.

Elements in a Tag Switching Network

The basic elements in a tag switching network are tag edge routers, tag switches, and a tag distribution protocol as defined in the following:

- Tag edge routers

Tag edge routers are located at the boundaries of a network, performing value-added network layer services and applying tags to packets. These devices can be either routers, such as the Cisco 7500, or multilayer LAN switches, such as the Cisco Catalyst 5000.

- Tag switches

These devices switch tagged packets or cells based on the tags. Tag switches may also support full Layer 3 routing or Layer 2 switching in addition to tag switching. Examples of tag switches include the Cisco LightStream 1010, Cisco BPX 8650, Cisco 7500, and future gigabit router systems from Cisco.

- Tag distribution protocol

The tag distribution protocol (TDP) is used in conjunction with standard network layer routing protocols to distribute tag information between devices in a tag switched network.

Tag Switching Operation at Layer 3

Tag switching operation comprises two major components:

- Forwarding
- Control

Forwarding

The forwarding component is based on label swapping. When a tag switch (or router in a packet context) receives a packet with a tag, the tag is used as an index in a Tag Forwarding Information Base (TFIB). Each entry in the TFIB consists of an incoming tag and one or more sub-entries of the form

```
<outgoing tag, outgoing interface, outgoing link level information>
```

For each sub-entry, the tag switch replaces the incoming tag with the outgoing tag and sends the packet on its way over the outgoing interface with the corresponding link level information.

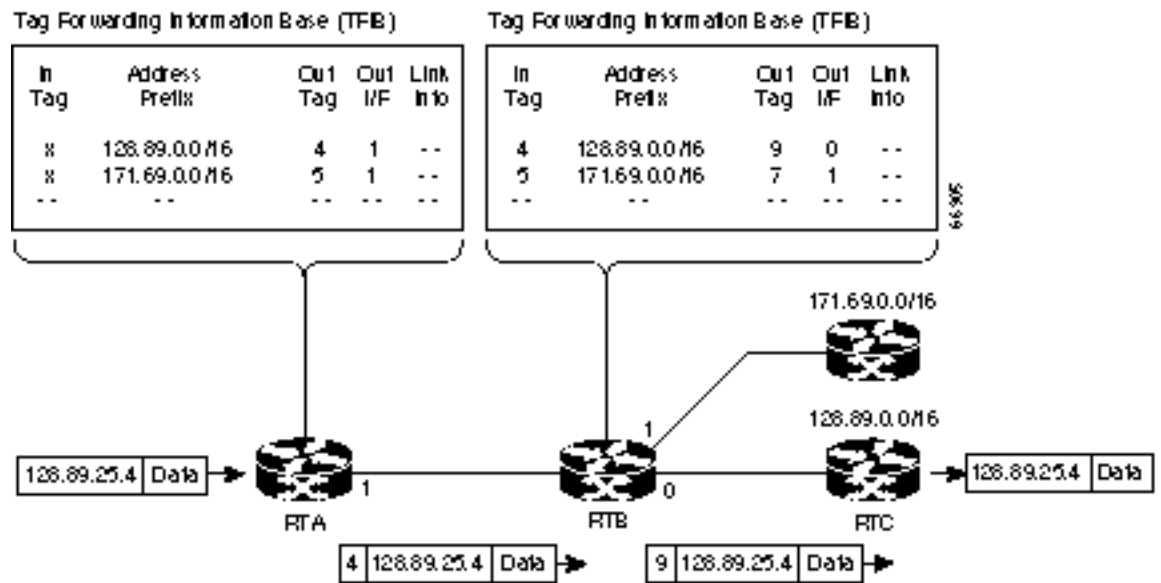
Figure 13-1 shows an example of tag switching. It shows an untagged IP packet with destination 128.89.25.4 arriving at Router A (RTA). RTA checks its TFIB and matches the destination with prefix 128.89.0.0/16. (The /16 denotes 16 network masking bits per the Classless Interdomain Routing (CIDR) standard.) The packet is tagged with an outgoing tag of 4 and sent toward its next hop RTB. RTB receives the packet with an incoming tag of 4 that it uses as an index to the TFIB. The incoming tag of 4 is swapped with outgoing tag 9, and the packet is sent out over interface 0 with the appropriate layer 2 information (e.g., MAC address) according to the TFIB. RTB did not have to do any prefix IP lookup based on the destination as was done by RTA. Instead, RTB used the tag information to do the tag forwarding. When the packet arrives at RTC, it removes the tag from the packet and forwards it as an untagged IP packet.

Control

The control component consists of tag allocation and maintenance procedures. The control component is responsible for creating tag bindings between a tag and IP routes, and then distributing these tag bindings to the tag switches.

The tag distribution protocol (TDP) is a major part of the control component. TDP establishes peer sessions between tag switches and exchanges the tags needed by the forwarding function.

Figure 13-1 Tag Forwarding Information Base (TFIB) in an IP Packet Environment



Tag Switching in an ATM WAN

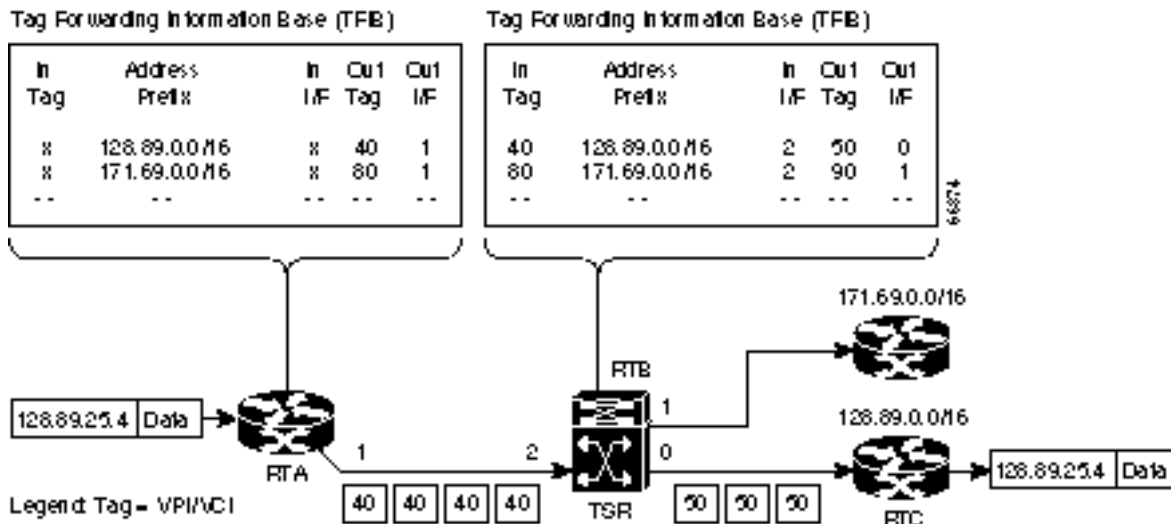
With tag switching over an ATM network, the forwarding and control components can be described as follows:

- **Forwarding:** In an ATM environment, the tag switching forwarding function is carried out identically to normal switching. The tag information needed for tag switching can be carried in the VCI field within one or a small number of VPs. The tags are actually the VCIs.
- **Control:** For the control component over ATM networks, a tag distribution protocol is used to bind VCIs to IP routes. The switch also has to participate in IP routing protocols such as OSPF, BGP, and RSVP.

Forwarding

Figure 13-2 shows the forwarding operation of an ATM switch in which the tags are designated VCIs. In Figure 13-2, an untagged IP packet with destination 128.89.25.4 arrives at router A (RTA). RTA checks its TFIB and matches the destination with prefix 128.89.0.0/16. RTA converts the AAL5 frame to cells, and sends the frame out as a sequence of cells on VCI 40. RTB, which is an ATM Tag Switch Router (TSR) controlled by a routing engine, performs a normal switching operation by switching incoming cells on interface 2/VCI 40 to interface 0/VCI 50

Figure 13-2 Tag Forwarding Information Base (TFIB) in an ATM Environment



Control

ATM-TSRs use the downstream-on-demand allocating mechanism. Each ATM-TSR maintains a forwarding information base (FIB) that contains a list of all IP routes that the ATM-TSR uses. This function is handled by the routing engine function which is either embedded in the switch or runs on an outside controller. For each route in its forwarding information base, the ATM Edge TSR identifies the next hop for a route. It then issues via TDP a request to the next hop for a tag binding for that route.

When the next hop ATM-TSR receives the route, it allocates a tag, creates an entry in its TFIB with the incoming tag changed to the allocated outgoing tag. The next action depends on whether the tag allocation is in an optimistic mode or a conservative mode. In optimistic mode, it will immediately return the binding between the incoming tag and the route to the TSR that sent the request. However, this may mean that it is not immediately able to forward tagged packets which arrive, as the ATM-TSR may not yet have an outgoing tag/VCI for the route. In conservative mode, it does not immediately return the binding, but waits until it has an outgoing tag.

In optimistic mode, the TSR that initiated the request receives the binding information, it creates an entry in its TFIB, and sets the outgoing tag in the entry to the value received from the next hop. The next hop ATM TSR then repeats the process, sending a binding request to its next hop, and the process continues until all tag bindings along the path are allocated.

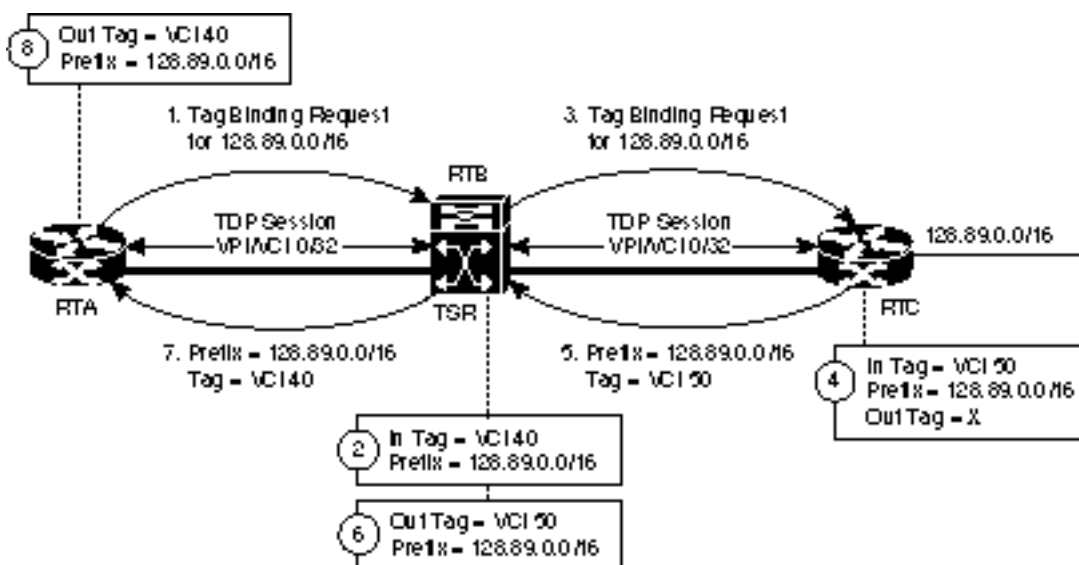
In conservative mode, the next hop TSR sends a new binding request to its next hop, and the process repeats until the destination ATM edge TSR is reached. It then returns a tag binding to the previous ATM-TSR, causing it to return a tag binding, and so on until all the tag bindings along the path are established.

Figure 13-3 shows an example of conservative allocation. ATM edge TSR RTA is an IP routing peer to ATM-TSR RTB. In turn, ATM-TSR RTB is an IP routing peer to ATM-TSR-RTC. IP routing updates are exchanged over VPI/VCI 0/32 between RTA-RTB and RTB-RTC. For example:

- 1 RTA sends a tag binding request toward RTB in order to bind prefix 128.89.0.0/16 to a specific VCI.
- 2 RTB allocates VCI 40 and creates an entry in its TFIB with VCI 40 as the incoming tag.
- 3 RTB then sends a bind request toward RTC.
- 4 RTC issues VCI 50 as a tag.
- 5 RTC sends a reply to RTB with the binding between prefix 128.89.0.0/16 and the VSI 50 tag.
- 6 RTB sets the outgoing tag to VCI 50.
- 7 RTB sends a reply to RTA with the binding between prefix 128.89.0.0/16 and the VCI 40 tag.
- 8 RTA then creates an entry in its TFIB and sets the outgoing tag to VCI 40.

Optimistic mode operation is similar to that shown in Figure 13-3, except that the events labeled 7 and 8 in the figure may occur concurrently with event 3.

Figure 13-3 Downstream on Demand Tag Allocation, Conservative Mode Shown



Tag Switching and the BPX 8650

With tag switching the router function can be accomplished by either integrating the routing engine into the switch or by using a separate routing controller (associated router). The BPX 8650 tag switch combines a BPX switch with a separate router controller (Cisco Series 7200 or 7500 router). This has the advantage of separating the various services (e.g., AutoRoute, SVCs and tag switching) into separate logical spaces that do not interfere with one another. Figure 13-4 shows two scenarios, one in which the IP packets are applied to the network via the edge routers (either part of the BPX 8650 Tag Switches or independent 7500 Tag Edge Routers), and the other where IP packets are routed via a BPX 8620 to a BPX 8650 via Frame Relay permanent virtual circuits (PVCs).

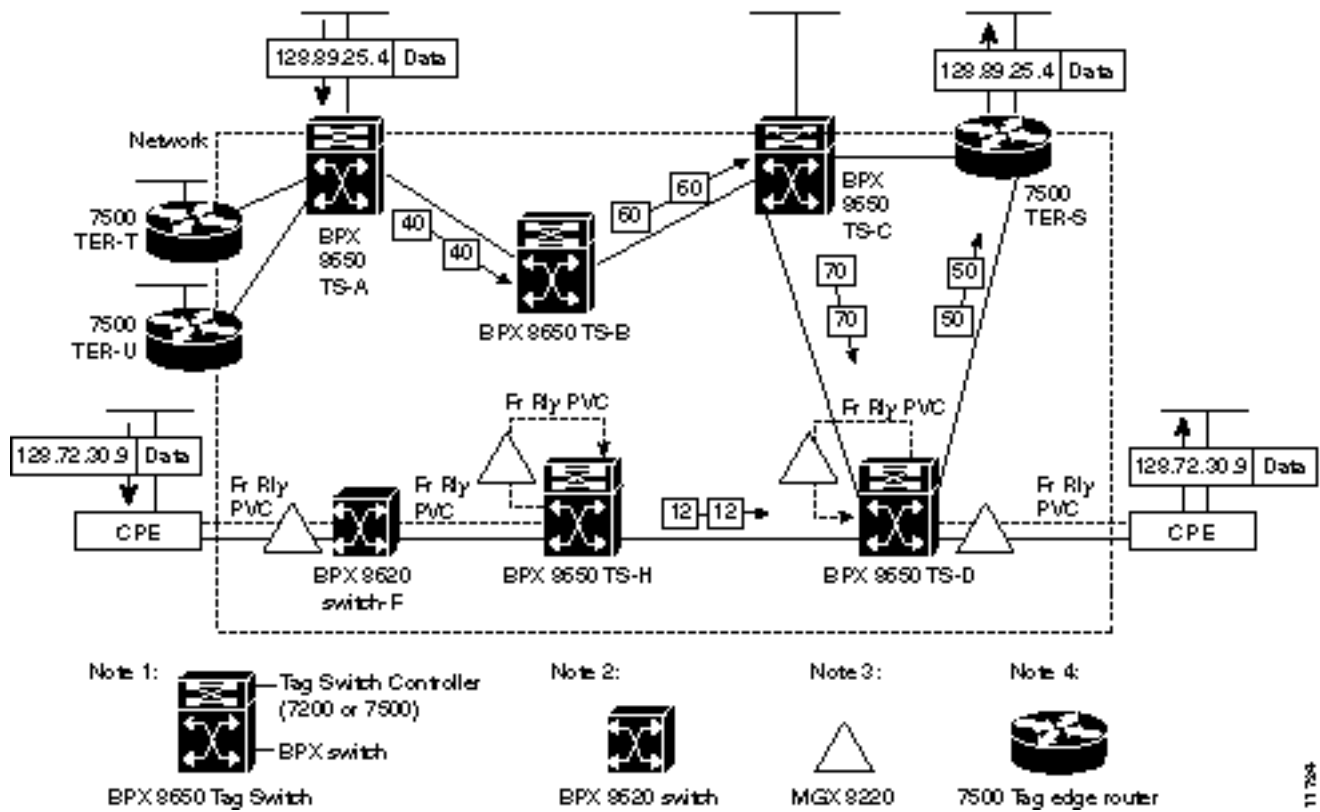
Example 1: An IP packet is applied to the network via BPX 8650s on the edge of the network and then tag switching is used to forward the packet across the network via BPX 8650s. In this example the shortest path is not used, but rather the tag switch connection is routed across BPX 8650 TS-A, BPX 8650 TS-B, BPX 8650 TS-C, BPX 8650 TS-D, and 7500 TER-S. This particular routing path might, for example, have been selected with administrative weights set by the network operator. The designated tags for the cells transmitted across the network in this example are shown as 40, 60, 70, and 50, respectively. The router component of the tag switches that are located at the boundaries of the network (BPX 8650 TS-A, BPX 8650 TS-C, BPX 8650 TS-H), perform edge-routing network layer services including the application of tags to incoming packets. The tag edge routers, 7500 TER-S, 7500 TER-T, and 7500 TER-U, perform the same edge-routing network layer services in this example.

Example 2: An IP packet is routed to BPX 8650 TS-H at the interior of the network via BPX 8620 switch-F, using a Frame Relay PVC. The BPX switch interface for a Frame Relay PVC might be an MGX 8220 as shown. The applicable Frame Relay interface for BPX 8650 TS-H is connected via cable to a Frame Relay interface on its TSC where tag switching is performed on the incoming IP packet. The designated tag switching cells are shown with an tag designation of 12. These tag switching cells are then forwarded to BPX 8650 TS-D where they are converted back to an IP packet and routed to the CPE at the edge of the network as a Frame Relay PVC via an MGX 8220.

Tag Edge Router functionality is necessary to add and remove tags from IP packets, but not to switch tagged packets. Figure 13-4 shows 3 stand-alone Tag Edge Routers (TERs). These would typically be co-located with BPX 8650 Tag Switches in Points of Presence. However the Tag Switch Controller in a BPX 8650 can also act as a TER if required.

In Figure 13-4, Tag Switches A, C, D and H use this combined Tag Switch/Tag Edge Router functionality. Only Tag Switch B acts purely as a Tag Switch. Note also that the Tag Edge Router performance of a BPX 8650 Tag Switch is significantly lower than its Tag Switching performance. Typically there will be several Tag Edge Routers (or combined TSC/TERs) for each BPX Tag Switch.

Figure 13-4 BPX Tag Switching

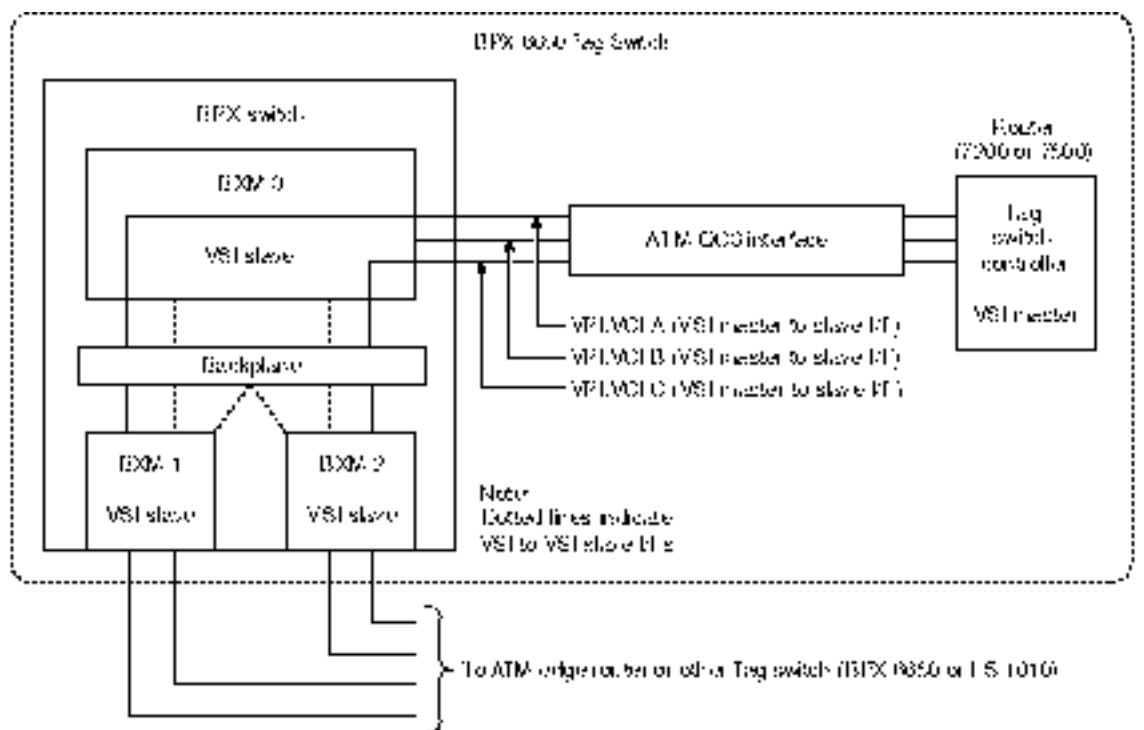


Virtual Switch Interfaces

Figure 13-5 shows how virtual switch interfaces are implemented by the BPX switch in order to facilitate tag switching. A virtual switch interface (VSI) provides a standard interface so that a resource in the BPX switch can be controlled by additional controllers other than the BPX controller card such as a tag switch controller.

The tag switch controller is connected to the BPX switch using ATM T3/E3/OC3 interfaces on the TSC device (a 7200 or 7500 series router) and on a BXM card. The ATM OC3 interface on the 7200 router is provided by an ATM port adapter, on the 7500 router by an AIP or a VIP with ATM Port Adapter, and for the BXM front card by an ATM OC3 4-port or 8-port back card.

Figure 13-5 BPX Switch VSI Interfaces



A distributed slave model is used for implementing VSI in a BPX switch. Each BXM in a BPX switch is a VSI slave and communicates with the controller and other slaves, if needed when processing VSI commands. The VSI master sends a VSI message to one slave. Depending on the command, the slave either handles the command entirely by itself, or communicates with a remote slave to complete the command. For example, a command to obtain configuration information would be processed by one slave only. A command for connection setup would cause the local slave to communicate with the remote slave in order to coordinate with both endpoints of the connection.

Figure 13-6 shows a simplified example of a connection setup with endpoints on the same slave (BXM VSI), and an example of a connection setup with endpoints on different slaves (BXM VSIs) is shown in Figure 13-7.

Figure 13-6 Connection Setup, End Points on same VSI Slave

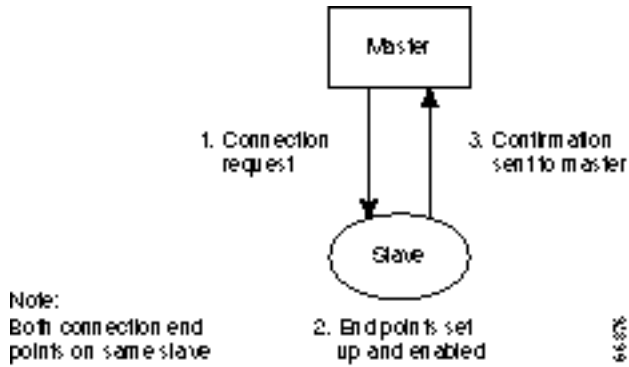
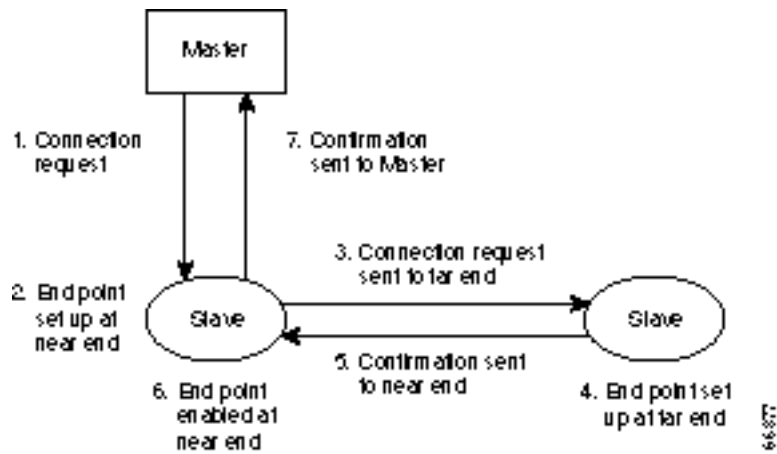


Figure 13-7 Connection Setup, End Points on Different VSI Slaves



Tag Switching Resource Configuration Parameters

This section describes resource partitioning for tag switching. It includes the following:

- Summary
- Configuring VSI LCNS
- Useful Default Allocations
- Details of More Rigorous Allocations

Summary

Most tag switching configuration, including the provisioning of connections, is performed directly by the Tag Switch Controller. This is discussed separately; refer to the *Tag Switching for the Cisco 7500/7200 Series Routers* documentation. Configuration for tag switching on the BPX 8650 itself, consists of basic VSI configuration, including resource partitioning.

The following items need to be configured or checked on the BPX 8650:

- Partitioning

On each interface (port or trunk) on the BXM cards used for tag switching, two sets of resources must be divided up between traditional PVC connections and tag switching connections. The traditional PVC connections are configured directly on the BPX platform, and tag switching connections are set up by the TSC using the VSI. The following resources are partitioned on each interface:

- Bandwidth
- Connections

As with all ATM switches, the BPX switch supports up to a specified number of connections. On the BPX switch, the number of connections supported depends on the number of port/trunk cards installed. On each interface, space for connections is divided up between traditional BPX switch permanent virtual circuit (PVC) connections, and Tag Switching VCs (TVCs). The details of connection partitioning using the **cnfrsrc** command are discussed later in this section.

- Queues for Tag Switching traffic

These should be automatically configured correctly, but it is possible to change the configuration manually. Consequently, the configuration of the queues should be checked as part of the process of enabling tag switching. Configuration of these parameters using the **cnfqbin** command is discussed later in this chapter.

- VSI Control Interface

A trunk must be enabled as VSI control interface, to allow a TSC to be connected. This is done using the **addshelf** command and selecting the VSI option.

Configuring VSI LCNS

In the first release of tag switching, each BXM card supports 16k connections in total, including PVCs, tag switching VSI connections, and connections used for internal signaling.

On the BXM, the ports are grouped into port groups, and a certain number of connections is available to each port group. For example, an 8-port-OC3 BXM has two port groups, consisting of ports 1-4 and 5-8, respectively.

Each port group for the various versions of the BXM cards has a separate connection pool as specified in Table 13-1.

Table 13-1 BXM Port Groups

BXM Card Type	Number of Port Groups	Port Group Size	LCN Limit per Port Group	Average Connections per Port
8-T3/E3	1	8 ports	16k	2048
12-T3/E3	1	12 ports	16k	1365
4-OC3	2	2 ports	8k	4096
8-OC3	2	4 ports	8k	2048
1-OC12	1	1 port	16k	16384
2-OC12	2	1 port	8k	8192

For tag switching, connections are allocated to VSI partitions. On the BPX 8650, for Release 9.1, only one VSI partition is used. In the future, other VSI partitions may be used to support controllers other than the Tag Switch Controller (e.g., 7200 and 7500 series routers). Also, currently there is only one VSI partition per port, but in the future multiple VSI partitions may be assigned to a given port.

When configuring connection partitioning for a BXM card, with one VSI partition per port, a number of connection spaces (LCNs) are assigned to each port as listed in Table 13-2. The **cnfrsrc** command is used to configure partition resources.

Note When the configuring the port using the **cnfrsrc** command, the term LCN is used in place of connection.

Table 13-2 Port Connection Allocations

Connection Type	cnfrsrc cmd parameter	Variable	Description
AutoRoute LCNs	maxpvclns	a(x)	Represents the number of AutoRoute (PVC) LCNs configured for a port.
Minimum VSI LCNs for partition 1	minvsilcns	n ₁ (x)	Represents the guaranteed minimum number of LCNs configured for the port VSI partition. This value is not necessarily always available. Reaching it is dependent on FIFO access to the unallocated LCNs in the port group common pool.
Maximum VSI LCNs for partition 1	maxvsilcns	m ₁ (x)	Represents the maximum number of LCNs configured for the port VSI partition. This value is not necessarily reached. It is dependent on FIFO access to the unallocated LCNs in the port group common pool.

(where x is the port number, and subscript “1” is the partition number)

AutoRoute is guaranteed to have its assigned connection spaces (LCNs) available. Tag switching, uses one connection space (LCN) per Tag VC (TVC). This is usually one connection space (LCN) per source-destination pair using the port where the sources and destinations are tag edge routers.

Beyond the guaranteed minimum number of connection spaces (LCNs) configured for a port VSI partition, a tag switching partition uses unallocated LCNs on a FIFO basis from the common pool shared by all ports in the port group. These unallocated LCNs are accessed only after a port partition has reached its guaranteed minimum limit, “minvsilcns”, as configured by the **cnfrsrc** command.

Useful Default Allocations

Reasonable default values for all ports on all cards are listed in Table 13-3. If these values are not applicable, then other values may be configured using the **cnfrsrc** command.

Table 13-3 Port Connection Allocations, Useful Default Values

Connection Type	Variable	Useful Default Value	cnfrsrc cmd parameter
AutoRoute LCNs	a(x)	256	maxpvclns
Minimum VSI LCNs for partition 1	n ₁ (x)	512	minvsilcns
Maximum VSI LCNs for partition 1	m ₁ (x)	16384	maxvsilcns

Different types of BXM cards support different maximums. If you enter a value greater than the allowed maximum, a message is displayed with the allowable maximum.

Here, a(x) = 256, n₁(x) = 512, and m₁(x) = 16384.

The next section describes more rigorous allocations which may be configured in place of using these default allocations.

Details of More Rigorous Allocations

More rigorous allocations are possible as may be desired when the default values are not applicable. For example, the LCN allocations for a port group must satisfy the following limit:

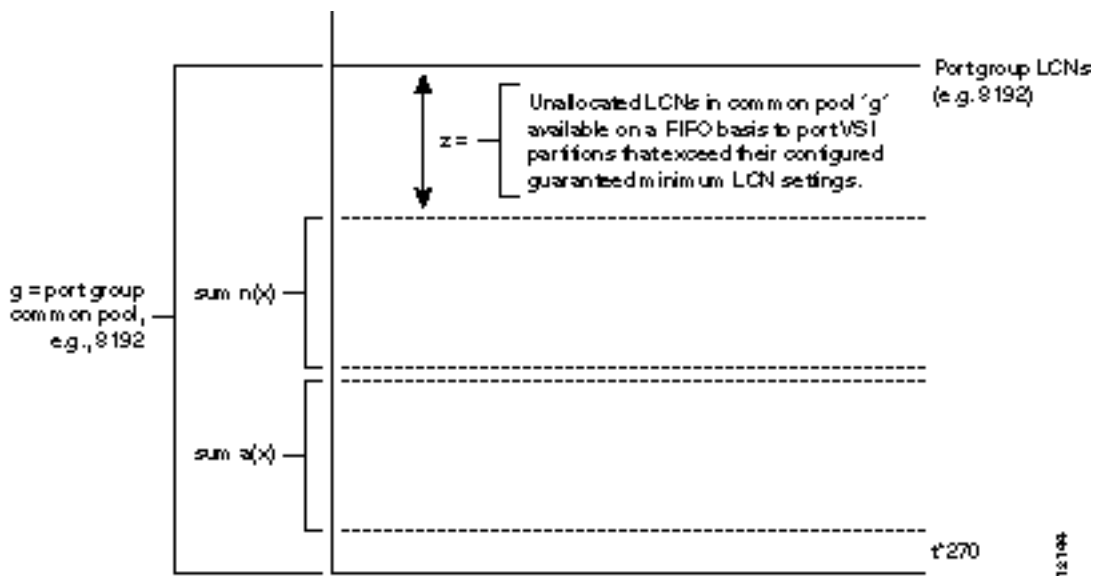
$$\text{sum} (a (x)) + \text{sum} (n_1 (x)) + t * 270 \leq g$$

In this expression, “a (x)” represents AutoRoute LCNs, “n₁ (x)” represents the guaranteed minimum number of VSI LCNs, “t” is the number of ports in the port group that are configured as AutoRoute trunks, and “g” is the total number of LCNs available to the port group. Figure 13-8 shows the relationship of these elements.

The “270” value reflects the number of LCNs which are reserved on each AutoRoute trunk for internal purposes. If the port is configured in port rather than trunk mode, “t” = 0, and t*270 drops out of the expression.

For detailed information on the allocation of resources for VSI partitions, refer to the **cnfrsrc** command description in the section, *Command Reference* in this chapter.

Figure 13-8 Port VSI Partition LCN Allocation Elements



Note Tag switching can operate on a BXM card configured for either trunk (network) or port (service) mode. If a BXM card is configured for port (service) mode, all ports on the card are configured in port (service) mode. If a BXM card is configured for trunk (network) mode, all ports on the card are configured for trunk (network) mode. When the card is configured for trunk mode, the trunks reserve some connection bandwidth.

Requirements

- BCC cards of one of the following versions:
 - BCC-3-64
 - BCC-4-64
 - BCC-4-128
- BPX switches require BXM cards to originate, terminate, or transfer tag switching connections.

List of Terms

The following terms are defined for a tag switching context only, not for general situations:

ATM edge TSR—A tag switching router that is connected to the ATM-TSR cloud through TC-ATM interfaces. The ATM edge TSR adds tags to untagged packets and strips tags from tagged packets.

ATM-TSR—A tag switching router with a number of TC-ATM interfaces. The router forwards the cells from these interfaces using tags carried in the VPI and/or VCI field.

BPX switch—The BPX switch is a carrier quality switch, with trunk and CPU hot standby redundancy.

BPX-TSR—An ATM tag switch router consisting a tag switch controller (series 7200 or 7500 router) and a tag controlled switch (BPX switch).

BXM—Broadband Switch Module. ATM port and trunk card for the BPX switch.

CLI—Command line interface.

extended tag ATM interface—A new type of interface supported by the remote ATM switch driver and a particular switch-specific driver that supports tag switching over an ATM interface on a remotely controlled switch.

external ATM interface—One of the interfaces on the slave ATM switch other than the slave control port. It is also referred to as an exposed ATM interface, because it is available for connections outside of the tag controlled switch.

LCNs—A common pool of logical connection numbers is defined per port group. The partitions in the same port group share these LCNs. New connections are assigned LCNs from the common pool.

master control port—A physical interface on a TSC that is connected to one end of a slave control link.

Ships in the Night (SIN)—The ability to support both tag switching procedures and ATM Forum protocols on the same physical interface, or on the same router or switch platform. In this mode, the two protocol stacks operate independently.

slave ATM switch—An ATM switch that is being controlled by a TSC.

slave control link—A physical connection, such as an ATM link, between the TSC and the slave switch, that runs a slave control protocol such as VSI.

slave control port—An interface that uses a TSC to control the operation of a slave ATM switch (for example, VSI). The protocol runs on the slave control link.

remote ATM switch driver—A set of interfaces that allow IOS software to control the operation of a remote ATM switch through a control protocol, such as VSI.

tag controlled switch—The tag switch controller and slave ATM switch that it controls, viewed together as a unit.

Tag switch controller (TSC)—An IOS platform that runs the generic tag switching software and is capable of controlling the operation of an external ATM (or other type of) switch, making the interfaces of the latter appear externally as TC-ATM interfaces.

tag switching router (TSR)—A Layer 3 router that forwards packets based on the value of a tag encapsulated in the packets.

TC-ATM interface—A tag switching interface where tags are carried in the VPI/VCI bits of ATM cells and where VC connections are established under the control of tag switching control software.

TFIB—Tag Forwarding Information Base (TFIB). A data structure and way of managing forwarding in which destinations and incoming tags are associated with outgoing interfaces and tags.

TVC—Tag switched controlled virtual circuit (TVC). A virtual circuit (VC) established under the control of tag switching. A TVC is not a PVC or an SVC. It must traverse only a single hop in a tag-switched path (TSP), but may traverse several ATM hops only if it exists within a VP tunnel.

VP tunnel—In the context of ATM tag switching, a VP tunnel is a TC-ATM interface that traverses one or more ATM switches that do not act as ATM-TSRs.

VSI—Virtual Switch Interface. The protocol that enables a TSC to control an ATM switch over an ATM link.

VSI slave—In a hardware context, a switch or a port card that implements the VSI. In a software context, a process that implements the slave side of the VSI protocol.

VSI master—In a hardware context, a device that controls a VSI switch (for example, a VSI tag switch controller). In a software context, a process that implements the master side of the VSI protocol.

Related Documents

- *Tag Switching for the Cisco 7500/7200 Series Routers*
- *Cisco BPX 8600 Series Installation and Configuration*
- *Cisco BPX 8600 Series Reference*
- *Cisco WAN Switching Command Reference*

Configuration Management

The BPX switch must be initially installed, configured, and connected to a network. Following this, connections can be added to the BPX switch.

For tag switching, the BPX node must be enabled for tag switching. The BXM cards that will be used to support tag switching connections must also be configured properly, including setting up resources for the tag switching VSIs. In addition, a Tag Switch Controller (7200 or 7500 series router) must be connected to one of the BXM cards configured for tag switching.

Instructions for configuring the BPX switch and BXM cards for tag switching are provided in the next section.

Instructions for configuring the router are provided in the applicable tag switch controller documents, such as the:

- *Tag Switch Controller Documentation*

Configuration Criteria

Tag switching for VSIs on a BXM card is configured using the **cnfrsrc** and **cnfqbin** commands. Qbin 10 is assigned to tag switching.

The cnfqbin Command

The **cnfqbin** command is used to adjust the threshold for the traffic arriving in Qbin 10 of a given VSI interface as away of fine tuning traffic delay.

If the **cnfqbin** command is used to set an existing Qbin to disabled, the egress of the connection traffic to the network is disabled. Re-enabling the Qbin restores the egress traffic.

The cnfrsrc Command

The **cnfrsrc** command is used to enable a VSI partition and to allocate resources to the partition. An example of a **cnfrsrc** command is shown in the following example. If the **cnfrsrc** command is used to disable a partition, those connections are deleted.

```
n4          TN      SuperUser      BPX 15      9.1      Apr. 4 1998 16:40 PST

Port/Trunk : 4.1

Maximum PVC LCNS:          256      Maximum PVC Bandwidth:26000

Min Lcn(1) : 0 Min Lcn(2) : 0
Partition 1

Partition State :          Enabled
Minimum VSI LCNS:          512
Maximum VSI LCNS:          7048
Start VSI VPI:             2
End VSI VPI :              15
Minimum VSI Bandwidth :    26000      Maximum VSI Bandwidth :      100000

Last Command: cnfrsrc 4.1 256 26000 1 e 512 7048 2 15 26000 100000

Next Command:
```

A detailed description of the **cnfrsrc** parameters is provided later in this chapter in the *Command Reference* section under the heading **cnfrsrc**. A brief summary of the parameters and their use is provided in Table 13-4.

Table 13-4 cnfrsrc Parameter Summary

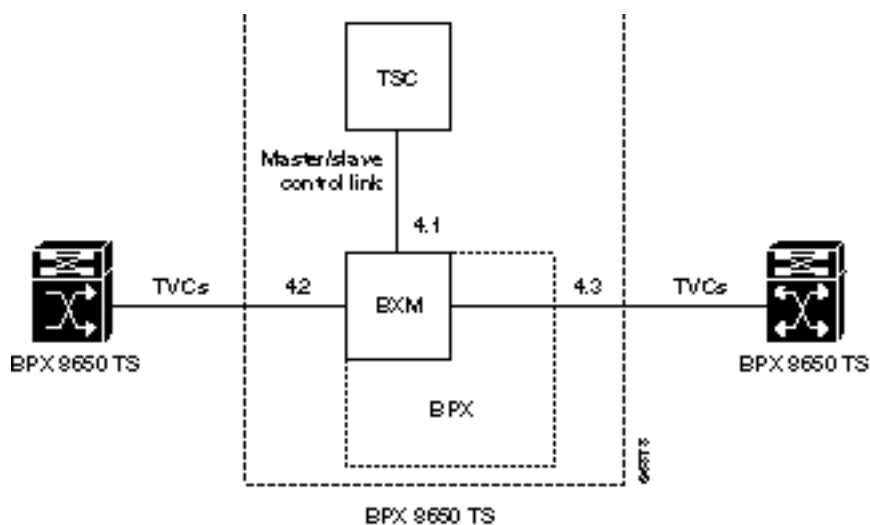
Parameter (cnfrsrc)	Example Value	Description
slot.port	4.1	Specifies the slot and port number for the BXM
maxpvclns	256	The maximum number of LCNs allocated for AutoRoute PVCs for this port.
maxpvcbw	26000	The maximum bandwidth of the port allocated for AutoRoute use.
partition	1	Partition number
e/d	e	enables or disables the VSI partition
minvsilns	512	The minimum number of LCNs guaranteed for this partition.
maxvsilns	7048	The total number of LCNs the partition is allowed for setting up connections. Cannot exceed the port group max shown by The dspcd command.
vsistartvpi	2	Should be set to “2” or higher for ports in trunk mode because “1” is reserved for AutoRoute. For ports in port mode it should be set to “1”. By default the TSC (e.g. 7200 or 7500 series router) will use either a starting VSI VPI of 1 or 2 for tag switching, whichever is available. They default to 1.
vsientdvpi	15	Two VPIs are sufficient for the current release, although it may be advisable to reserve a larger range of VPIs for later expansion, for example, VPIs 2-15.
vsiminbw	26000	The minimum port bandwidth allocated to this partition in cells/sec. Not used in this release. Entered values are ignored.
vsimaxbw	100000	The maximum port bandwidth guaranteed to this partition. The actual bw may be as high as the line rate. This value is used for VSI QBIN bandwidth scaling.

Configuration Example

The following initial configuration example for a BPX tag switching router is with respect to a BXM OC3 card located in slot 4 of the BPX switch, a Tag Switch Controller (e.g., 7500 or 7200 series router) connected to BXM port 4.1, and with connections to two tag switching routers in the network at BXM ports 4.2 and 4.3, respectively, as shown in Figure 13-9.

Note Whether a BXM card operates in trunk or port mode is determined by how the first port is brought up. Once the first port is upped, the following ports can only be upped in the same mode, that is by using either the **uport** or **uptrk** command, as applicable. For tag switching, the BXM may operate in either trunk or port mode.

Figure 13-9 BPX Tag Switching Router with BXM in Slot 4



- Step 1** Log in to the BPX switch.
- Step 2** Check the card status by entering the command:
- ```
dspcds
```
- The card status, for card in slot 4 in this example, should be “standby”.  
If the card status is OK, proceed to step 4, otherwise, proceed to step 3.
- Step 3** If the card does not come up in standby, perform the following actions as required:
- Enter the command
 

```
resetcd 4 h
```
  - If the resetcd command does not work, pull the card and re-insert it.
  - If reseating the card does not work, call Customer Service.

**Step 4** Enter the **dspcd** command to check the port group max that can be entered for the **maxvsilcn** parameter of the **cnfrsrc** command. In this example, the maximum value for a port group is 7048.

```
n4 TN SuperUser BPX 15 9.1 Apr. 4 1998 16:40 PST
```

```
Detailed Card Display for BXM-155 in slot 4
```

```
Status: Active
Revision: CD18
Serial Number: 693313
Fab Number: 28-2158-02
Queue Size: 228300
Support: FST, 4 Pts, OC3, Vc
Chnls:16320, PG[1]:7048, PG[2]:7048
PG[1]:1,2,
PG[2]:3,4,
```

```
Backcard Installed
Type: LM-BXM
Revision: BA
Serial Number: 688284
Supports: 8 Pts, OC3, MMF Md
```

```
Last Command: dspcd 4
```

```
Next Command:
```

**Step 5** On the BXM in slot 4, bring up the ports 4.1, 4.2, and 4.3, as follows:

**Note** The following example enables ports 4.1, 4.2, and 4.3 in trunk mode with the uptrk command, they could also all be upped in port mode using the upport command. This is because tag switching and the VSI make no distinction between a “port” and a “trunk”.

**uptrk 4.1**

**uptrk 4.2**

**uptrk 4.3**

Sample Display:

```

n4 TN SuperUser BPX 15 9.1 Apr. 4 1998 16:39 PST

TRK Type Current Line Alarm Status Other End
2.1 OC3 Clear - OK j4a/2.1
3.1 E3 Clear - OK j6c (AXIS)
5.1 E3 Clear - OK j6a/5.2
5.2 E3 Clear - OK j3b/3
5.3 E3 Clear - OK j5c (IPX/AF)
6.1 T3 Clear - OK j4a/4.1
6.2 T3 Clear - OK j3b/4
4.1 OC3 Clear - OK VSI (VSI)

```

Last Command: uptrk 4.1

Next Command:

**Step 6** Port 4.1 is the slave interface to the tag switch controller. Configure the VSI partitions for port 4.1 as follows:

**cnfrsrc 4.1**

**PVC LCNs: [256] {accept default value}**

**max PVC bandwidth: 26000**

**partition: 1**

**enabled: e**

**VSI min LCNs: 512**

**VSI max LCNs: 7048** {varies with BXM type}

**VSI start VPI: 2**

**VSI end VPI: 15**

**VSI min b/w: 26000**

**VSI max b/w: 100000**

or with one entry as follows:

**cnfrsrc 4.1 256 26000 1 e 512 7048 2 15 26000 100000**

### Sample Display:

```
n4 TN SuperUser BPX 15 9.1 Apr. 4 1998 16:40 PST

Port/Trunk : 4.1

Maximum PVC LCNS: 256 Maximum PVC Bandwidth:26000

Min Lcn(1) : 0 Min Lcn(2) : 0
Partition 1

Partition State : Enabled
Minimum VSI LCNS: 512
Maximum VSI LCNS: 7048
Start VSI VPI: 2
End VSI VPI : 15
Minimum VSI Bandwidth : 26000 Maximum VSI Bandwidth : 100000

Last Command: cnfrsrc 4.1 256 26000 1 e 512 7048 2 15 26000 100000

Next Command:
```

---

**Note** It is possible to have PVCs terminating on the Tag Switch Controller itself, as shown in Figure 13-4. This example reserves approximately 10 Mbps (26000 cells/sec) for PVCs, and allows up to 256 PVCs on the switch port connected to the TSC.

---

---

**Note** The VSI max and min logical connections (LCNs) will determine the maximum number of tag virtual connections (TVCs) that can be supported on the interface. The number of TVCs required on the interface depends on the routing topology of the tag switch.

---

---

**Note** By default the TSC will use either a starting VSI VPI of 1 or 2 for tag switching, whichever is available. If both are available, a starting VSI VPI of 1 is used. The VPI range should be 2-3 on a BPX VSI connected to a 7200 or 7500 AIP. If VPI 2 is not to be used, the tag switching VPI interface configuration command can be used on the TSC to override the defaults

---

---

**Note** The VSI range for tag switching on the BPX switch is configured as a VSI partition, usually VSI partition number 1. VSI VPI 1 is reserved for autoroute, so the VSI partition for tag switching should start at VPI 2. Two VPIs are sufficient for the current release, although it may be advisable to reserve a larger range of VPIs for later expansion, for example, VPIs 2-15.

---

**Step 7** Ports 4.2 and 4.3 are connected to other tag switch router ports in this example and support TVCs across the network. Configure the VSI partitions for ports 4.2 and 4.3 by repeating the procedures in the previous step, but entering 4.2 and 4.3, where applicable.

Maximum VSILCNs (logical connection numbers) determine the number of connections that can be made to each port. For a description of how the LCNs may be assigned to a port, refer to *Configuring VSI LCNS on page 12*.



If the interfaces require other than a max PVC bandwidth of 10 Mbps or require other than a PVC LCN configuration of 256, adjust the configuration accordingly.

**Step 8** For this release, Class of Service buffer 10 is used for tag switching connections. Check the queue buffer 10 configurations for port 4.1 as follows:

**dspqbin 4.1 10**

The qbin configuration should be as shown in the following example:

---

**Note** VC connections are grouped into large buffers called qbins. (per-VC queues can be specified on a connection-by-connection basis also). In this release, all VSI connections use qbin 10 on each interface.

---

Sample Display:

```

Sample Display:
n4 TN SuperUser BPX 15 9.1 Apr. 4 1998 16:41 PST
Qbin Database 4.1 on EXM qbin 10
Qbin State: Enabled
Minimum Bandwidth: 0
Qbin Discard threshold: 65536
Low CLP/EPD threshold: 95%
High CLP/EPD threshold: 100%
EFCI threshold: 40%

This Command: cnfqbin 4.1 10
'E' to Enable, 'D' to Disable [E]:

Next Command:

```

If the qbin is not configured as shown in the example, configure the queues on the ports using the cnfqbin command:

**cnfqbin 4.1 10**

**enable/disable: e**

For all other parameters, accept the (default).

The previous parameters can also be set for qbin 10 as follows:

**cnfqbin 4.1 10 e 0 65536 95 100 40**

Sample Display:

```
Sample Display:

n4 TN SuperUser BPX 15 9.1 Apr. 4 1998 16:41 PST

Qbin Database 4.1 on BXM qbin 10

Qbin State: Enabled
Minimum Bandwidth: 0
Qbin Discard threshold: 65536
Low CLP/EPD threshold: 95%
High CLP/EPD threshold: 100%
EFCI threshold: 40%

Last Command: cnfqbin 4.1 10 e 0 65536 95 100 40

Next Command:
```

**Step 9** Configure the Qbin 10 for ports 4.2 and 4.3 by performing the procedures in the previous step, but entering port 4.2 and 4.3 where applicable.

**Step 10** 5. Add a VSI controller to port 4.1, controlling partition 1

**addshelf 4.1 vsi 1 1**

---

**Note** The second “1” in the addshelf command is a controller ID. Controller IDs must be in the range 1-32, and must be set identically on the TSC and in the addshelf command. A controller id of 1 is the default used by the TSC.

---

Sample Display:

```
n4 TN SuperUser BPX 15 9.1 Apr. 4 1998 16:42 PST

 BPX Interface Shelf Information

Trunk Name Type Alarm
 3.1 j6c AXIS MIN
 5.3 j5c IPX/AF MIN
 4.1 VSI VSI OK

Last Command: addshelf 4.1 vsi 1 1

Next Command:
```

## Checking and Troubleshooting

Use the following procedure as a quick checkout of the tag switching configuration and operation with respect to the BPX switch.

**Step 1** Wait a while, and check whether the controller sees the interfaces correctly; on the TSC, enter the following command:

```
tsc# show controllers VSI descriptor
```

and the an example output is:

---

**Note** Check the TSC on-line documentation for the most current information.

---

```
Phys desc: 4.1
Log intf: 0x00040100 (0.4.1.0)
Interface: slave control port
IF status: n/a
Min VPI: 0
Max VPI: 10
Min VCI: 0
Max VCI: 65535
IFC state: ACTIVE
Maximum cell rate: 10000
Available channels: 999
Available cell rate (forward): 100000
Available cell rate (backward): 100000
```

```
Phys desc: 4.2
Log intf: 0x00040200 (0.4.2.0)
Interface: ExtTagATM2
IF status: up
Min VPI: 0
Max VPI: 10
Min VCI: 0
Max VCI: 65535
IFC state: ACTIVE
Maximum cell rate: 10000
Available channels: 999
Available cell rate (forward): 100000
Available cell rate (backward): 100000
```

```
Phys desc: 4.3
Log intf: 0x00040300 (0.4.3.0)
Interface: ExtTagATM3
IF status: up
Min VPI: 0
Max VPI: 10
Min VCI: 0
Max VCI: 65535
IFC state: ACTIVE
Maximum cell rate: 10000
Available channels: 999
Available cell rate (forward): 100000
Available cell rate (backward): 100000
```

-----

**Step 2** If there are no interfaces present, first check that card 4 is up, with, on the BPX switch:

```
dspcds
```

and, if the card is not up:

```
resetcd 4 h
```

and/or remove the card to get it to reset if necessary.

---

**Note** This example assumes that the controller is connected to card 4 on the switch. Substitute a different card number, as applicable.

---

**Step 3** Check the trunk status with the following command:

**dsptrks**

The dsptrks screen should show 4.1, 4.2 and 4.3, with the “Other End” of 4.1 reading “VSI (VSI)”. A typical dsptrks screen example follows:

Sample Display

```
n4 TN SuperUser BPX 15 9.1 Apr. 4 1998 16:45 PST

TRK Type Current Line Alarm Status Other End
2.1 OC3 Clear - OK j4a/2.1
3.1 E3 Clear - OK j6c (AXIS)
5.1 E3 Clear - OK j6a/5.2
5.2 E3 Clear - OK j3b/3
5.3 E3 Clear - OK j5c (IPX/AF)
6.1 T3 Clear - OK j4a/4.1
6.2 T3 Clear - OK j3b/4
4.1 OC3 Clear - OK VSI (VSI)
4.2 OC3 Clear - OK VSI (VSI)
4.3 OC3 Clear - OK VSI (VSI)
```

Last Command: dsptrks

Next Command:

**Step 4** Enter the dspnode command.

**dspnode**

The resulting screens should show trunk 4.1 as type VSI. A typical dspnode screen follows:

Example of dspnode screen.

```
n4 TN SuperUser BPX 15 9.1 Apr. 4 1998 16:46 PST

 BPX Interface Shelf Information

Trunk Name Type Alarm
3.1 j6c AXIS MIN
5.3 j5c IPX/AF MIN
4.1 VSI VSI OK
4.2 VSI VSI OK
4.3 VSI VSI OK
```

Last Command: dspnode

Next Command:

**Step 5** Enter the dsprsrc command as follows:

**dsprsrc 4.1 1**

The resulting screen should show the settings shown in the following example:

Sample Display:

```
n4 TN SuperUser BPX 15 9.1 Apr. 4 1998 16:47 PST

Port/Trunk : 4.1

Maximum PVC LCNS: 256 Maximum PVC Bandwidth:26000

Min Lcn(1) : 0 Min Lcn(2) : 0
Partition 1

Partition State : Enabled
Minimum VSI LCNS: 512
Maximum VSI LCNS: 7048
Start VSI VPI: 2
End VSI VPI : 15
Minimum VSI Bandwidth : 26000 Maximum VSI Bandwidth : 100000

Last Command: dsprsrc 4.1 1

Next Command:
```

**Step 6** Enter the dspqbin command as follows:

**dspqbin 4.1 10**

The resulting screen should show the settings shown in the following example:

Sample Display:

```
n4 TN SuperUser BPX 15 9.1 Apr. 4 1998 16:48 PST

Qbin Database 4.1 on EXM qbin 10

Qbin State: Enabled

Minimum Bandwidth: 0
Qbin Discard threshold: 65536
Low CLP threshold: 95%
High CLP threshold: 100%
EFCI threshold: 40%

Last Command: dspqbin 4.1 10

Next Command:
```

**Step 7** If interfaces 4.2 and 4.3 are present, but not enabled, perform the previous debugging steps for interfaces 4.2 and 4.3 instead of 4.1, except for the dspnode command which does not show anything useful pertaining to ports 4.2 and 4.3.

**Step 8** Try a ping on the tag switch connections. If the ping doesn't work, but all the tag switching and routing configuration looks correct, check that the TSC has found the VSI interfaces correctly by entering the following command at the TSC:

```
tsc# show tag int
```

**Step 9** If the interfaces are not shown, re-check the configuration of port 4.1 on the BPX switch as described in the previous steps.

**Step 10** If the VSI interfaces are shown, but are down, check whether the TSRs connected to the BPX switch show that the lines are up. If not, check such items as cabling and connections.

**Step 11** If the TSCs and BPX switch show the interfaces are up, but the TSC doesn't, enter the following command on the TSC:

```
tsc# reload
```

**Step 12** If the "show tag int" shows that the interfaces are up, but the ping doesn't work, enter the follow command at the TSC:

```
tsc# sho tag tdp disc
```

The resulting display should show something similar to the following:

```
Local TDP Identifier:
 30.30.30.30:0
TDP Discovery Sources:
 Interfaces:
 ExtTagATM2.1: xmit/rcv
 ExtTagATM3.1: xmit/rcv

```

**Step 13** If the interfaces on the display show "xmit" and not "xmit/rcv", then the TSC is sending TDP messages, but not getting responses. Enter the following command on the neighboring TSRs.

```
tsc# sho tag tdp disc
```

If resulting displays also show "xmit" and not "xmit/rcv", then one of two things is likely:

- (a) The TSC is not able to set up VSI connections
- (b) The TSC is able to set up VSI connections, but cells won't be transferred because they can't get into a queue

**Step 14** Check the VSI configuration on the switch again, for interfaces 4.1, 4.2, and 4.3, paying particular attention to:

- (a) maximum bandwidths at least a few thousands cells/sec
- (b) qbins enabled
- (c) all qbin thresholds non-zero

---

**Note** VSI partitioning and resources must be set up correctly on the interface connected to the TSC, interface 4.1 in this example, as well as interfaces connected to other tag switching devices.

---

## Provisioning and Managing Connections

Instructions for configuration of the BPX switch including the setting of VSI partitions for tag switching are provided in this document. Adding (provisioning) and administering connections is performed from the Tag Switch Controller. For further information on the Tag Switch Controller, refer to:

*Tag Switching for the Cisco 7500/7200 Series Routers*

## Statistics

Statistics are monitored via the Tag Switch Controller. Refer to the *Cisco StrataView Plus Operations Guide* for information on monitoring statistics.

## Command Reference

This section provides a description of the BPX switch and TSC commands referenced in this chapter on tag switching. They are presented in the following order:

### BPX Switch Commands

A summary of the following commands is provided in this section. For complete descriptions of user and superuser commands, refer to the *Cisco WAN Switching Command Reference* and the *Cisco WAN Switching SuperUser Command Reference* documents.

- addshelf
- cnfqbin
- cnfrsrc
- dspcd
- dspcds
- dspnode
- dspqbin
- dsprsrc
- dsptrks
- resetcd
- upport
- uptrk

### TSC Commands

```
tsc# show controller vsi descriptor
```

```
tsc# show tag int
```

```
tsc# reload
```

```
tsc# sho tag tdp disc
```

For the TSC command reference information, refer to the appropriate router 7200 or 7500 source documentation.



## addshelf

Adds an ATM link between a hub node and an interface shelf such as an MGX 8220, IPX shelf, or IGX shelf in a tiered network, or an ATM link between a BXM card on a BPX node and a tag switch controller such as a series 7200 or 7500 router.

### Syntax

Tag switch controller:

**addshelf** <slot.port> <device-type> <control partition> <control ID>

Interface shelf:

**addshelf** <slot.port> <shelf-type> <vpi> <vci>

### Examples

Tag switch controller: **addshelf 4.1 vsi 1 1**

Interface shelf: **addshelf 12.1 A 21 200**

### Attributes

| Privilege | Jobs | Log | Node                                                                                                                          | Lock |
|-----------|------|-----|-------------------------------------------------------------------------------------------------------------------------------|------|
| 1-4       | Yes  | Yes | BPX switch for tag switch controller,<br>BPX switch and IGX switch for IPX<br>and IGX shelves,<br>BPX switch for the MGX 8220 | Yes  |

### Related Commands

delshelf, dspnode, dsptrk, dspport

### Description for Tag Switching

For tag switching, before it can carry traffic, the link to a tag switch controller must be “upped” (using either **uptrk** or **upport**) at the BPX node. The link can then be “added” to the network (using **addshelf**). Also, the link must be free of major alarms before you can add it with the **addshelf** command.

---

**Note** Once a port on the BXM is upped in either trunk or port mode by either the uptrk or upport commands, respectively, all other ports can only be “upped” in the same mode.

---

### Tag Switching Parameters-addshelf

| Parameter         | Description                                                                                                                                                                            |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| slot.port         | Specifies the BXM slot and port number. (The port may be configured for either trunk (network) or port (service) mode.)                                                                |
| device-type       | vsi, which is “virtual switch interface” and specifies a virtual interface to a tag switch controller (TSR) such as a 7200 or 7500 series router.                                      |
| control partition | -                                                                                                                                                                                      |
| control ID        | Control IDs must be in the range 1-32, and must be set identically on the TSC and in the addshelf command. A control ID of “1” is the default used by the tag switch controller (TSC). |

### Example for Tag Switching

Add a tag switch controller link to a BPX node, by entering the addshelf command at the desired BXM port as follows:

```
addshelf 4.1 vsi 1 1
```

Sample Display:

```

n4 TN SuperUser BPX 15 9.1 Apr. 4 1998 16:40 PST

 BPX Interface Shelf Information

Trunk Name Type Alarm
5.1 j6c AXIS MIN
5.3 j5c IPX/AF MIN
4.1 VSI VSI OK

```

```
Last Command: addshelf 4.1 vsi 1 1
```

```
Next Command:
```

## Description for Interface Shelves

An interface shelf can be one of the following:

- An MGX 8220 connected to a BPX node
- An IPX or IGX node connected to a BPX node that serves as a hub for the IPX/AF or IGX/AF.
- An IGX node connected to an IGX routing node that serves as a hub for the IGX/AF

The signaling protocol that applies to the trunk on an interface shelf is Annex G.

Each IPX/AF, IGX/AF, or MGX 8220 has one trunk that connects to the BPX or IGX node serving as an access hub. A BPX hub can support up to 16 T3 trunks to the interface shelves. An IGX hub can support up to 4 trunks to the interface shelves.

Before it can carry traffic, the trunk on an interface shelf must be “upped” (using **uptrk**) on both the interface shelf and the hub node and “added” to the network (using **addshelf**). Also, a trunk must be free of major alarms before you can add it with the **addshelf** command.

### Interface Shelf Parameters-addshelf

| Parameter  | Description                                                                                                                                                                                                                                                          |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| slot.port  | slot.port,<br>Specifies the slot and port number of the trunk                                                                                                                                                                                                        |
| shelf type | I or A,<br>On a BPX node, <i>shelf type</i> specifies the type of interface shelf when you execute <b>addshelf</b> . The choices are I for IPX/AF or IGX/AF or A for the MGX 8220. On an IGX hub, only the IGX/AF is possible, so <i>shelf type</i> does not appear. |
| vpi vci    | Specifies the vpi and vci (Annex G vpi and vci used). For the MGX 8220 only, the valid range for vpi is 5–14 and for vci is 16–271. For an IPX/AF interface shelf, the valid range for both vpi and vci is 1–255.                                                    |

## Example for Interface Shelves

Add an MGX 8220 at trunk 11.1. After you add the shelf, the screen displays a confirmation message and the name of the shelf. Add the MGX 8220 (may be referred to in screen as AXIX) as follows:

### **addshelf 11.1 a**

The sample display shows the partial execution of the command with the prompt requesting that the I/F type be entered:

Sample Display:

```
n4 TN SuperUser BPX 15 9.1 Apr. 4 1998 16:40 PST
```

```
BPX Interface Shelf Information
```

```
Trunk Name Type Alarm
 1.3 AXIS240 AXIS OK
11.2 A242 AXIS OK
```

```
This Command: addshelf 11.1
```

```
Enter Interface Shelf Type: I (IPX/AF), A (AXIS)
```

## cnfqbin

Tag switched VC connections are grouped into large buffers called Qbins. This command configures the Qbins. For the EFT release of tag switching, Qbin 10 is used for tagged switch connections.

### Syntax

**cnfqbin** <slot.port> <Qbin\_#> <e/d> <BWmin> <discard\_thr> <CLPlo> <CLPhi> <EFCI\_thr>

### Example

**cnfqbin** 13.4 10 E 0 65536 6095 80100 40

### Attributes

| Privilege | Jobs | Log | Node       | Lock |
|-----------|------|-----|------------|------|
|           |      |     | BPX switch |      |

### Related Commands

dspqbin

### Parameters-cnfqbin

| Parameter              | Description                                                                                                                                                                                    |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| slot.port              | slot.port<br>Specifies the slot and port number for the BXM                                                                                                                                    |
| Qbin number            | Specifies the number of the Qbin to be configured                                                                                                                                              |
| e/d                    | Enables or disables the Qbin.                                                                                                                                                                  |
| Minimum bandwidth      | Bandwidth allocated to the VCs                                                                                                                                                                 |
| Qbin discard threshold |                                                                                                                                                                                                |
| Low CLP threshold      | Specifies a percentage of the Qbin depth such that, when the Qbin level falls below this level, the node stops discarding CLP=1 cells.                                                         |
| High CLP threshold     | Specifies a percentage of the Qbin depth. When the threshold is exceeded, the node discards cells with CLP=1 in the connection until the Qbin level falls below the depth specified by CLP Lo. |
| EFCI threshold         | Explicit Forward Congestion Indication. The percentage of Qbin depth that causes EFCI to be set.                                                                                               |

## Description

The following example shows the configuration of a BXM Qbin on port 4.1 for tag switching

## Example

Configure a Qbin by enabling it and accepting the defaults for the other parameters:

```
cnfqbin 4.1 10 e 0 65536 95 100 40
```

Sample Display:

```
n4 TN SuperUser BPX 15 9.1 Apr. 4 1998 16:40 PST
```

```
Qbin Database 4.1 on BXM qbin 10
```

```
Qbin State: Enabled
Minimum Bandwidth: 0
Qbin Discard threshold: 65536
Low CLP/EPD threshold: 95%
High CLP/EPD threshold: 100%
EFCI threshold: 40%
```

```
Last Command: cnfqbin 4.1 10 e 0 65536 95 100 40
```

```
Next Command:
```

## cnfrsrc

This command configures resources among AutoRoute PVCs and VSI partitions.

### Syntax

```
cnfrsrc slot.port maxpvcLens maxpvcbw partition e/d minvsiLens maxvsiLens vsistartypi
 vsiendvpi vsiminbw vsimaxbw
```

### Example

```
cnfrsrc 4.1 256 26000 1 e 512 7048 2 15 26000 100000
```

### Attributes

| Privilege | Jobs | Log | Node       | Lock |
|-----------|------|-----|------------|------|
|           |      |     | BPX switch |      |

### Related Commands

### Parameters-cnfrsrc

| Parameter (cnfrsrc) | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| slot.port           | Specifies the slot and port number for the BXM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| maxpvcLens          | The maximum number of LCNs allocated for AutoRoute PVCs for this port. For trunks there are additional LCNs allocated for AutoRoute that are not configurable. The <b>dspecd</b> <slot> command displays the maximum number of LCNs configurable via the <b>cnfrsrc</b> command for the given port. For trunks, "configurable LCNs" represent the LCNs remaining after the BCC has subtracted the "additional LCNs" needed. For a port card, a larger number is shown, as compared with a trunk card. Setting this field to zero would enable configuring all of the configurable LCNs to the VSI. |
| maxpvcbw            | The maximum bandwidth of the port allocated for AutoRoute use.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| partition           | Partition number                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| e/d                 | enables or disables the VSI partition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

| Parameter (cnfrsrc) | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| minvsilcns          | <p>The minimum number of LCNs guaranteed for this partition. The VSI controller guarantees at least this many connection endpoints in the partition, provided that there are sufficient free LCNs in the common pool to satisfy the request at the time the partition is added. When a new partition is added or the value is increased, it may be that existing connections have depleted the common pool so that there are not enough free LCNs to satisfy the request. The BXM gives priority to the request when LCNs are freed. The net effect is that the partition may not receive all the guaranteed LCNs (min LCNs) until other LCNs are returned to the common pool.</p> <p>This value may not be decreased dynamically. All partitions in the same port group must be deleted first and reconfigured in order to reduce this value.</p> <p>The value may be increased dynamically. However, this may cause the “deficit” condition described above.</p> <p>The command line interface warns the user when the action is invalid, except for the “deficit” condition.</p> <p>To avoid this deficit condition which could occur with maximum LCN usage by a partition or partitions, it is recommended that all partitions be configured ahead of time before adding connections. Also, it is recommended that all partitions be configured before adding a VSI controller via the <b>addshelf</b> command.</p> |
| maxvsilcns          | <p>The total number of LCNs the partition is allowed for setting up connections. The min LCNs is included in this calculation. If max LCNs equals min LCNs, then the max LCNs are guaranteed for the partition.</p> <p>Otherwise, (max - min) LCNs are allocated from the common pool on a FIFO basis.</p> <p>If the common pool is exhausted, new connection setup requests will be rejected for the partition, even though the max LCNs has not been reached.</p> <p>This value may be increased dynamically when there are enough unallocated LCNs in the port group to satisfy the increase.</p> <p>The value may not be decreased dynamically. All partitions in the same port group must be deleted first and reconfigured in order to reduce this value.</p> <p>Different types of BXM cards support different maximums. If you enter a value greater than the allowed maximum, a message is displayed with the allowable maximum.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| vsistartvpi         | <p>By default the TSC (e.g, 7200 or 7500 series router) will use either a starting VSI VPI of 1 or 2 for tag switching, whichever is available. If both are available, a starting VSI VPI of 1 is used. The VPI range should be 2-15 on a BPX 8620 VSI. The VSI range for tag switching on the BPX 8620 is configured as a VSI partition, usually VSI partition number 1. VSI VPI 1 is reserved for AutoRoute PVCs, so the VSI partition for tag switching should start at VPI 2. If VPI 2 is not to be used, the tag switching VPI interface configuration command can be used on the TSC to override the defaults</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| vsientdvp           | <p>Two VPIs are sufficient for the current release, although it may be advisable to reserve a larger range of VPIs for later expansion, for example, VPIs 2-15.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| vsiminbw            | <p>The minimum port bandwidth allocated to this partition in cells/sec. (Multiply by 400 based on 55 bytes per ATM cell to get approximate bits/sec.)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| vsimaxbw            | <p>The maximum port bandwidth allocated to this partition. This value is used for VSI QBIN bandwidth scaling.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

### Description

The following paragraphs describe various configurations of BXM port resources for tag switching. The first allocation example is using default allocations. The second allocation example describes more rigorous allocations where default allocations are not applicable.

## Useful Default Allocations

Reasonable default values for all ports on all cards are listed in Table 13-5. If these values are not applicable, then other values may be configured using the **cnfrsrc** command.

**Table 13-5 Port Connection Allocations, Useful Default Values**

| Connection Type                  | Variable           | Useful Default Value | cnfrsrc cmd parameter |
|----------------------------------|--------------------|----------------------|-----------------------|
| AutoRoute LCNs                   | a(x)               | 256                  | maxpvclns             |
| Minimum VSI LCNs for partition 1 | n <sub>1</sub> (x) | 512                  | minvsilns             |
| Maximum VSI LCNs for partition 1 | m <sub>1</sub> (x) | 7048                 | maxvsilns             |

Different types of BXM cards support different maximums. If you enter a value greater than the allowed maximum, a message is displayed with the allowable maximum

Here, a(x) = 256, n<sub>1</sub>(x) = 512, and m<sub>1</sub>(x) = 16384.

### Example:

Configure the VSI partition for port 4.1 by entering the following command:

```
cnfrsrc 4.1 256 26000 1 e 512 16384 2 15 26000 100000
```



Sample Display:

n4                    TN    SuperUser            BPX 15    9.1            Apr. 4 1998 16:40 PST

Port/Trunk : 4.1

Maximum PVC LCNS:                    256            Maximum PVC Bandwidth:26000

Min Lcn(1) : 0 Min Lcn(2) : 0  
Partition 1

Partition State :                    Enabled  
Minimum VSI LCNS:                    512  
Maximum VSI LCNS:                    7048  
Start VSI VPI:                        2  
End VSI VPI :                         15  
Minimum VSI Bandwidth :              26000            Maximum VSI Bandwidth :              100000

Last Command: cnfrsrc 4.1 256 26000 1 e 512 7048 2 15 26000 100000

Next Command:

## Details of More Rigorous Allocations

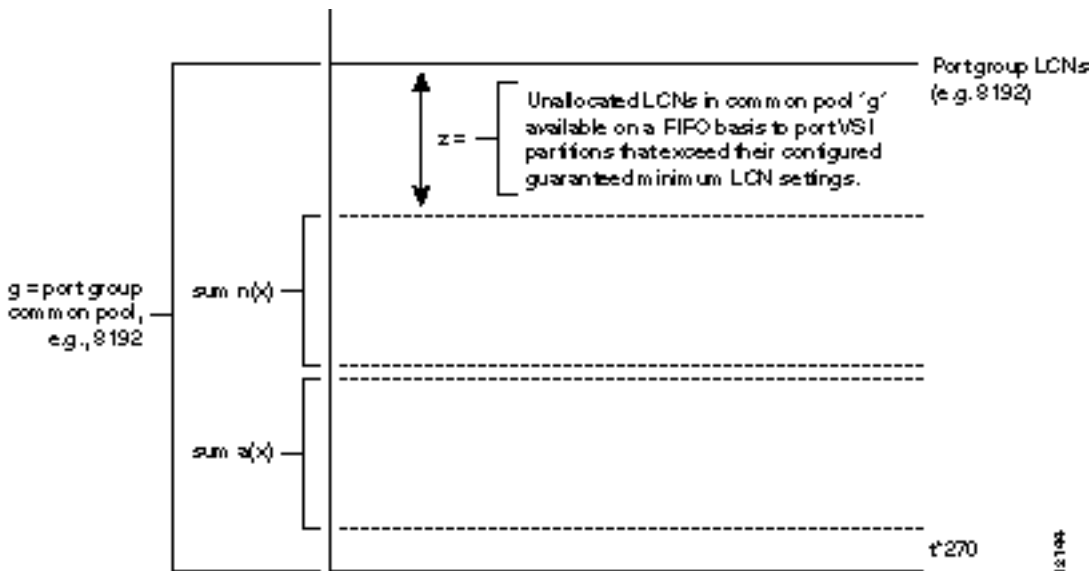
More rigorous allocations are possible when default values are not applicable. For example, the LCN allocations for a port group must satisfy the following limit:

$$\text{sum} ( a ( x ) ) + \text{sum} ( n_1 ( x ) ) + t * 270 \leq g$$

In this expression, “a (x)” represents AutoRoute LCNs, “n<sub>1</sub> (x)” represents the guaranteed minimum number of VSI LCNs, “t” is the number of ports in the port group that are configured as AutoRoute trunks, and “g” is the total number of LCNs available to the port group. Figure 13-10 shows the relationship of these elements.

The “270” value reflects the number of LCNs which are reserved on each AutoRoute trunk for internal purposes. If the port is configured in port rather than trunk mode, “t” = 0, and t\*270 drops out of the expression.

Figure 13-10 Port VSI Partition LCN Allocation Elements



**Note** Tag switching can operate on a BXM card configured for either trunk (network) or port (service) mode. If a BXM card is configured for port (service) mode, all ports on the card are configured in port (service) mode. If a BXM card is configured for trunk (network) mode, all ports on the card are configured for trunk (network) mode. When the card is configured for trunk mode, the trunks reserve some connection bandwidth.

In the following expression, “z<sub>1</sub>” equals the number of unallocated LCNs in the common pool of LCNs available for use by the port VSI partitions. The value of “z<sub>1</sub>” is the number of LCNs available after subtracting the AutoRoute LCNs [sum ( a ( x ) ], VSI LCNs [sum ( n<sub>1</sub> ( x ) )], and LCNs for trunk use [t\*270] from the total number of LCNs “g” available at the port. For a BXM card with ports configured in “port” mode, “t” = 0.

$$z_1 = ( g - \text{sum} ( a ( x ) ) - \text{sum} ( n_1 ( x ) ) - t * 270 )$$

When a port partition has exhausted its configured guaranteed LCNs (min LCNs), it may draw LCNs for new connections on a FIFO basis from the unallocated LCNs, “ $z_1$ ”, until its maximum number of LCNs, “ $m_1(x)$ ”, is reached or the pool, “ $z_1$ ”, is exhausted.

No limit is actually placed on what may be configured for “ $m_1(x)$ ”, although “ $m_1(x)$ ” is effectively ignored if larger than “ $z_1 + n_1$ ”. The value “ $m_1(x)$ ” is a non-guaranteed maximum value of connection spaces that may be used for a new connection or shared by a number of connections at a given time if there are a sufficient number of unallocated “LCNs available in “ $z_1$ ”. The value  $m_1(x)$  typically is not used in Release 9.1, but in future releases allows more control over how the LCNs are shared among multiple VSI partitions.

The following two examples, one for a BXM in port mode and the other for a BXM in trunk mode, provide further detail on the allocation of connections.

### Example 1, 8-Port OC3 BXM Configured in Trunk Mode

This example is for an 8-port OC3 BXM configured for trunk mode and therefore, in Release 9.1, with all ports configured as trunks. Table 13-6 lists the configured connection space (LCN) allocations for each port of “ $a(x)$ ”, “ $n_1(x)$ ”, and “ $m_1(x)$ ”. It also shows the unallocated LCN pool, “ $z_1$ ” for each port group and the total common pool access, “ $g$ ”.

---

**Note** LCN is the variable affected when configuring connection space allocations using the **cnfrsrc** command.

---

The port groups in the example are ports 1-4 and 5-8, and the maximum number of connection spaces (LCNs) per port group is 8192 for this 8-port-OC3 BXM card. The allocations for ports 1-4 are shown in Figure 13-11. The allocations for ports 5-8 are similar to that shown in Figure 13-11, but with correspondingly different values.

As shown in Figure 13-11, “ $g$ ” is the total number of connection spaces (LCNs) available to port group 1-4 and is equal to 8192 LCNs in this example. To find the number of unallocated LCNs available for use by port partitions that exhaust their assigned number of LCNs, proceed as follows:

From “ $g$ ”, subtract the sum of the AutoRoute connections, “ $a(x)$ ”, and the sum of minimum guaranteed LCNs, “ $n_1(x)$ ”. Also, since the ports in this example are configured in trunk mode, 270 LCNs per port are subtracted from “ $g$ ”. Since there are four ports, “ $t$ ” equals “4” in the expression “ $t*270$ ”. The resulting expression is as follows:

$$z_1 = (g - \text{sum}(a(x)) - \text{sum}(n_1(x)) - t*270)$$

The remaining pool of unallocated LCNs is “ $z_1$ ” as shown. This pool is available for use by ports 1-4 that exceed their minimum VSI LCN allocations “ $n_1(x)$ ” for partition 1.

The maximum number of LCNs that a port partition can access on a FIFO basis from the unallocated pool “ $z_1$ ” for new connections can only bring its total allocation up to either “ $(z_1 + n_1(x))$ ” or “ $m_1(x)$ ”, whichever value is smaller. Also, since “ $z_1$ ” is a shared pool, the value of “ $z_1$ ” will vary as the common pool is accessed by other port partitions in the group.

The values shown in Table 13-6 are obtained as follows:

- For ports 1-4:

$$z_1 = (g - \text{sum}(a(x)) - \text{sum}(n_1(x)) - 4*270)$$

and factoring in the sum of  $a(x)$  and the sum of  $n_1(x)$ , the above expression evaluates to:

$$= (8192 - (185) - (3100) - 4*270) = 3827 \text{ unallocated LCNs}$$

The values shown in Table 13-6 for the port group containing ports 1-4 may be summarized as follows:

- Port 1 is guaranteed to be able to support 120 AutoRoute connections (PVCs) and 3000 tag VCs (TVCs). It will not support more than 120 PVCs. It may be able to support up to 3500 TVCs, subject to availability of unallocated LCNs “z<sub>1</sub>” on a FIFO basis. Since “m<sub>1</sub>(1)” of 3500 is less than “z<sub>1</sub>” of 3827, the most TVCs that can be supported are 3500.
- Port 2 will support up to 50 PVCs, and no more. It will support no TVCs, as “m<sub>1</sub>(2)” = 0.
- Port 3 is guaranteed to support up to 15 PVCs, and no more. It is not guaranteed to support any TVCs, but will support up to:  
3827 TVCs, subject to availability of unallocated LCNs “z<sub>1</sub>” on a FIFO basis. The configured maximum limit “m<sub>1</sub>(3)” of 7048 LCNs is ignored, as it is greater than the unallocated LCNs, “z<sub>1</sub>”, of 3827.
- Port 4 supports no PVCs. It is guaranteed to support 100 TVCs, and no more.

- For ports 5-8:

$$z_1 = (g - \sum (a(x)) - \sum (n_1(x) - 4*270))$$

and factoring in the sum of a (x) and the sum of n<sub>1</sub> (x), the above expression evaluates to:

$$= (8192 - (6100) - (310) - 4*270) = 702 \text{ unallocated LCNs}$$

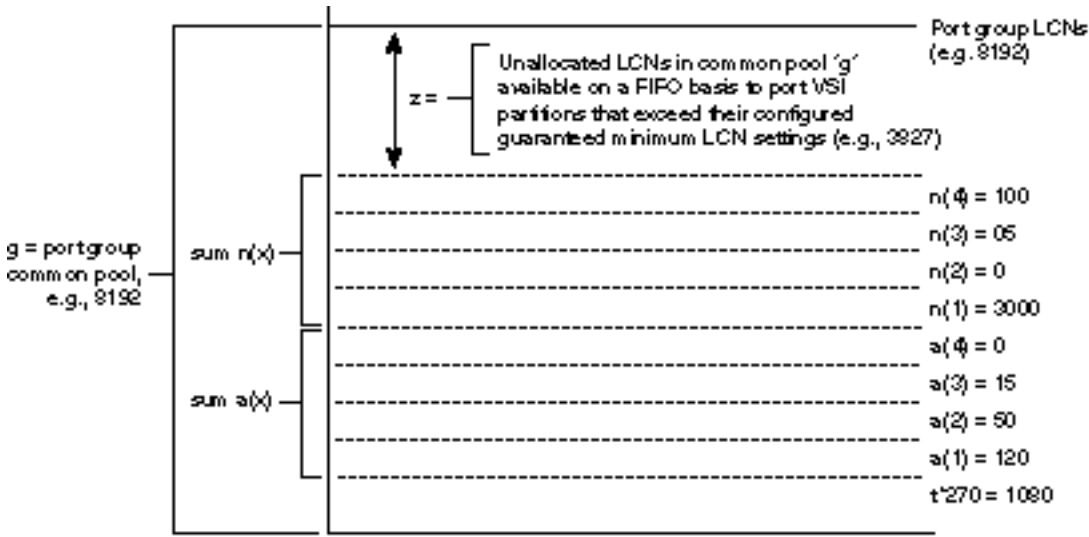
The values shown in Table 13-6 for the port group containing ports 5-8 may be summarized as follows:

- Port 5 will support 6000 PVCs, and at least 10 TVCs. It will support up to 712 TVCs, subject to availability of the 702 unallocated LCNs “z<sub>1</sub>” on a FIFO basis. The configured maximum limit “m<sub>1</sub>(5)” of 7048 is ignored, as it is greater than 712 (the unallocated 702 LCNs in the “z<sub>1</sub>” pool plus the 10 LCN guaranteed minimum already allocated from the common pool “g” of 8192 LCNs).
- Port 6 will support no PVCs. It will support up to 100 TVCs subject to available LCNs, but is not guaranteed to be able to support any TVCs.
- Port 7 is guaranteed to be able to support 100 PVCs and 200 TVCs. It will not support any more.
- Port 8 will support no PVCs. It is not guaranteed to be able to support more than 100 TVCs, but will support up to 802 TVCs, subject to the availability of the 702 unallocated LCNs “z<sub>1</sub>” on a FIFO basis. The configured maximum limit “m<sub>1</sub>(8)” of 2100 TVCS is ignored, as it is greater than 802 (the number of unallocated 702 LCNs in the “z<sub>1</sub>” pool plus the 100 LCN guaranteed minimum already allocated from the common pool “g” of 8192 LCNs).

**Table 13-6 LCN Allocations for 8-port OC3 BXM, Ports Configured in Trunk Mode**

| Port (x)                | a(x) | n <sub>1</sub> (x) | m <sub>1</sub> (x) | z <sub>1</sub> = unallocated LCNs | Total LCNS available to Port VSI Partition = min ( z <sub>1</sub> + n <sub>1</sub> (x), max m <sub>1</sub> (x) ) |
|-------------------------|------|--------------------|--------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------|
| <b>Port Group 1</b>     |      |                    |                    |                                   |                                                                                                                  |
| 1                       | 120  | 3000               | 3500               | 3827                              | 3500                                                                                                             |
| 2                       | 50   | 0                  | 0                  | 3827                              | 0                                                                                                                |
| 3                       | 15   | 0                  | 7048               | 3827                              | 3827                                                                                                             |
| 4                       | 0    | 100                | 100                | 3827                              | 100                                                                                                              |
| Sum, for x =1 through 4 | 185  | 3100               | N/A                | N/A                               |                                                                                                                  |
| <b>Port Group 2</b>     |      |                    |                    |                                   |                                                                                                                  |
| 5                       | 6000 | 10                 | 7048               | 702                               | 712                                                                                                              |
| 6                       | 0    | 0                  | 100                | 702                               | 100                                                                                                              |
| 7                       | 100  | 200                | 200                | 702                               | 200                                                                                                              |
| 8                       | 0    | 100                | 2100               | 702                               | 802                                                                                                              |
| Sum for x = 5 through 8 | 6100 | 310                | N/A                | N/A                               |                                                                                                                  |

**Figure 13-11 LCN Allocations for Ports 1-4, Ports Configured in Trunk Mode Example**



## Example 2, 8-Port OC3 BXM Configured in Port Mode

BXM ports configured for port mode rather than trunk mode have more connection spaces available for use by the TVC connections as it is not necessary to provide connection spaces for use by the AutoRoute trunks. This example is for an 8-port OC3 BXM configured for port mode and therefore, in Release 9.1, with all ports configured as ports. Table 13-7 lists the configured connection space (LCN) allocations for each port of “a (x)”, “n<sub>1</sub> (x)”, and “m<sub>1</sub> (x)”. It also shows the unallocated LCN pool, “z<sub>1</sub>” for each port group and the total common pool access, “g”.

---

**Note** LCN is the variable affected when configuring connection space allocations using the **cnfrsrc** command.

---

The port groups in the example are ports 1-4 and 5-8, and the maximum number of connection spaces (LCNs) per port group is 8192 for this 8-port-OC3 BXM card. The allocations for ports 1-4 are shown in Figure 13-12. The allocations for ports 5-8 are similar to that shown in Figure 13-12, but with correspondingly different values.

As shown in Figure 13-12, “g” is the total number of connection spaces (LCNs) available to port group 1-4 and is equal to 8192 LCNs in this example. To find the number of unallocated LCNs available for use by port partitions that exhaust their assigned number of LCNs, proceed as follows:

From “g”, subtract the sum of the AutoRoute connections, “a (x)”, and the sum of minimum guaranteed LCNs, “n<sub>1</sub> (x)”. Also, since the ports in this example are configured in port mode, “t” equals zero in the expression “t\*270”. This is indicated as follows:

$$z_1 = (g - \text{sum} ( a (x) ) - \text{sum} ( n_1 (x) ) - t*270 )$$

The remaining pool of unallocated LCNs is “z<sub>1</sub>” as shown. This pool is available for use by ports 1-4 that exceed their minimum VSI LCN allocations “n<sub>1</sub> (x)” for partition 1.

The maximum number of LCNs that a port partition can access on a FIFO basis from the unallocated pool “z<sub>1</sub>” for new connections can only bring its total allocation up to either “(z<sub>1</sub> + n<sub>1</sub> (x) ) or m<sub>1</sub>(x)”, whichever value is smaller. Also, since “z<sub>1</sub>” is a shared pool, the value of “z<sub>1</sub>” will vary as the common pool is accessed by other port partitions in the group.

The values shown in Table 13-7 are obtained as follows:

- For ports 1-4:

$$z_1 = (g - \text{sum} ( a(x) ) - \text{sum} ( n_1(x) ) - 0*270)$$

which simplifies to:

$$z_1 = (g - \text{sum} ( a(x) ) - \text{sum} ( n_1(x) ) )$$

and factoring in the sum of a (x) and the sum of n<sub>1</sub> (x), the above expression evaluates to:

$$= (8192 - (185) - (3100) ) = 4907 \text{ unallocated LCNs}$$

The values shown in Table 13-7 for the port group containing ports 1-4 may be summarized as follows:

- Port 1 is guaranteed to be able to support 120 AutoRoute connections (PVCs) and 3000 tag VCs (TVCs). It will not support more than 120 PVCs. It may be able to support up to 3500 TVCs, subject to availability of unallocated LCNs “z<sub>1</sub>” on a FIFO basis. Since “m<sub>1</sub> (1)” of 3500 is less than “z<sub>1</sub>” of 4907, the most TVCs that can be supported are 3500.
- Port 2 will support up to 50 PVCs, and no more. It will support no TVCs, as “m<sub>1</sub>(2)” = 0.

- Port 3 is guaranteed to support up to 15 PVCs, and no more. It is not guaranteed to support any TVCs, but will support up to:
  - 4907 TVCs, subject to availability of unallocated LCNs “z<sub>1</sub>” on a FIFO basis. The configured maximum limit “m<sub>1</sub>(3)” of 7588 LCNs is ignored, as it is greater than the unallocated LCNs, “z<sub>1</sub>”, of 4907.
- Port 4 supports no PVCS. It is guaranteed to support 100 TVCs, and no more.
- For ports 5-8:

$$z_1 = (g - \sum (a(x)) - \sum (n_1(x) - 0 * 270))$$

which simplifies to:

$$z_1 = (g - \sum (a(x)) - \sum (n_1(x)))$$

and factoring in the sum of a (x) and the sum of n<sub>1</sub> (x), the above expression evaluates to:

$$= (8192 - (6100) - (310)) = 1782 \text{ unallocated LCNs}$$

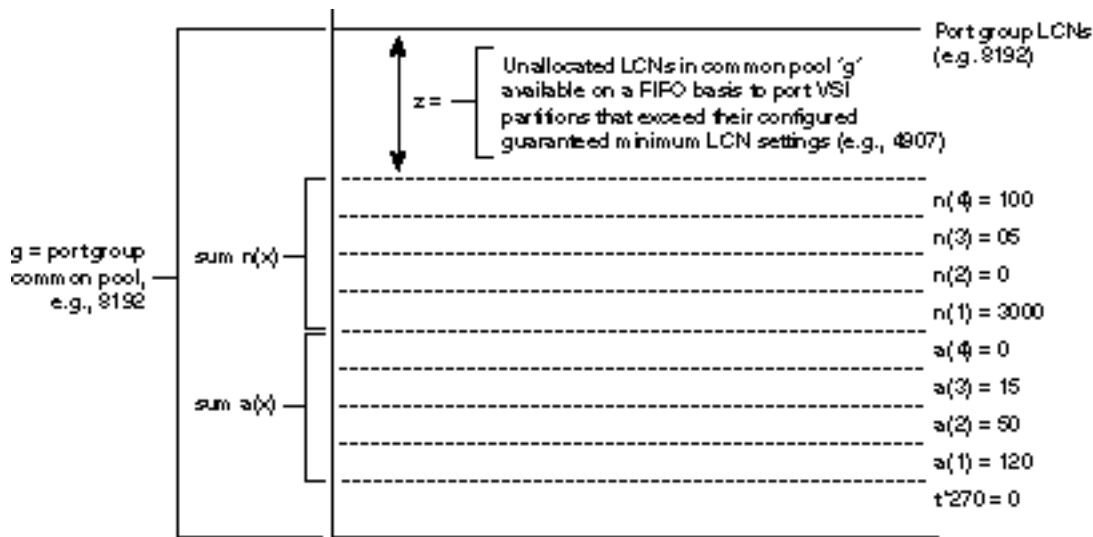
The values shown in Table 13-7 for the port group containing ports 5-8 may be summarized as follows:

- Port 5 will support 6000 PVCs, and at least 10 TVCs. It will support up to 1792 TVCs, subject to availability of the 1782 unallocated LCNs “z<sub>1</sub>” on a FIFO basis. The configured maximum limit “m<sub>1</sub>(5)” of 7588 is ignored, as it is greater than 1792 (the unallocated 1782 LCNs in the “z<sub>1</sub>” pool plus the 10 LCN guaranteed minimum already allocated from the common pool “g” of 8192 LCNs).
- Port 6 will support no PVCs. It will support up to 100 TVCs subject to available LCNs, but is not guaranteed to be able to support any TVCs.
- Port 7 is guaranteed to be able to support 100 PVCs and 200 TVCs. It will not support any more.
- Port 8 will support no PVCs. It is not guaranteed to be able to support more than 100 TVCs, but will support up to 1882 TVCs, subject to availability of the 1782 unallocated LCNs “z<sub>1</sub>” on a FIFO basis. The configured maximum limit “m<sub>1</sub>(8)” of 2100 TVCS is ignored, as it is greater than 1882 (the number of unallocated 1782 LCNs in the “z<sub>1</sub>” pool plus the 100 LCN guaranteed minimum already allocated from the common pool “g” of 8192 LCNs).

**Table 13-7 LCN Allocations for 8-Port OC3 BXM, Ports Configured in Port Mode**

| Port (x)                | a(x) | n <sub>1</sub> (x) | m <sub>1</sub> (x) | z <sub>1</sub> = unallocated LCNs | Total LCNS available to Port VSI Partition = min ( z <sub>1</sub> + n <sub>1</sub> (x), max m <sub>1</sub> (x) ) |
|-------------------------|------|--------------------|--------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------|
| <b>Port Group 1</b>     |      |                    |                    |                                   |                                                                                                                  |
| 1                       | 120  | 3000               | 3500               | 4907                              | 3500                                                                                                             |
| 2                       | 50   | 0                  | 0                  | 4907                              | 0                                                                                                                |
| 3                       | 15   | 0                  | 7588               | 4907                              | 4907                                                                                                             |
| 4                       | 0    | 100                | 100                | 4907                              | 100                                                                                                              |
| Sum, for x =1 through 4 | 185  | 3100               | N/A                | N/A                               |                                                                                                                  |
| <b>Port Group 2</b>     |      |                    |                    |                                   |                                                                                                                  |
| 5                       | 6000 | 10                 | 7588               | 1782                              | 1792                                                                                                             |
| 6                       | 0    | 0                  | 100                | 1782                              | 100                                                                                                              |
| 7                       | 100  | 200                | 200                | 1782                              | 200                                                                                                              |
| 8                       | 0    | 100                | 2100               | 1782                              | 1882                                                                                                             |
| Sum for x = 5 through 8 | 6100 | 310                | N/A                | N/A                               |                                                                                                                  |

**Figure 13-12 LCN Allocations for Ports 1-4, Ports Configured in Port Mode Example**





## dspcd

Displays the status, revision, and serial number of a card. If a back card is present, its type, revision, and serial number appear. The displayed information can vary with different card types.

### Syntax

**dspcd** <slot>

Example

**dspcd 5**

### Attributes

| Privilege | Jobs | Log | Node                               | Lock |
|-----------|------|-----|------------------------------------|------|
| 1-6       | No   | No  | IPX switch, IGX switch, BPX switch | No   |

### Related Commands

dncd, dspcds, resetcd, upcd

### Parameters-dspcd

| Parameter | Description          |
|-----------|----------------------|
| slot      | slot number of card. |

### Description

The following shows an example of the dspcd command for a BXM card.

Sample Display:

```
n4 TN SuperUser BPX 15 9.1 Apr. 4 1998 16:40 PST
```

```
Detailed Card Display for BXM-155 in slot 4
```

```
Status: Active
Revision: CD18
Serial Number: 693313
Fab Number: 28-2158-02
Queue Size: 228300
Support: FST, 4 Pts, OC3, Vc
Chnls:16320, PG[1]:7588, PG[2]:7588
PG[1]:1,2,
PG[2]:3,4,
Backcard Installed
Type: LM-BXM
Revision: BA
Serial Number: 688284
Supports: 8 Pts, OC3, MMF Md
```

```
Last Command: dspcd 4
```

```
Next Command:
```

## dspcds

Displays the cards in a shelf, front and back, with their type, revision, and status.

### Syntax

**dspcds** [1]

Example

**dspcds**

### Attributes

| Privilege | Jobs | Log | Node                               | Lock |
|-----------|------|-----|------------------------------------|------|
| 1-6       | No   | No  | IPX switch, IGX switch, BPX switch | No   |

### Related Commands

dncd, dspcd, resetcd, upcd

### Parameters-dspcds

| Parameter | Description                                                                                                                                                   |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1         | Directs the system to display status of the cards on just the lower shelf of an IPX 32 or IGX 8430. If not entered, dspcds displays the top shelf by default. |

### Description

For front and back card sets, the status field applies to the cards as a set. A letter “T” opposite a card indicates that it is running self-test. A letter “F” opposite a card indicates that it has failed a test. If lines or connections have been configured for a slot, but no suitable card is present, the display will list the missing cards at the top of the screen. If a special backplane is installed or if a card was previously installed, empty slots are identified as “reserved”.

For an IPX 32 or IGX 8430, the screen initially displays only the upper shelf with a “Continue?” prompt. Typing “y” to the prompt displays the cards in the lower shelf. The command **dspcds** followed by the letter “L” (for lower shelf) displays card status for just the lower shelf. For an IPX 8 or IGX 8410, the card information appears in only the left column. The status and update messages are as follows:

- Active                      Card in use, no failures detected.
- Active—F                      Card in use, failure(s) detected.
- Active—T                      Card active, background test in progress.
- Active—F-T                      Card active, minor failures detected, background test in progress.
- Standby                      Card idle, no failures.
- Standby—F                      Card idle, failure(s) detected.

- Standby—T            Card idle, background test in progress.
- Standby—F-T        Card idle, failure(s) detected, background test in progress.
- Failed                Card failed.
- Down                 Card downed by user.
- Down—F             Card downed, failure(s) detected.
- Down—T             Card downed, failure(s) detected, background test in progress.
- Mismatch            Mismatch between front card and back card.
- Update \*             Configuration RAM being updated from active control card.
- Locked\*             Incompatible version of old software is being maintained in case it is needed.
- Dnlding\*            Downloading new system software from the active BCC (BPX switch), or NPC (IPX switch or IGX switch), adjacent node, or from StrataView Plus.
- Dnldr\*              Looking to adjacent nodes or StrataView Plus for either software to load or other software needs you have not specifically requested.

In the preceding messages, an asterisk (\*) means an additional status designation for BCC, NPC, or NPM cards. "F" flag in the card status indicates that a non-terminal failure was detected. Cards with an "F" status are activated only when necessary (for example, when no other card of that type is available). Cards with a "Failed" status are never activated.

## Example

### Sample Display:

```
n4 TN SuperUser BPX 15 9.1 Apr. 4 1998 16:40 PST
```

|   | FrontCard |      |      |     |         | Status | BackCard |         |       |           |        | Status  |
|---|-----------|------|------|-----|---------|--------|----------|---------|-------|-----------|--------|---------|
|   | Type      | Rev  | Type | Rev | Type    |        | Rev      | Type    | Rev   | Type      | Rev    |         |
| 1 | Empty     |      |      |     |         | Active | 9        | ASI-155 | BE02  | MMF-2     | AB     | Standby |
| 2 | BXM-155   | BB16 | MM-8 | BA  | Active  | 10     | BME-622  | KDJ     | MM-2  | FH        | Active |         |
| 3 | Empty     |      |      |     |         | Active | 11       | BXM-E3  | BB16  | TE3-12P04 |        | Active  |
| 4 | BNI-E3    | CE08 | E3-3 | JY  | Active  | 12     | BXM-155  | BB16    | MM-8  | BA        | Active |         |
| 5 | BNI-E3    | CE08 | E3-3 | EY  | Active  | 13     | BXM-155  | AC30    | SM-4  | P05       | Active |         |
| 6 | BNI-T3    | CF08 | T3-3 | FH  | Active  | 14     | Empty    |         |       |           |        |         |
| 7 | BCC-3     | DJL  | LM-2 | AA  | Active  | 15     | ASM      | ACB     | LMASM | P01       | Active |         |
| 8 | BCC-3     | DJL  | LM-2 | AA  | Standby |        |          |         |       |           |        |         |

```
Last Command: dspcds
```

```
Next Command:
```

## dspnode

Displays a summary of interface devices connected to a routing node, or when executed from an IPX or IGX interface shelve shows the name of its hub node and trunk number.

### Syntax:

dspnode

### Related Commands

addshelf, delshelf, dsptrk

### Attributes

| Privilege | Jobs | Log | Node                   | Lock |
|-----------|------|-----|------------------------|------|
| 1-6       | No   | No  | BPX switch, IGX switch | Yes  |

### Description

The command displays tag switch controller devices connected to a BPX node and interface shelves connected to an IGX switch or BPX node. The command can be used to isolate the shelf or tag switch controller where an alarm has originated.

The routing nodes in a network do not indicate the interface shelf or tag switch controller where an alarm condition exists, so **dspnode** may be executed at a hub node to find out which interface device originated the alarm.

When executed on an IPX or IGX interface shelve, **dspnode** shows the name of the hub node and the trunk number. Note that to execute a command on an IPX or IGX interface shelf, you must either use a control terminal directly attached to the IPX or IGX switch or telnet to the IPX/AF, as the **vt** command is not applicable.

## Example

Displays information about tag switch controllers and interface shelves (executed on the BPX hub node).

### Sample Display:

```
n4 TN SuperUser BPX 15 9.1 Apr. 4 1998 16:40 PSTT
```

#### BPX Interface Shelf Information

| Trunk | Name | Type   | Alarm |
|-------|------|--------|-------|
| 3.1   | j6c  | AXIS   | MIN   |
| 5.3   | j5c  | IPX/AF | MIN   |
| 4.1   | VSI  | VSI    | OK    |
| 4.2   | VSI  | VSI    | OK    |
| 4.3   | VSI  | VSI    | OK    |

Last Command: dspnode

Next Command:

## dspqbin

Displays the configuration of the specified Qbin on a BXM.

### Syntax

**dspqbin** <slot.port> <qbin number>

### Example

**dspqbin 4.1 10**

### Attributes

| Privilege | Jobs | Log | Node       | Lock |
|-----------|------|-----|------------|------|
|           |      |     | BPX switch |      |

### Related Commands

cnfqbin

### Parameters-dspqbin

| Parameter   | Description                                                     |
|-------------|-----------------------------------------------------------------|
| slot.port   | The slot and port number of interest                            |
| qbin number | The qbin number. For EFT tag switching, this is Qbin number 10. |

### Description

The following example shows configuration of Qbin 10 on port 4.1 of a BXM card.

## Example dspqbin 4.1 10

### Sample Display:

```
n4 TN SuperUser BPX 15 9.1 Apr. 4 1998 16:40 PST
```

```
Qbin Database 4.1 on EXM qbin 10
```

```
Qbin State: Enabled
Minimum Bandwidth: 0
Qbin Discard threshold: 65536
Low CLP/EPD threshold: 95%
High CLP/EPD threshold: 100%
EFCI threshold: 40%
```

```
This Command: dspqbin 4.1 10
```

```
Next Command:
```

## dsprsrc

Displays the tag switching resource configuration of the specified partition on a BXM card.

### Syntax

**dsprsrc** <slot.port> <partition>

### Example

**dsprsrc 4.1 1**

### Attributes

| Privilege | Jobs | Log | Node       | Lock |
|-----------|------|-----|------------|------|
|           |      |     | BPX switch |      |

### Related Commands

cnfrsrc

### Parameters-dspcds

| Parameter | Description                     |
|-----------|---------------------------------|
| slot.port | Specifies the BXM slot and port |
| partition | Specifies the vsi partition.    |

### Description

The following example shows configuration of vsi resources for partition 1 at BXM port 4.1.

#### Example Display:

```

n4 TN SuperUser BPX 15 9.1 Apr. 4 1998 16:40 PST

Port/Trunk : 4.1

Maximum PVC LCNS: 256 Maximum PVC Bandwidth:26000

Min Lcn(1) : 0 Min Lcn(2) : 0
Partition 1

Partition State : Enabled
Minimum VSI LCNS: 512
Maximum VSI LCNS: 7048
Start VSI VPI: 2
End VSI VPI : 15
Minimum VSI Bandwidth : 26000 Maximum VSI Bandwidth : 100000

Last Command: dsprsrc 4.1 1

Next Command:

```



## dsptrks

Display information on the trunk configuration and alarm status for the trunks at a node. The trunk numbers with three places represent virtual trunks.

### Syntax

dsptrks

### Related Commands

addtrk, deltrk, dntrk, uptrk

### Attributes

| Privilege | Jobs | Log | Node                               | Lock |
|-----------|------|-----|------------------------------------|------|
| 1-6       | No   | No  | IPX switch, IGX switch, BPX switch | No   |

### Description

Displays basic trunk information for all trunks on a node. This command applies to both physical only and virtual trunks. The displayed information consists of:

- Trunk number, including the virtual trunk number (three places such as 4.1.10)
- Line type (E1, T3, or OC3, for example)
- Alarm status
- Device type at other end of trunk, such as node, interface shelf, tag switch controller.

For trunks that have been added to the network with the **addtrk** or **addshelf** command, the information includes the device name and trunk number at the other end. Trunks that have a “-” in the Other End column have been upped with **uptrk** but not yet added. For disabled trunks, the trunk numbers appear in reverse video on the screen. Virtual trunk numbers contain three parts, for example, 4.1.1.

### Example

Enter the dsptrks command as follows to display the trunks on a BPX switch:

### dsptrks

Sample Display:

```
n4 TN SuperUser BPX 15 9.1 Apr. 4 1998 16:40 PST

TRK Type Current Line Alarm Status Other End
2.1 OC3 Clear - OK j4a/2.1
3.1 E3 Clear - OK j6c(Axis)
5.1 E3 Clear - OK j6a/5.2
5.2 E3 Clear - OK j3b/3
5.3 E3 Clear - OK j5c(IPX/AF)
6.1 T3 Clear - OK j4a/4.1
6.2 T3 Clear - OK j3b/4
4.1 OC3 Clear - OK VSI(VSI)
4.2 OC3 Clear - OK VSI(VSI)
4.3 OC3 Clear - OK VSI(VSI)
```

Last Command: dsptrks

Next Command:

## resetcd

The reset card command resets the hardware and software for a specified card.

### Syntax

```
resetcd <slot_num> <reset_type>
```

### Example

```
resetcd 5 H
```

### Attributes

| Privilege | Jobs | Log | Node                               | Lock |
|-----------|------|-----|------------------------------------|------|
| 1-3       | Yes  | Yes | IPX switch, IGX switch, BPX switch | Yes  |

### Related Commands

dspcd

Parameters-resetcds

| Parameter   | Description                                                                                                                                 |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| slot number | Specifies the card number to be reset.                                                                                                      |
| H/F         | Specifies whether the hardware or failure history for the card is to be reset. An "H" specifies hardware; an "F" specifies failure history. |

### Description

A hardware reset is equivalent to physically removing and reinserting the front card of a card group and causes the card's logic to be reset. When you reset the hardware of an active card other than a controller card (an NPC, NPM, or BCC), a standby card takes over if one is available. A failure reset clears the card failures associated with the specified slot. If a slot contains a card set, both the front and back cards are reset.

Do not use the reset command on an active NPC, NPM, or BCC because this causes a temporary interruption of all traffic while the card is re-booting. (Resetting a controller card does not destroy configuration information.) Where a redundant NPC, NPM, or BCC is available, the **switchcc** command is used to switch the active controller card to standby and the standby controller card to active. If a standby card is available, resetting an active card (except for a NPC, NPM, or BCC) does not cause a system failure. H/F Resetting of an active card that has no standby does disrupt service until the self-test finishes.

### Example 1

```
resetcd 3 H
```

### Sample Display:

No display is generated.

## upport

Displays the cards in a shelf, front and back, with their type, revision, and status.

### Syntax

**upport** <slot,port>

### Example

**upport 4.2**

### Attributes

| Privilege | Jobs | Log | Node       | Lock |
|-----------|------|-----|------------|------|
| 1-2       | Yes  | Yes | BPX switch | Yes  |

### Related Commands

dnport, cnfport, upln

### Parameters-dspcds

---

| Parameter | Description                                                            |
|-----------|------------------------------------------------------------------------|
| slot.port | Specifies the slot number and port number of the port to be activated. |

---

### Related Commands

dnport, cnfport, upln

## Description

The following example shows the screen that is displayed when the following command is entered to up a port on an ASI card:

```
upport 4.2
```

## System Response

Sample Display:

```
n4 TN SuperUser BPX 15 9.1 Apr. 4 1998 16:40 PST

Port: 4.2 [ACTIVE]
Interface: T3-2
Type: UNI
Speed: 96000 (cps)

CBR Queue Depth: 200
CBR Queue CLP High Threshold: 80%
CBR Queue CLP Low Threshold: 60%
CBR Queue EFCI Threshold: 80%
VBR Queue Depth: 1000
VBR Queue CLP High Threshold: 80%
VBR Queue CLP Low Threshold: 60%
VBR Queue EFCI Threshold: 80%
ABR Queue Depth: 9800
ABR Queue CLP High Threshold: 80%
ABR Queue CLP Low Threshold: 60%
ABR Queue EFCI Threshold: 80%
```

```
Last Command: upport 4.2
```

```
Next Command:
```

## uptrk

Activates (or “ups”) a trunk.

### Syntax

```
uptrk <slot.port>[.vtrk]
```

### Example

```
uptrk 4.1
```

### Related Commands

addtrk, dntrk

### Attributes

| Privilege | Jobs | Log | Node                               | Lock |
|-----------|------|-----|------------------------------------|------|
| 1-2       | Yes  | Yes | IPX switch, IGX switch, BPX switch | Yes  |

### Parameters-uptrk

| Parameter | Description                                                                                                                                                         |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| slot.port | Specifies the slot and port of the trunk to activate. If the card has only one port, the <i>port</i> parameter is not necessary. An NTM, for example, has one port. |

### Optional Parameters-uptrk

| Parameter | Description                                                                                                                                                                                                  |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| vtrk      | Specifies the virtual trunk number. The maximum on a node is 32. The maximum on a T3 or E3 line is 32. The maximum for user traffic on an OC3/STM1 trunk is 11 (so more than one OC3/STM1 may be necessary). |

### Description

After you have upped the trunk but not yet *added* it, the trunk carries line signaling but does not yet carry live traffic. The node verifies that the trunk is operating properly. When the trunk is verified to be correct, the trunk alarm status goes to clear. The trunk is then ready to go into service, and can be added to the network.

If you need to take an active trunk between nodes out of service, the **dntrk** command may be used. However, this will result in temporary disruptions in service as connections are rerouted. The **dntrk** command causes the node to reroute any existing traffic if sufficient bandwidth is available.

Interface Shelves and Tag Switch Controllers: For interface shelves or tag switch controllers connected to a node, connections from those devices will also be disrupted when the links to them are deleted. For an interface shelf, the **delshelf** command is used to deactivate the trunk between the IGX or BPX routing node and the shelf.

Tag Switch Controller: For a tag switch controller, the **delshelf** command is also used to deactivate the link between the BPX routing node and the tag switch controller. In the case of tag switching, this is a link between a port on the BXM card and the tag switch controller. This link can be connected to a port that has been upped by either the **upport** or **uptrk** command, as the tag switching operation does not differentiate between these modes on the BXM.

Virtual Trunks: If you include the optional *vrk* parameter, **uptrk** activates the trunk as a *virtual* trunk. If the front card is a BXM (in a BPX switch), **uptrk** indicates to the BXM that it is supporting a trunk rather than a UNI port. (See the **upln** description for the BXM in port mode.)

You cannot mix physical and virtual trunk specifications. For example, after you up a trunk as a standard trunk, you cannot add it as a virtual trunk when you execute **addtrk**. Furthermore, if you want to change trunk types between standard and virtual, you must first down the trunk with **dntrk** then up it as the new trunk type.

You cannot up a trunk if the required card is not available. Furthermore, if a trunk is executing self-test, a “card in test” message may appear on-screen. If this message appears, re-enter **uptrk**.

### Example 1

Activate (up) trunk 21—a single-port card, in this case, so only the slot is necessary.

**uptrk 21**

### Example 2

This example shows the screen when BXM trunk 4.1 connected to a Tag Switch Controller is upped with the following command:

**uptrk 4.1**

Sample Display:

```

n4 TN SuperUser BPX 15 9.1 Apr. 4 1998 16:40 PST

TRK Type Current Line Alarm Status Other End
 2.1 OC3 Clear - OK j4a/2.1
 5.1 E3 Clear - OK j6c (AXIS)
 5.1 E3 Clear - OK j6a/5.2
 5.2 E3 Clear - OK j3b/3
 5.3 E3 Clear - OK j5c (IPX/AF)
 6.1 T3 Clear - OK j4a/4.1
 6.2 T3 Clear - OK j3b/4
 4.1 OC3 Clear - OK VSI (VSI)

```

Last Command: uptrk 4.1

Next Command:

### Example 3

Activate (up) trunk 6.1.1—a virtual trunk, in this case, which the third digit indicates.

**uptrk 6.1.1**





# Configuration, BME Multicasting

---

This chapter contains an overview of multicasting, a description of the BME card used on the BPX switch for multicasting, and configuration information.

This chapter contains the following:

- Introduction
- Standards
- Multicasting Benefits
- Multicasting Overview
- Connection Management Criteria
- Connection Management with Cisco StrataView Plus
- BME Operation
- Alarms
- Hot Standby Backup
- Configuration
- Connection Diagnostics
- List of Terms
- Related Documents
- Configuration Management

## Introduction

The BME provides multicast services in the BPX switch. It is used in conjunction with a two-port OC-12 backcard.

Multicasting point-to-multipoint services meets the demands of users requiring virtual circuit replication of data (frame relay and ATM) performed within the network. Some examples of functions benefiting from multicasting are:

- Retail — point-of-sale updates
- Router topology updates
- Desktop multimedia
- Video conferencing

- Video distribution, e.g., IP multicast video networks to the desktop
- Remote learning
- Medical imaging

## Standards

- UNI 3.1 Multicast Server
- UNI 4.0 Leaf Initiated Joins and related standards

## Multicasting Benefits

Multicasting point-to-multipoint connections benefits include:

- Decreased delay in receiving data
- Near simultaneous reception of data by all leaves

## Multicasting Overview

### BME Features:

- The BME is a two-port OC12 card
- Supports up to 1000 multicast groups
- Supports up to 8064 connections, at 4032 per port. It can support the following combinations:
  - 1000 roots with 8 leaves in each multicast group
  - 100 roots with 80 leaves in each multicast group
  - 2 roots with 4000 leaves in each multicast group
  - or any other such combination.
- Supports CBR, UBR, VBR, and ATFR connections
- Hot standby

### BME Requirements

- Firmware of type BMEMK, where K is the model number for BME
- **upln** is used to bring up line 1 and line 2.
- **upport** is used to bring up port1 and port 2, respectively.

## BME Restrictions

- BMEs can function in the following two BPX node configurations:
  - BCC-4s and BXMs only
  - BCC-3 control cards and legacy cards only, including BNIs and ASIs
- VC frame merge is not currently supported

## Address Criteria

- The VPI of a multicast connection indicates the multicast group to which it belong.
- The VPI.VCI assigned to a multicast connection is unique for that card.
- If the VCI = 0 for a multicast connection, this indicates a root connection.
- If the VCI is not = 0 for a multicast connection, this indicates a leaf connection.
- If the root connection of a given multicast group is added to port 1 of the two port card, then the leaves belonging to that multicast group must be added to port 2, and vice versa.

For example, if 12.1.50.0 is added on port 1, then the leaves should be 12.2.50.50, 12.2.50.100, 12.2.50.101 etc. Similarly, if a root 12.2.60.0 is added on port 2, then the leaves should be 12.1.60.101, 12.1.60.175, etc.

## Connection Management Criteria

Root connections and leaf connections can be added in any order:

- Add root first and then leaves
- Add leaves first and then root
- Add root in between adding leaves.

Root and leaf connections can be deleted in any order.

Root can be deleted and replaced with a new root.

## Connection Management with Cisco StrataView Plus

- Cisco StrataView Plus management includes the following functions:
  - Connection filtering by multicast type (root/leaf)
  - Multicast connection addition, deletion, and modification
  - Multicast view of multicast group of a selected connection
  - No multicast specific statistics support
  - No service MIB support

## BME Operation

Cables are connected between port 1 and port 2 of the backcard, transmit to receive and receive to transmit.

---

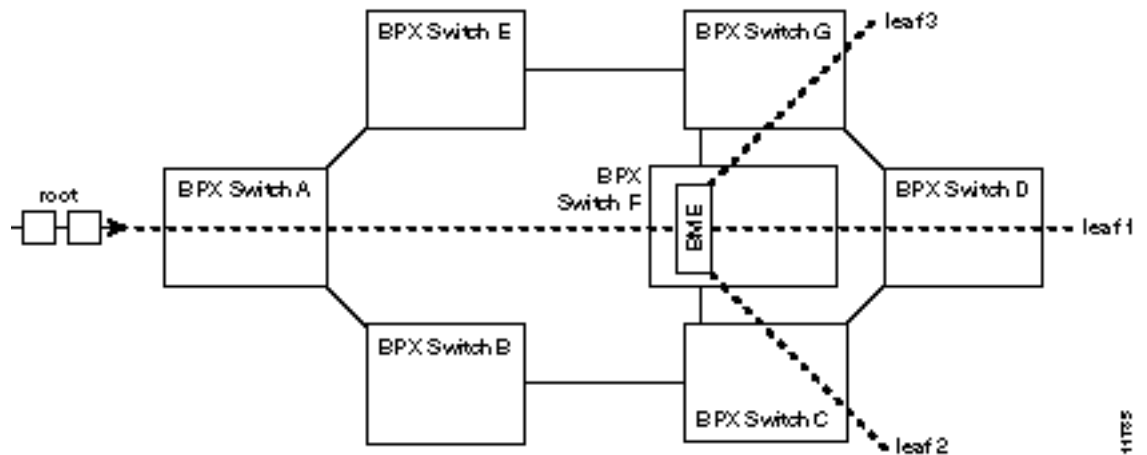
**Note** Removing the physical loopback cables or placing line 1 or 2 into loopback will prevent the cells from the root reaching the leaves.

---

## BME Cell Replication

Figure 14-1 shows a BME with a single root input multicasting with 3 leaves. The root connection can be added at a BPX switch (BPX switch A) distant from where the traffic is replicated by the BME card (BPX switch F) and routed through a number of BPX nodes. Similarly, the leaves can be routed from the multicasting node through a number of nodes before reaching their destination.

**Figure 14-1** Replication of a Root Connection into Three Leaves

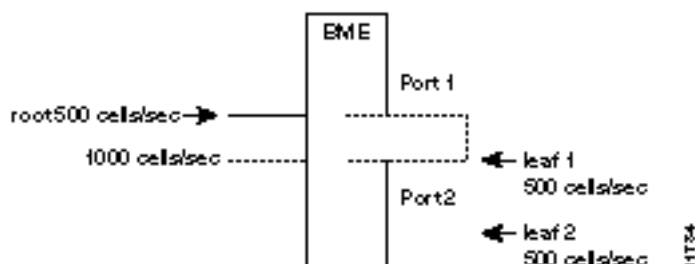


14135

## Cell Replication Stats

As an example of how traffic appears on the BME, if there is one root at port 1 with two leaves at port 2, and traffic is passed on the root at 500 cells/sec, then one should see an egress port stat of 1000 cell/sec on port 1 and an ingress port stat of 1000 cells/sec on port 2, as shown in Figure 14-2.

**Figure 14-2 Example of Traffic, one root and two leaves**

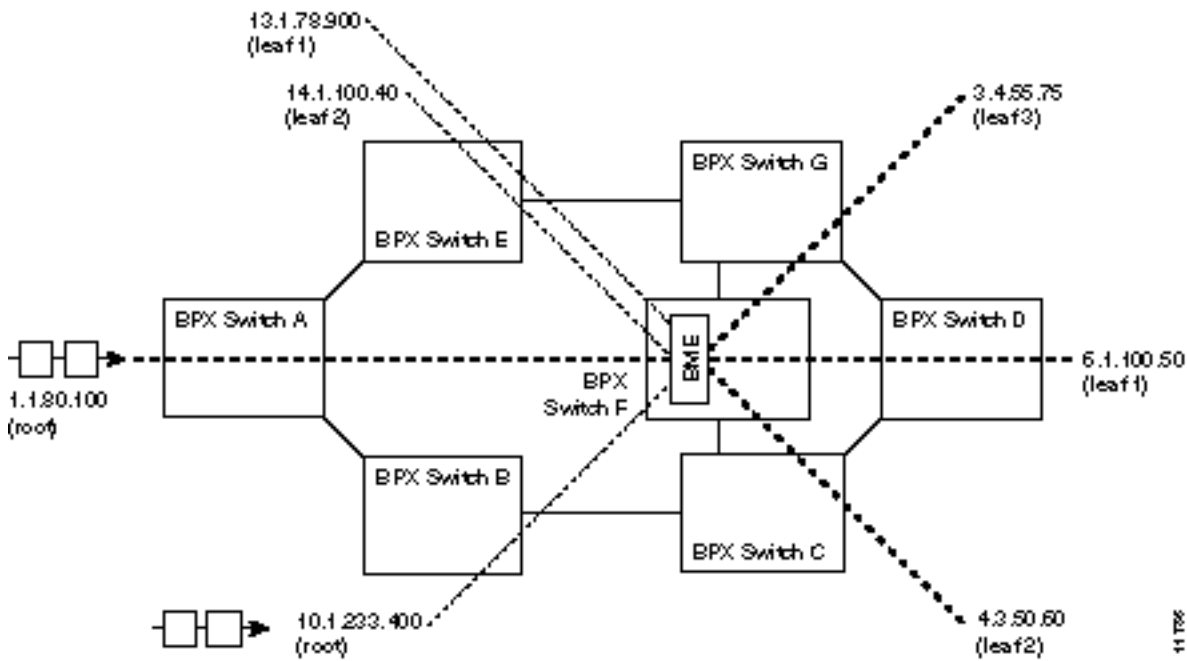


## Adding Connections

Figure 14-3 shows two multicasting groups. For purposes of the illustration only a few leaves are shown for each connection. However, as described previously, each multicasting group could contain up to 8064 connections. Also, in this example, the two connections with a VCI of 0 each define a multicasting root connection. Their VPI defines a broadcasting group. For example, one group is defined by 2.1.70.0, where the VCI of zero defines the root connection to a BME, and the VPI of 70 defines a group. All the leaves in that group are of the form 2.2.70.x. The other group is defined by 2.2.80.0, where the VCI of zero defines the root connection to a BME, and the VPI of 80 defines a group. All the leaves in that group are of the form 2.1.80.x.

| Group 2.1.70.x   | Action            | Command                                                 |
|------------------|-------------------|---------------------------------------------------------|
| at bpx switch_F, | add input to root | addcon 2.1.70.0 bpx switch_A 1.1.80.100 c 500 * * *     |
| at bpx switch_F, | add leaf 1        | addcon 2.2.70.101 bpx switch_D 6.1.100.50 c 500 * * *   |
| at bpx switch_F, | add leaf 2        | addcon 2.2.70.100 bpx switch_C 4.3.50.60 c 500 * * *    |
| at bpx switch_F, | add leaf 3        | addcon 2.2.70.102 bpx switch_G 3.4.55.75 c 500 * * *    |
| Group 2.2.80.x   |                   |                                                         |
| at bpx switch_F, | add input to root | addcon 2.2.80.0 bpx switch_B 10.1.233.400 v 4000 * * *  |
| at bpx switch_F, | add leaf 1        | addcon 2.1.80.201 bpx switch_E 13.1.78.900 v 4000 * * * |
| at bpx switch_F, | add leaf 2        | addcon 2.1.80.100 bpx switch_E 14.1.100.40 v 4000 * * * |

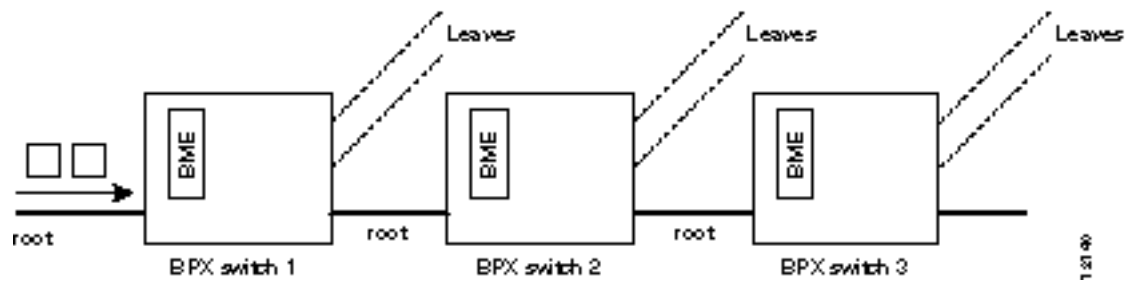
Figure 14-3 Adding Multicasting Connections



## Multi-Segment Multicast Connections

Figure 14-4 shows an example of a multi-segment multicast connection where a leaf connection from one BME can become a root connection for another BME. This capability allows the users to configure multi-segment multicast tree topologies.

Figure 14-4 Multi-Segment Multicast Connections



## Multicast Statistics

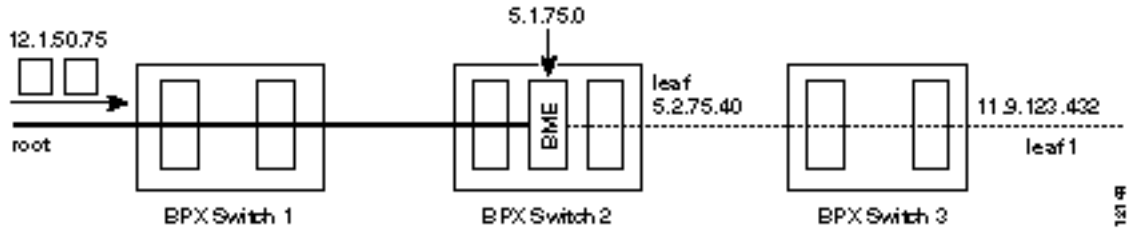
Channel statistics are available for leaf connections on the BME end. However, channel statistics are not available for the root connection on the BME end.

For the example in Figure 14-5:

- **dspchstats** 12.1.50.75 on BPX switch 1 (available)
- **dspchstats** 5.1.75.0 on BPX switch 2 (not available)

- **dspchstats** 5.2.75.40 on BPX switch 2 (available)
- **dspchstats** 11.9.123.432 on BPX switch 3 (available)

**Figure 14-5 Statistics Collection**



## Policing

Policing is supported on all leaf connections on the BME end.

All policing types available on the BXM are available on the BME leaves

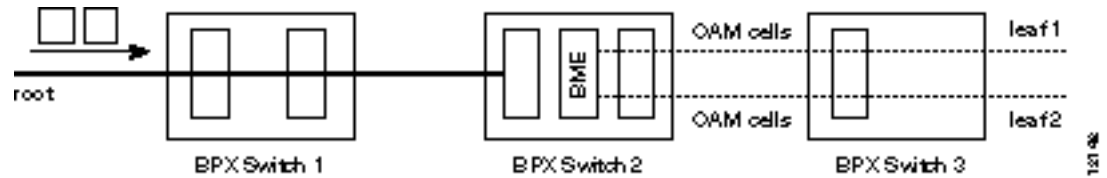
No policing functionality is available on the root connection on the BME end.

## Alarms

## OAM cells

OAM cells coming into the root are multicast into the leaves along with data, as shown in Figure 14-6.

**Figure 14-6 OAM Cells**

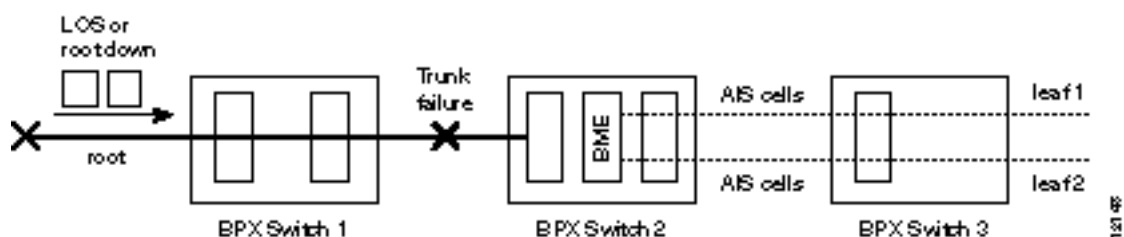


## AIS cells

AIS cells are automatically generated on the leaves, as shown in Figure 14-7, when:

- There is a loss of signal (LOS) on the far end of the root
- There is a trunk failure
- When the root connection is downed using the **dncon** command.

Figure 14-7 Alarms



## Hot Standby Backup

BME cards can be set up to provide hot standby backup. Both cards are set up with port 1 connected to port 2 on the same card to provide the multicasting connection, transmit to receive and receive to transmit. There is no Y-cabling connection between the cards, and they do not have to be adjacent to each other.

The **addyred** command is used to enable hot standby backup between the cards. *The **addyred** command must be used before any connections are added to the active card.* The command will be rejected if used after connections have been added to the active card.



## Configuration

If the multicast tree has a large number of leaf connections, for example, 3000, then the **cnfportq** command should be used to configure the Qbin threshold to be greater than needed for half the number of leaves so as to assure that the multicast group will have no discards. The Qbin default depth is about 1200 cells.

Qbin example using **cnfportq** command:

```

j4b VT SuperUser ~ BPX 15 9.1.sj Feb. 24 1998 16:59 PST
Port: 3.2 [ACTIVE]
Interface: LM-BXM
Type: NNI
Speed: 1412830 (cps)
SVC Queue Pool Size: 0
CBR Queue Depth: 1200
CBR Queue CLP High Threshold: 80%
CBR Queue CLP Low Threshold: 60%
CBR Queue EFCI Threshold: 80%
VBR Queue Depth: 10000 UBR/ABR Queue Depth: 40000
VBR Queue CLP High Threshold: 80% UBR/ABR Queue CLP High Threshold: 80%
VBR Queue CLP Low Threshold: 60% UBR/ABR Queue CLP Low Threshold: 60%
VBR Queue EFCI Threshold: 80% UBR/ABR Queue EFCI Threshold: 30%

This Command: cnfportq 3.2
SVC Queue Pool Size [0]:
Virtual Terminal CD

```

## Connection Diagnostics

- **tstconseq** and **tsdelay** commands may be used to troubleshoot a leaf connection both from the BME end point as well as on the other end point
- **tstconseq** is available on the root connection only on the non-BME end point
- **tstconseq** is not supported from the BME end of the root connection
- **tsdelay** is not supported on root connections.

## List of Terms

BME

The card used in the BPX switch to provide multicasting.

## Related Documents

- *Cisco WAN Switching Command Reference Manual*

## Configuration Management

The BPX switch must be initially installed, configured, and connected to a network.

Following this, multi-casting connections can be added to the BPX switch.



PART 3

# Reference

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# Cisco Cabinet Dimensions

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This appendix illustrates typical cable management and space requirements for various system configurations in the Cisco cabinet. It also contains a table with the height of Cisco components in inches, centimeters, and rack-mount units (RMUs). This can help in the calculation of height requirements for individual setups. The last illustration shows the bracket installation in the Cisco (for a BPX switch, in this case). The information is grouped as follows:

- Cisco Cabinet and Component Heights
- Cisco Cabinet
- Cable Management
- Examples of BPX 8600 Series Switch Configurations
- Examples of IGX 8400 Series Switch Configurations

## Cisco Cabinet and Component Heights

Table A-1 lists Cisco cabinet dimensions and the heights of components that may be installed in the cabinet.

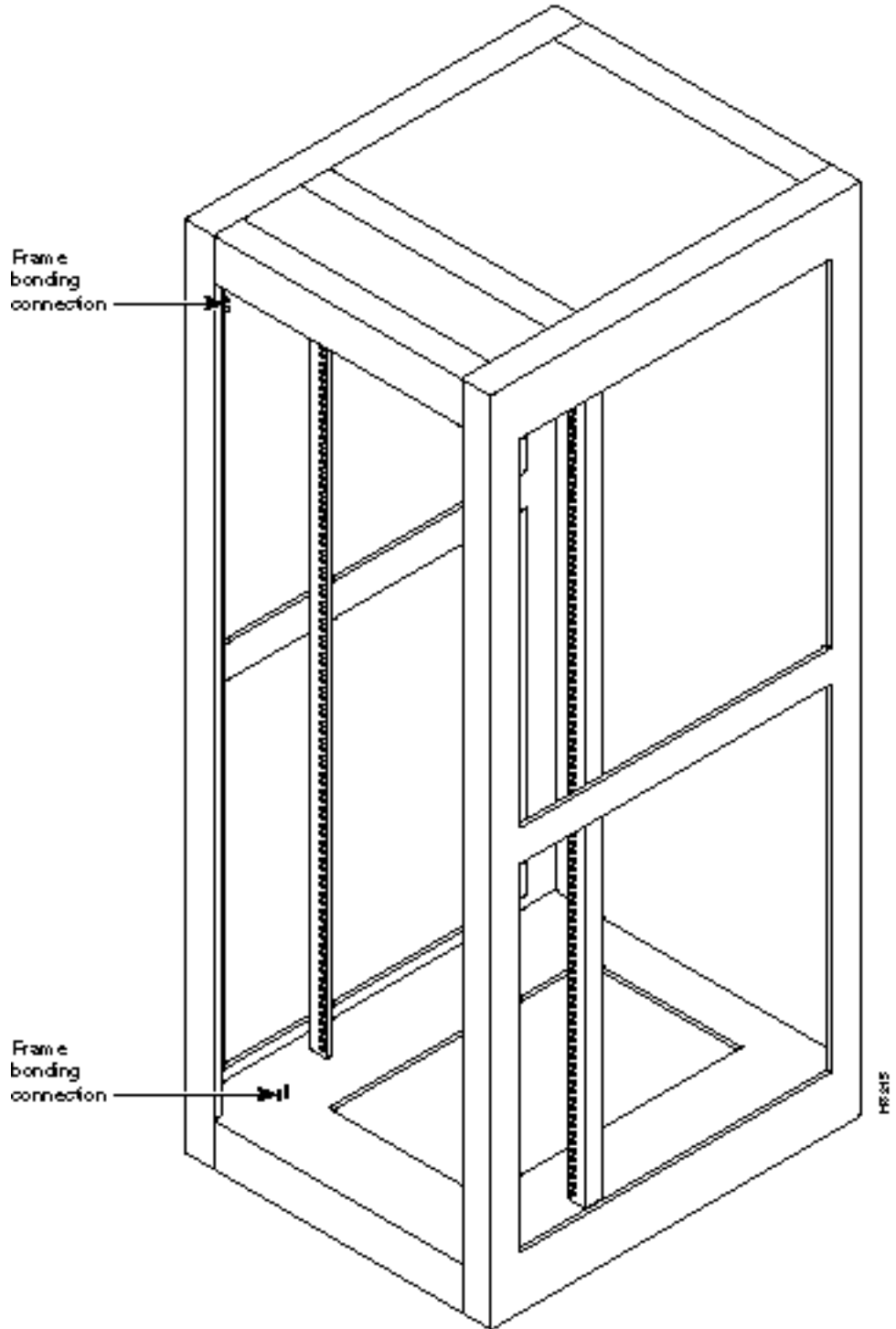
**Table A-1 Table of Cisco Cabinet and Component Heights**

| Components                       | Unit Height |         |      |
|----------------------------------|-------------|---------|------|
|                                  | Inches      | CM.     | RMUs |
| MGX 8220 Card Cage               | 8.75        | 22.225  | 5    |
| MGX 8220 AC Power Supply shelf   | 5.25        | 13.335  | 3    |
| MGX 8220 Booster Fan Assembly    | 3.5         | 8.89    | 2    |
| MGX 8220 Cooling Assembly        | 5.25        | 13.335  | 3    |
| MGX 8220 Exhaust Plenum          | 3.5         | 8.89    | 2    |
| BPX switch AC Power Supply shelf | 5.25        | 13.335  | 3    |
| BPX switch Card Cage             | 22.75       | 57.785  | 13   |
| IGX switch AC Power Supply shelf | 5.25        | 13.335  | 3    |
| IGX switch Booster Fan Assembly  | 3.5         | 8.89    | 2    |
| IGX switch Card Cage             | 17.5        | 44.45   | 10   |
| IGX switch Cooling Assembly      | 5.25        | 13.335  | 3    |
| IGX switch Exhaust Plenum        | 3.5         | 8.89    | 2    |
| IGX 8410 switch                  | 24.5        | 62.23   | 14   |
| DAS, VNS, and ESP                | 5.25        | 13.335  | 3    |
| Cabinet                          | Unit Height |         |      |
|                                  | Inches      | CM.     | RMUs |
| Cisco Cabinet                    | 71.75       | 1822.45 | 41   |

# Cisco Cabinet

Figure A-1 shows a back view of an empty Cisco cabinet.

Figure A-1 Back View of Empty Cisco Cabinet

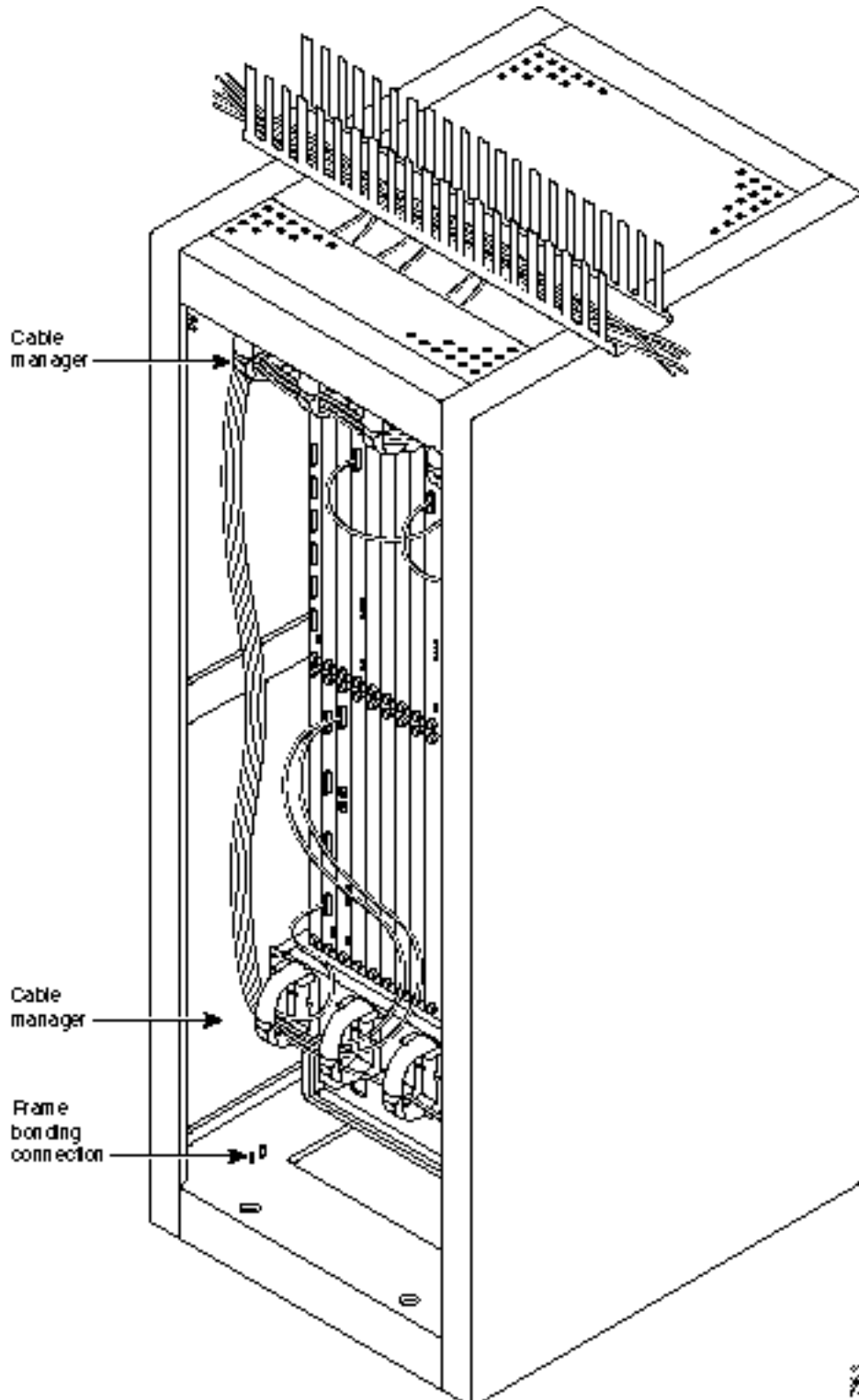


## Cable Management

Figure A-2 shows a typical cable management configuration for an IGX-32 switch in a Cisco cabinet.



Figure A-2 Typical Cable Management, IGX-32 Switch in Cisco Cabinet



## Examples of BPX 8600 Series Switch Configurations

Figure A-3 through Figure A-9 show various BPX switch configurations.

Figure A-3 Single BPX Switch, DC and AC Systems

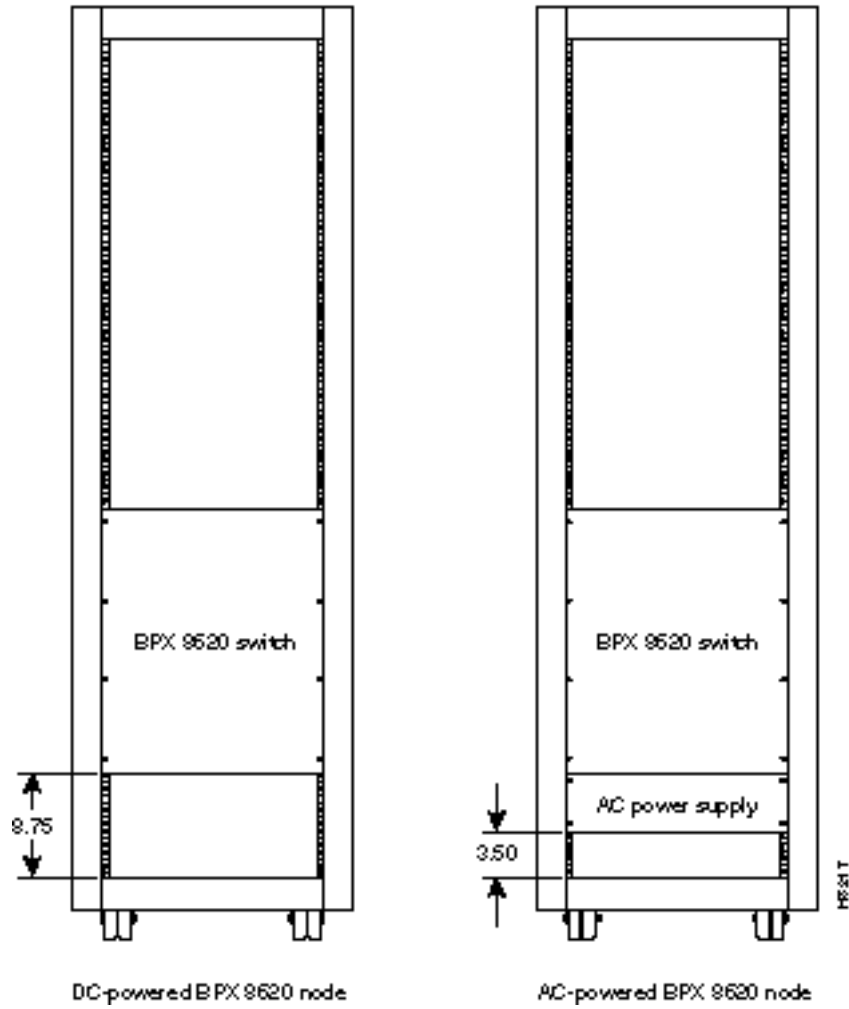


Figure A-4 Single BPX Switch and MGX 8220, DC and AC Systems

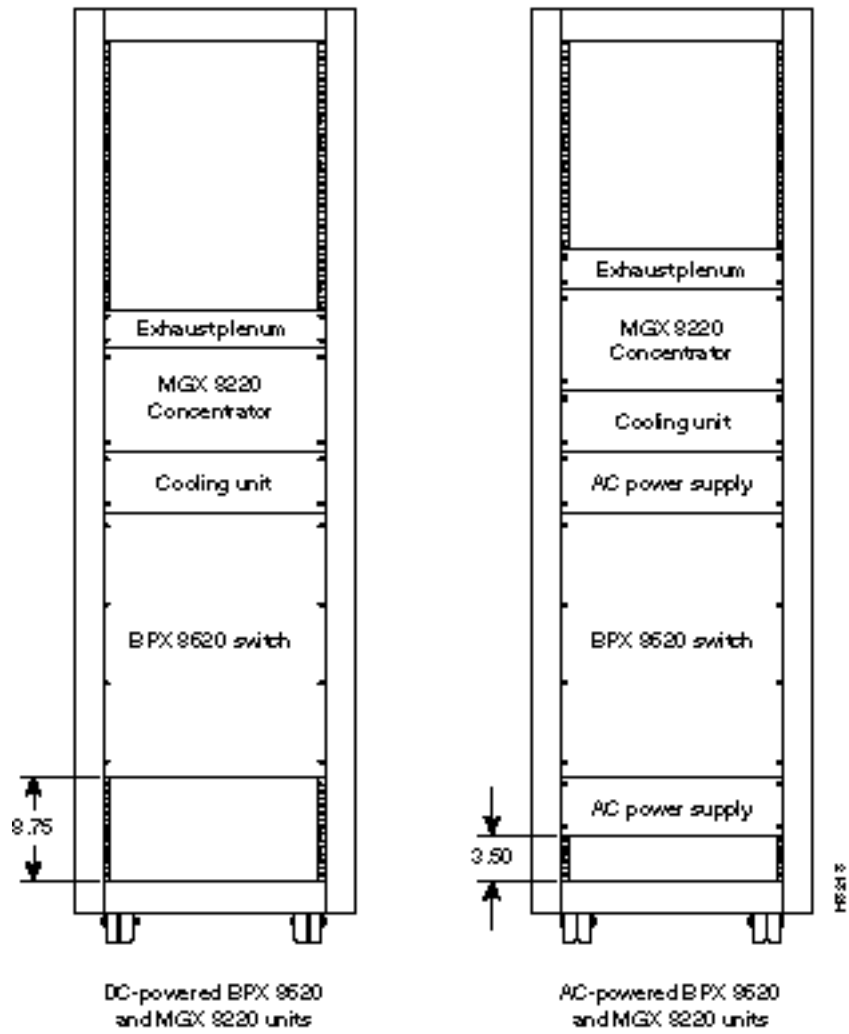


Figure A-5 BPX Switch, MGX 8220, and ESP, DC and AC Systems

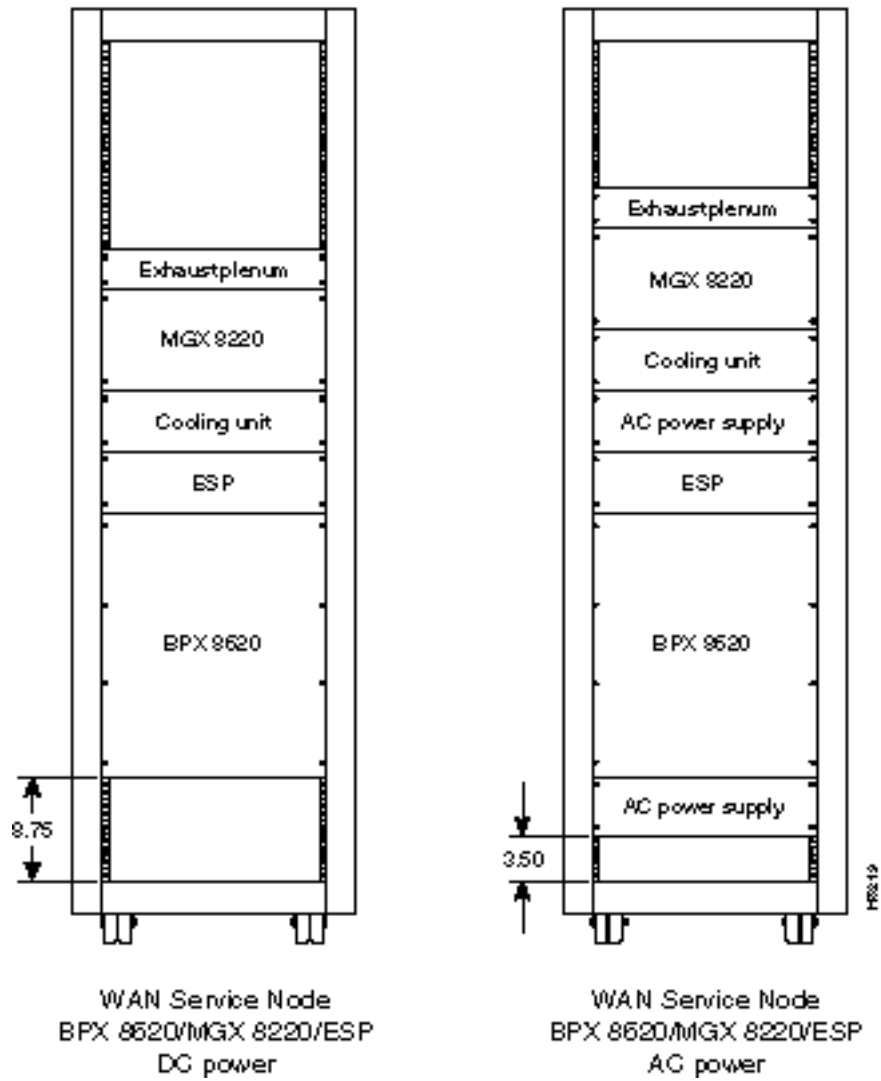


Figure A-6 BPX Switch With 2 ESP and 3 MGX 8220, DC System

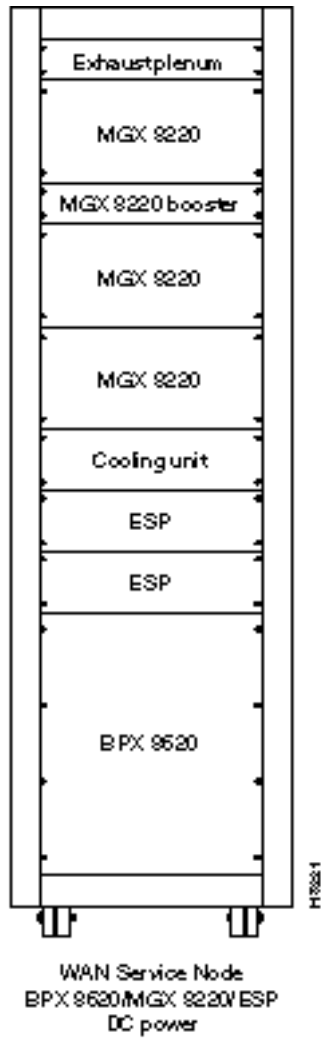


Figure A-7 Six MGX 8220, DC System

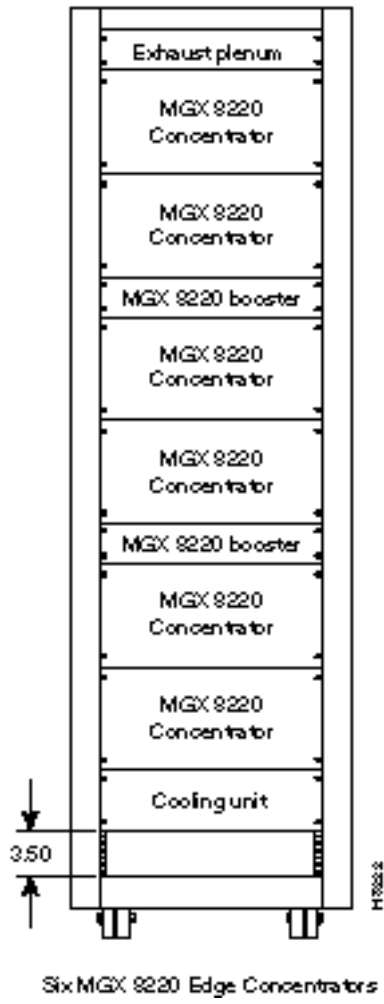


Figure A-8 BPX Switch with Three MGX 8220s, DC System

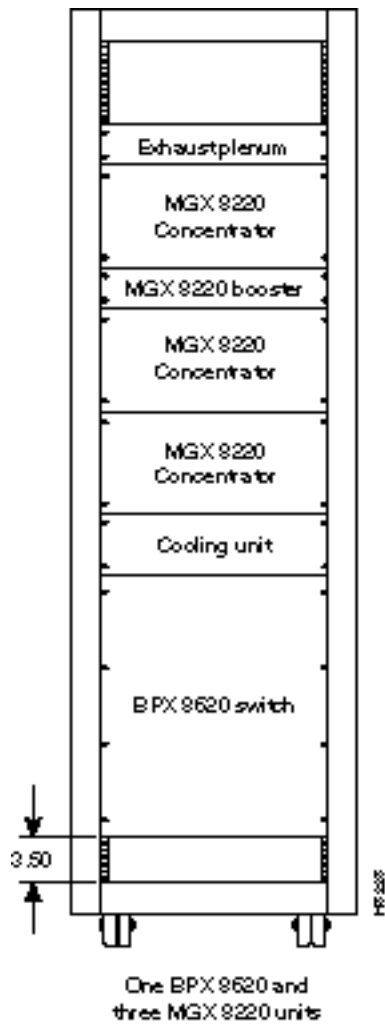
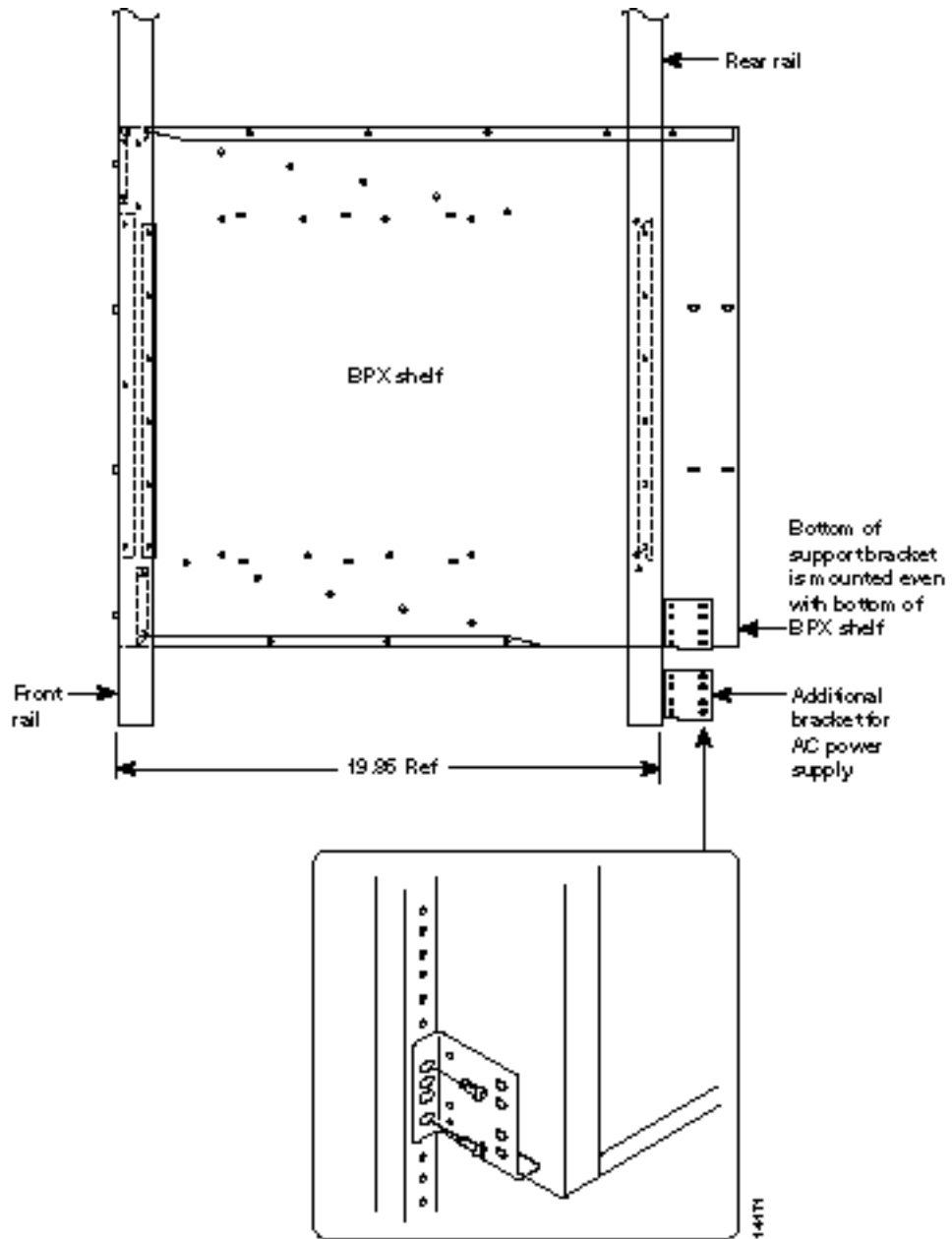


Figure A-9 Mounting Brackets (BPX switch), Standard Configuration





## Examples of IGX 8400 Series Switch Configurations

Figure A-10 through Figure A-12 show various IGX switch configurations.

Figure A-10 IGX 8430 Switch, DC and AC Systems

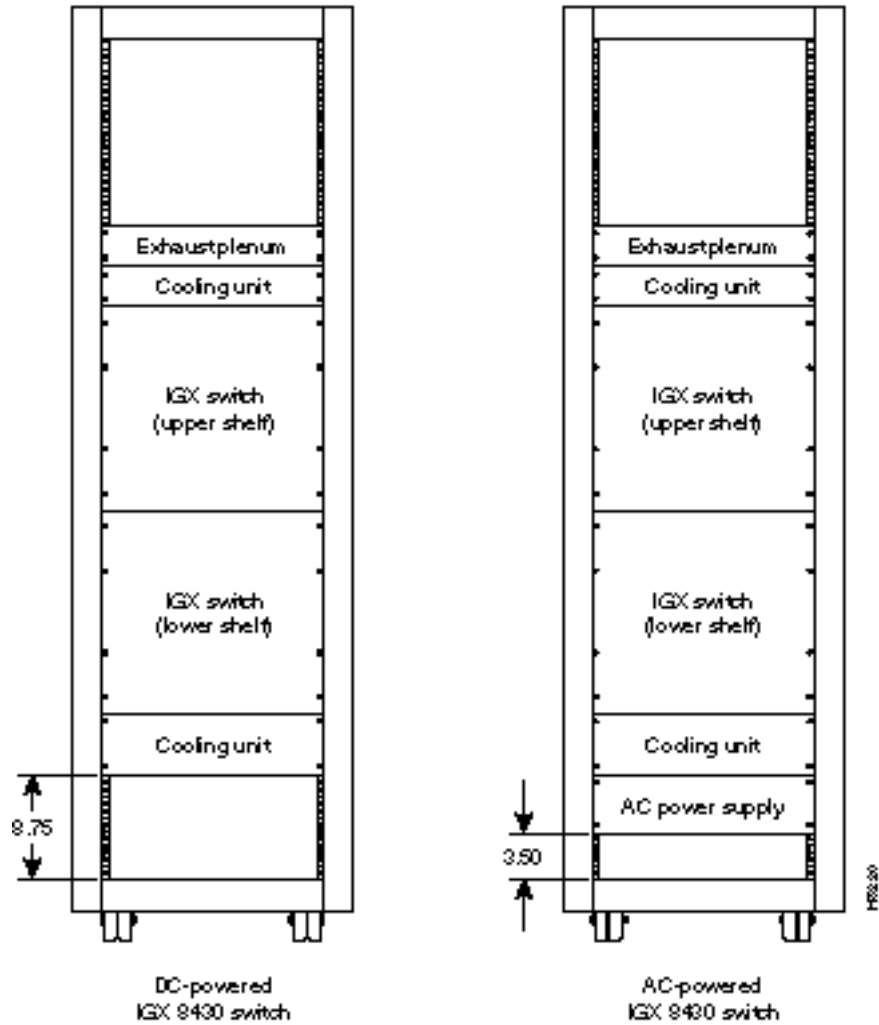


Figure A-11 Single IGX 8420 Switch, DC and AC Systems

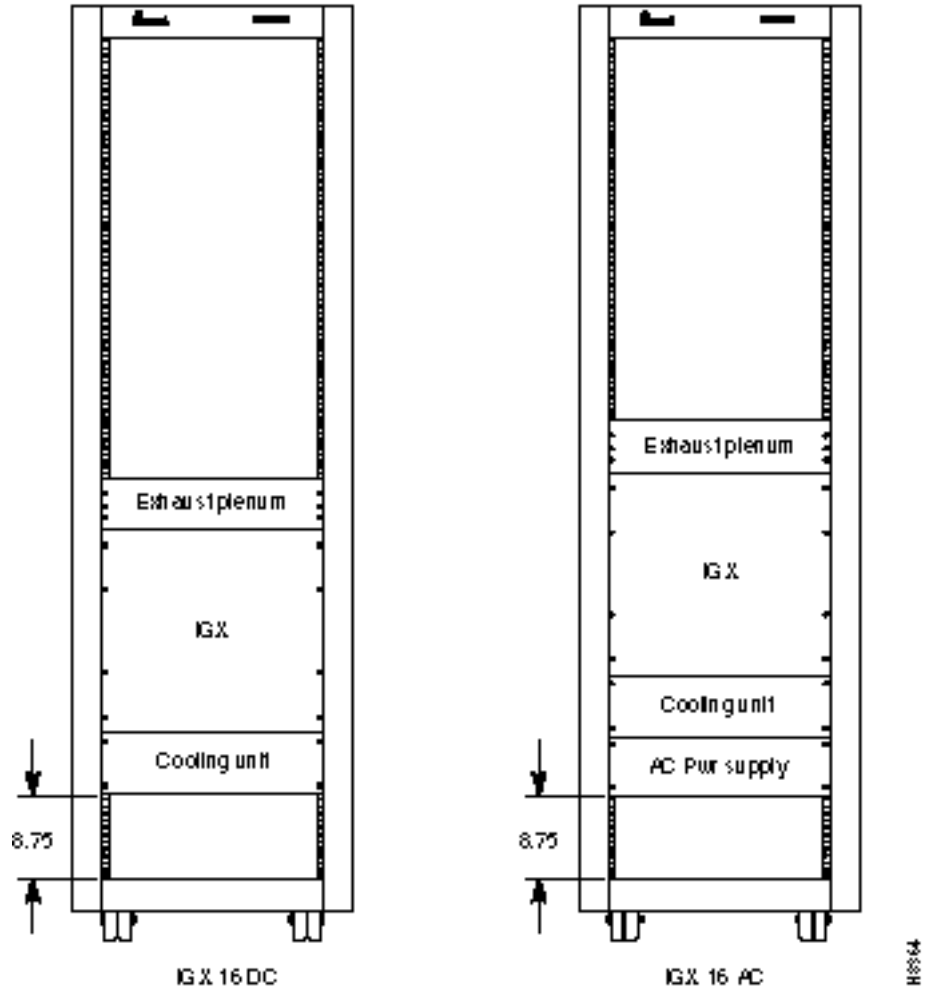
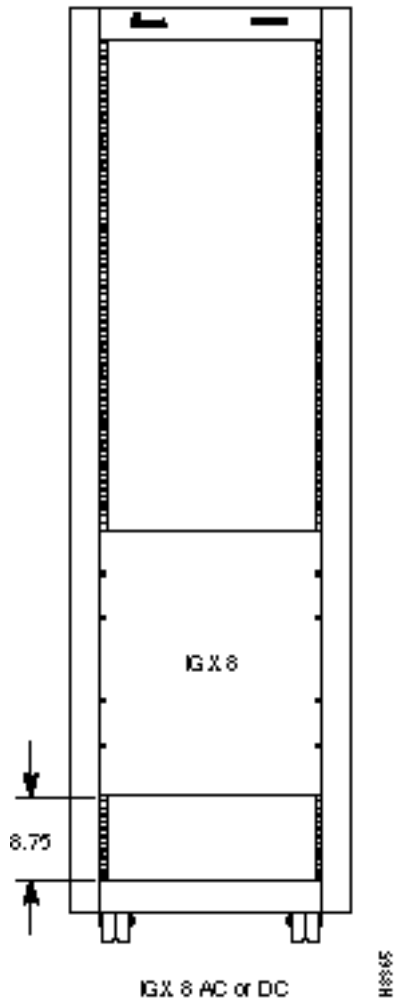


Figure A-12 Single IGX 8410 switch, DC or AC System





# BPX Switch Cabling Summary

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This appendix provides details on the cabling required to install the BPX switch.

---

**Note** In all cable references, the transmit direction is from the BPX switch, receive is to the BPX switch.

---

## Trunk Cabling

Trunk cables connect the customer DSX-3 crossconnect point or T3-E3 Interface Module to the BPX switch at the LM-3T3 back card. Refer to Table B-1 for details.

**Table B-1      Trunk Cables**

| Cable Parameter | Description                                                                                                                                                                                                                                                                    |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Type:           | 75-ohm coax cable (RG-59 B/U for short runs, AT&T 734A for longer runs). Two per T3/E3 line (XMT and RCV).<br><br>For European shipment of the BXM-E3 cards, in order to meet CE mark transient test requirement (IEC1000-4-4), RG-17G double shielded SMB cable must be used. |
| Max. Length:    | 450 feet max. between the BPX switch and the DSX-3/E3 point.                                                                                                                                                                                                                   |
| Connector:      | Terminated in male BNC; Rx is receive from trunk, Tx is transmit to trunk.                                                                                                                                                                                                     |

## Power Cabling

Power connections are made to the AC Power Supply Shelf or the DC Power Entry Module at the rear of the BPX switch. Refer to Table B-2 and Table B-3. (next page) for acceptable cable and wire types.

## AC Powered Nodes

AC power cables may be provided by the customer or ordered from Cisco. Several standard cables are available (see Table B-2). AC cables with other plugs or different lengths may be special ordered. For users who wish to construct their own power cable, the cable must mate with an IEC320 16/20A male receptacle on rear of the AC Power Supply Assembly.

**Table B-2 AC Power Cables**

| Cable Parameter    | Description                                                                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cable:             | Provided with 8 feet (2.3 m.) of 3-conductor wire with plug.                                                                                                                                  |
| Plug: customer end | 20 A NEMA L620, 3-prong plug (domestic) or<br>13 A 250 Vac BS1363, 3-prong fused plug (UK, Ireland)<br>CEE 7/7 (Continental Europe)<br>AS3112 (Australia/New Zealand)<br>CEI23-16/VII (Italy) |

## DC Powered Nodes

DC wiring (Table B-3) is generally provided by the customer.

**Table B-3 DC Power Wiring**

| Cable Parameter | Description                                                                                                                                  |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Wiring:         | Single conductor, 8 AWG recommended wire gauge, 75°C insulation rating, copper conductors only. Provision is provided for attaching conduit. |
| Connection:     | 90° ring lug for #10 screw terminal block.                                                                                                   |

## LM-BCC Cabling

This cabling connects data ports on the LM-BCC to StrataView Plus NMS computers, control terminals, and modems. It is also used for external clock inputs from a clock source. See *Appendix C, BPX Switch Cabling Summary*, for more details on peripherals that can be attached to these ports.

## Auxiliary and Control Port Cabling

The auxiliary and control ports are used to connect one of the nodes in the network to a control terminal, StrataView NMS workstation, or modem connections for remote alarm reporting or system monitoring. Refer to Table B-4 and Table B-5 for details on this cable.

**Table B-4 Auxiliary and Control Port Cabling**

| Cable Parameter    | Description                                                                                                                                                                  |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interface:         | RS-232 DCE ports.                                                                                                                                                            |
| Suggested Cable:   | 24 AWG, 25-wire. A straight-through RS-232 cable is used for a terminal or printer connection. A null modem cable may be needed when interfacing with modems on either port. |
| Cable Connector:   | DB-25, subminiature, male. Table B-5 contains a list of the port pin assignments.                                                                                            |
| Max. Cable Length: | 50 feet (15 m.)                                                                                                                                                              |

**Table B-5 Auxiliary and Control Port Pin Assignments**

| Pin# | Name | Source | Description     |
|------|------|--------|-----------------|
| 1    | FG   | both   | Frame Ground    |
| 2    | TxD  | DTE    | Transmit Data   |
| 3    | RxD  | DCE    | Receive Data    |
| 4    | RTS  | DTE    | Request to Send |
| 5    | CTS  | DCE    | Clear to Send   |
| 6    | DSR  | DCE    | Data Set Ready  |
| 7    | SG   | both   | Signal Ground   |
| 8    | CD   | DCE    | Carrier Detect  |
| 20   | DTR  | DTE    | Data Term Ready |

## LAN Port Cabling

The LAN connection is used to connect one of the nodes in the network to a StrataView Plus NMS workstation. See Table B-6 and Table B-7 for details.

**Table B-6 LAN Port Cabling**

| Cable Parameter    | Description                                                                       |
|--------------------|-----------------------------------------------------------------------------------|
| Interface:         | Ethernet DCE port.                                                                |
| Suggested Cable:   | TBS                                                                               |
| Cable Connector:   | DB-15, subminiature, male. Table B-7 contains a list of the port pin assignments. |
| Max. Cable Length: | 50 feet (15 m.) max. to interface adapter.                                        |

**Table B-7 LAN Port Pin Assignments**

| Pin # | Name                 | Pin # | Name                 |
|-------|----------------------|-------|----------------------|
| 1     | Shield               | ---   | ---                  |
| 2     | Collision Presence + | 9     | Collision Presence - |
| 3     | XMT +                | 10    | XMT -                |
| 4     | Reserved             | 11    | Reserved             |
| 5     | RCV +                | 12    | RCV -                |
| 6     | Power return         | 13    | Power (+12V)         |
| 7     | Reserved             | 14    | Reserved             |
| 8     | Reserved             | 15    | Reserved             |

## Modem Cabling

Refer to *Appendix C, BPX Switch Peripherals*, for modem cabling information.

## External Clock Input Cabling

This cabling is for making external clock connections for use by the BCC-32, BCC-3, and BCC-4 backcards. The BCC-32 uses the BCC-bc backcard, and the BCC-3 and BCC-4 both use the BCC-3-bc backcard.

### T1 Clock Cabling

Table B-8 through Table B-11 lists T1 clock cabling details.

**Table B-8 External Clock Cabling**

| Cable Parameter    | Description                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------|
| Cable Type:        | 22 AWG, ABAM individually shielded twisted pair. Two pair per T1 line (1 transmit and 1 receive).                   |
| Cable Connector:   | Male DB-15 subminiature. See Table B-10 through Table B-11 for pinouts.                                             |
| Max. Cable Length: | 533 ft (162 m.) maximum between the BPX switch and the first repeater or CSU. Selection of cable length equalizers. |

**Table B-9 T1 Connection to XFER TMG on BCC-bc**

| Pin # | Description            |
|-------|------------------------|
| 1     | Transfer timing ring   |
| 2     | Transfer timing tip    |
| 3 & 4 | Transfer timing shield |

**Table B-10 T1 Connection to EXT TMG on BCC-bc**

| Pin # | Description         |
|-------|---------------------|
| 2     | Receive pair shield |
| 3     | Receive tip         |
| 11    | Receive Ring        |

**Table B-11 T1 Connection to EXT 1 or EXT 2 on BCC-3-bc**

| Pin # | Description            | Function                                             |
|-------|------------------------|------------------------------------------------------|
| 1     | Transmit tip           | Transmit T1 timing signal synchronized to the node   |
| 2     | Transmit pair shield   |                                                      |
| 3     | Receive tip            | Receive clock for synchronized clock source for node |
| 4     | Receive pair shield    |                                                      |
| 7     | Transfer timing tip    |                                                      |
| 8     | Transfer timing shield |                                                      |
| 9     | Transmit ring          |                                                      |
| 11    | Receive ring           |                                                      |
| 15    | Transfer timing ring   |                                                      |



## E1 Clock Cabling

Table B-12 through Table B-15 lists E1 clock cabling details.

**Table B-12 E1 Connector Pin Assignments for External Clock**

| Connector          | Description                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cable Type:        | 75-ohm coax cable for unbalanced connection or 100–120-ohm twisted pair for balanced connection. Two cables/pairs (1 transmit, 1 receive) per E1 line. |
| Cable Connector:   | Two female BNC for unbalanced connection; male DB15 for balanced connection. See Table B-13 and Table B-15 for pinouts.                                |
| Max. Cable Length: | Approx. 100 meters maximum between the BPX switch and the first repeater or CSU. Equalizer for cable length.                                           |

**Table B-13 E1 Connection 75 Ohm to EXT TMG on BCC-bc or BCC-3-bc**

| Connector | Description           |
|-----------|-----------------------|
| BNC       | Receive E1 from trunk |

**Table B-14 E1 Connection 100/120 Ohm to EXT TMG on BCC-bc**

| Pin # | Description         |
|-------|---------------------|
| 2     | Receive pair shield |
| 3     | Receive tip         |
| 11    | Receive Ring        |

**Table B-15 E1 Connection 100/120 Ohm to EXT 1 or EXT 2 on BCC-3-bc**

| Pin # | Description            | Function                                             |
|-------|------------------------|------------------------------------------------------|
| 1     | Transmit tip           | Transmit T1 timing signal synchronized to the node   |
| 2     | Transmit pair shield   |                                                      |
| 3     | Receive tip            | Receive clock for synchronized clock source for node |
| 4     | Receive pair shield    |                                                      |
| 7     | Transfer timing tip    |                                                      |
| 8     | Transfer timing shield |                                                      |
| 9     | Transmit ring          |                                                      |
| 11    | Receive ring           |                                                      |
| 15    | Transfer timing ring   |                                                      |

## External Alarm Cabling

This cable (Table B-16) is for connecting network alarm outputs to the LM-ASM ALARM OUTPUT connector only. Table B-17 lists the pinouts for the network alarm outputs.

**Table B-16 External Alarm Cabling**

| Cable Parameter | Description                |
|-----------------|----------------------------|
| Interface:      | Dry-contact relay closure. |
| Wire:           | 24 AWG, shielded, 6-pair.  |
| Connector:      | DB-15, Subminiature, male  |

**Table B-17 Network Alarm Pin Assignments**

| Pin | Alarm         | Description     |
|-----|---------------|-----------------|
| 1   | Audible—Major | Normally open   |
| 2   |               | Common          |
| 9   |               | Normally closed |
| 4   | Visual—Major  | Normally open   |
| 5   |               | Common          |
| 12  |               | Normally closed |
| 7   | unused        | n.c.            |
| 8   | unused        | n.c.            |
| 3   | Audible—Minor | Normally open   |
| 11  |               | Common          |
| 10  |               | Normally closed |
| 6   | Visual—Minor  | Normally open   |
| 14  |               | Common          |
| 13  |               | Normally closed |
| 15  | unused        | n.c.            |

## Standard BPX Switch Cables

Table B-18 lists the various cables that may be ordered directly from Cisco. Cable lengths are specified as a suffix to the Cisco model number. For example 5610-50 indicates a 50 foot cable. Cables are generally available in standard lengths of 10 ft (3 m.), 25 ft (7.6 m.), 50 ft (15 m.), 75 ft (22.8 m.) and 100 ft (30 m.) Lengths of 101 ft. (30 m.) to 600 ft. (183 m.) are available on a special order.

When a cable is connectorized, the connector gender (male-female) will be indicated as well as the number of pins. For example RS-232/M25-M25 indicates a cable terminated with a male DB25 at both ends.

**Table B-18 Standard Cables Available from Cisco**

| Model#   | Description                   | Usage                                                               |
|----------|-------------------------------|---------------------------------------------------------------------|
| T3-E3-10 | 75 $\Omega$ coax/BNC-BNC, 10' | T3 or E3 trunk interface                                            |
| T3-E3-25 | 75 $\Omega$ coax/BNC-BNC, 25' |                                                                     |
| T3-E3-50 | 75 $\Omega$ coax/BNC-BNC, 50' |                                                                     |
| T3-E3-75 | 75 $\Omega$ coax/BNC-BNC, 75' |                                                                     |
| T3-E3-xx | length to be specified        |                                                                     |
| 5620     | RS-232/M25-F25                | Control port to control terminal, StrataView, or ext. window device |
| 5621     | RS-232/M25-M25 special        | Control or Aux. port to modem                                       |
| 5623     | RS-232/M25-M25                | Aux. port to ext. window device                                     |
| 5601     | Ground cable                  | DC                                                                  |
| 5670     | Molex-pigtail                 | DC                                                                  |
| 5671     | Spade lug-pigtail             | DC                                                                  |

## Redundancy “Y” Cable

The redundancy cables are a special “Y” cable available from Cisco. They are required for redundant trunk and data interfaces. Table B-19 lists the Y-cables used with various BPX switch back cards.

**Table B-19 Redundancy Y-Cables**

| Y - Cable        | Used On | Cisco P/N |
|------------------|---------|-----------|
| T3 trunk         | LM-3T3  | TBS       |
| E3 trunk         | LM-3E3  | TBS       |
| Aux./Cont. ports | LM-BCC  | TBS       |
| Ext. Clk. In     | LM-BCC  | TBS       |
| Ext. Clk. Out    | LM-BCC  | TBS       |



# BPX Switch Peripherals

---

This appendix provide details on BPX switch peripheral equipment, including printers and modems. The appendix includes the following sections:

- Network Management
- Printer
- Modems, Dial-In and Dial-Out

## Network Management

### StrataView Plus Terminal

A StrataView Plus workstation is recommended for managing a network containing IPX, IGX, and BPX switch. Refer to the *StrataView Plus Operation Manual* and *StrataView Plus Installation Manual* for setup instructions and specifications for the StrataView Plus NMS, which is required to provide network alarm, control, and statistics monitoring. Connection of a StrataView Plus workstation for network management is described in *Chapter 7, Finishing the Installation and Power-Up*.

---

**Note** For network management, a StrataView Plus workstation is connected to the LAN port of one or more network nodes, typically BPX switches because of their processing power, to provide network management.

---

### Control Port, Local Control

A terminal (pc or workstation, including a StrataView Plus workstation) can be connected to the CONTROL port of a BPX switch for temporary or local control. This can be especially useful during installation, initial power-up, and configuration. Refer to Table C-1 for configuration data for the BPX CONTROL port.

**Table C-1 Control Port Parameters for Local Control (pc or workstation)**

| Parameter             | Setting                                                                                        |
|-----------------------|------------------------------------------------------------------------------------------------|
| BPX switch Port Used: | Serial CONTROL port, located on a BCC back card, is used to interface to a local terminal.     |
| Code:                 | Standard 7 or 8-bit ASCII; 1 or 2 stop-bits; even, odd or no parity.                           |
| Interface:            | RS-232 DCE.                                                                                    |
| Data Rate:            | All standard asynchronous data rates from 300 to 19200 bps, independently software-selectable. |
| Supported Terminals:  | Any terminal compatible with DEC VT-100.                                                       |
| Cable Required:       | Straight-through RS-232 cable.                                                                 |

## Printer

The standard maintenance printer that is currently being shipped with the BPX switch is the Okidata Model 184 dot matrix printer. This printer may be connected to any node. Refer to Table C-2 and Table C-2 for printer configuration requirements. Note that this is not the same as the printer that may be provided with the StrataView Plus NMS terminal but in addition to it.

**Table C-2 Auxiliary Port Parameters for OkiData 184 Printer**

| Parameter             | Setting                                                                                 |
|-----------------------|-----------------------------------------------------------------------------------------|
| BPX switch Port Used: | Serial AUXILIARY port, located on the LM-BCC card, is used for the maintenance printer. |
| Code:                 | Standard 8-bit ASCII; 8 data bits, 1 stop-bit, odd parity.                              |
| Interface:            | RS-232 DCE.                                                                             |
| Data Rate:            | 9600 baud.                                                                              |
| Supported Printer:    | Okidata 184.                                                                            |
| Cable Required:       | Straight-through RS-232 cable                                                           |

## DIP Switch Settings for Okidata 184

DIP Switch A is an 8-section DIP switch located on the printer's main circuit board. Access to the configuration switches is made by sliding back the switch cover at the top, rear of the printer case. Set Switch A as indicated in Table C-3.

**Table C-3 Switch A Settings —Okidata 184 Printer**

| Switch A | Setting | Description                 |
|----------|---------|-----------------------------|
| 1        | Off     | ASCII with non-slashed zero |
| 2        | Off     | ASCII with non-slashed zero |
| 3        | Off     | ASCII with non-slashed zero |
| 4        | Off     | 11-inch paper length        |
| 5        | On      | 11-inch paper length        |
| 6        | Off     | No Auto Line Feed.          |
| 7        | On      | 8- bit data.                |
| 8        | Off     | Enables front panel.        |

The High Speed Serial Interface DIP Switch consists of two DIP switches, SW1 and SW2, located on a serial-board that is attached to the printer's main board. Set switches 1 and 2 as indicated in Table C-4 and Table C-5.

**Table C-4      Switch 1 Settings—Okidata 184 Printer**

| <b>Switch 1</b> | <b>Setting</b> | <b>Description</b>   |
|-----------------|----------------|----------------------|
| 1               | On             | Odd parity.          |
| 2               | On             | No parity.           |
| 3               | On             | 8 data bits.         |
| 4               | On             | Ready/busy protocol. |
| 5               | On             | Test select circuit. |
| 6               | On             | Print mode.          |
| 7               | On             | Busy line selection. |
| 8               | On             | DTR pin 2 enabled.   |

**Table C-5      Switch 2 Settings—Okidata 184 Printer**

| <b>Switch 2</b> | <b>Setting</b> | <b>Description</b>    |
|-----------------|----------------|-----------------------|
| 1               | Off            | Transmission          |
| 2               | On             | Speed = 9600 baud.    |
| 3               | On             | Speed = 9600 baud.    |
| 4               | On             | DSR active.           |
| 5               | On             | Buffer = 32 bytes.    |
| 6               | On             | Timing = 200 ms.      |
| 7               | On             | Space after power on. |
| 8               | Don't care     | Not used.             |

## Modems, Dial-In and Dial-Out

Customer service uses modems for diagnosing and correcting customer problems with installed BPX switches. The modem that is currently recommended for use with the BPX switch is the Codex Model V.34R.

A dial-in connection to a BPX switch RS-232 from customer service via a modem uses the CONTROL port of the BPX switch. A dial-out connection from a BPX switch via a modem to customer service uses the AUXILIARY port of the BPX switch. Refer to Table C-6 for interface requirements.

**Table C-6 Modem Interface Requirements**

| Parameter             | Requirement                                                                                                                                |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| BPX switch Port Used: | CONTROL port on BCC back card is used for auto-answer modem setup.<br>AUXILIARY port on a BCC back card is used for auto-dial modem setup. |
| Code:                 | Standard 8-bit ASCII, 1 stop-bit, no parity.                                                                                               |
| Interface:            | RS-232 DCE.                                                                                                                                |
| Cable to modem:       | Null modem cable: CONTROL or AUXILIARY port to modem (DCE to DCE)                                                                          |
| Phone Lines:          | Dedicated, dial-up business telephone line for Customer Service-to-BPX switch modem.                                                       |
| Data Rate:            | All standard asynchronous data rates from 300 to 19200 bps, independently software-selectable.                                             |
| Supported Modems:     | Motorola V.34R 28.8 baud modem with or without talk/data button.                                                                           |

### Motorola V.34R BPX Switch Dial-In Configuration

#### BPX Switch Auto-Answer (Dial-In to BPX switch)

The following is a setup procedure that allows customer service to dial in to the customer's BPX switch to provide support and troubleshooting:

- Step 1** Using the **cnfterm** command, set the BPX CONTROL port speed to 9600 bps.
- Step 2** Using the **cnftermfunc** command, set the terminal type to VT100/StrataView.
- Step 3** To program the modem, temporarily attach a terminal to the modem using a straight through RS-232 cable (DTE to DCE). The modem EIA port will automatically match the 9600 bps setting of the terminal.
- Step 4** Enter the commands listed in Table C-7 to set up the modem for proper operation.

---

**Note** Consult the manual that is supplied with your modem for specific information concerning the modem configuration. Call customer service for latest modem configuration information.

---

- Step 5** Disconnect the terminal and the straight-through cable from the BPX CONTROL port.



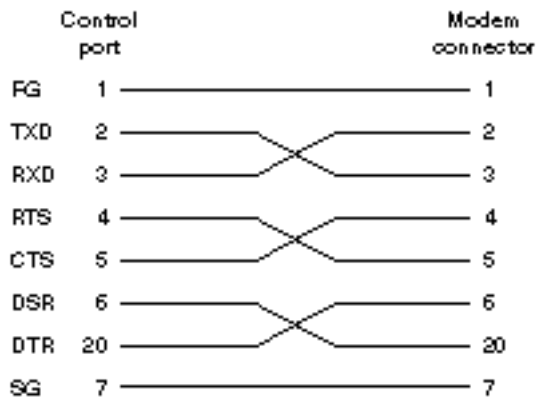
**Step 6** Connect the modem to the BPX CONTROL port using a null-modem cables Figure C-1. A null modem cable is used, as the connection is essentially a DCE to DCE rather than a DTE to DCE connection.

**Step 7** Ask customer service to assist in testing the operation of the modem setup.

**Table C-7 V.34R Modem Configuration for Auto-Answer (Dial-in to BPX)**

| Step | Command | Function                                                                                                      |
|------|---------|---------------------------------------------------------------------------------------------------------------|
| 1.   | AT & F  | Reset to factory default.                                                                                     |
| 2    | ATL1    | Set modem loudness, modem speaker at low volume.                                                              |
| 3.   | ATS0=1  | Enables Auto-Answer Mode on modem (answer on first ring).                                                     |
| 4    | AT\N3   | Enables automatic MNP error correction.                                                                       |
| 5    | AT%C    | Disables data compression.                                                                                    |
| 6.   | AT\Q0   | Disables XON/XOFF flow control.                                                                               |
| 7.   | AT&S1   | Sets DSR to "normal".                                                                                         |
| 8.   | ATE0    | Disables local character echo. Modem will not echo what you type.                                             |
| 9.   | ATQ1    | Disables result codes. (Modem will appear "dead", will stop responding "OK" to commands.)                     |
| 10.  | AT&W    | Saves current configuration settings in non-volatile memory. (Writes and stores to configuration location 1.) |

**Figure C-1 Dial-Modem Cabling for Auto Answer (Dial-In to BPX)**



Legend  
 FG - Frame Ground  
 TXD - Transmit Data  
 RXD - Receive Data  
 RTS - Request To Send  
 CTS - Clear To Send  
 DSR - Data Set Ready  
 DTR - Data Terminal Ready  
 CD - Carrier Detect  
 SG - Signal Ground

### IPX Auto-Dial to Customer Service

The following is a setup procedure for the customer’s BPX to dial up customer service.

- Step 1** Using the **cnfterm** command, set the BPX AUXILIARY port speed to 9600 bps and enable XON/XOFF flow control.
- Step 2** Using the **cnftermfunc** command, select option 7, “Autodial Modem” and enter the customer service-designated Network ID, and the customer service modem phone number.
- Step 3** Attach a 9600 bps terminal to the modem using a straight-through cable. The modem EIA port will automatically match the 9600 bps setting of the terminal.
- Step 4** Enter the commands listed in either Table C-8 (V.34R modem without talk/data pushbutton) or Table C-9 (V.34R modem with talk/data pushbutton), to set up the modem for proper operation.

---

**Note** Consult the manual that is supplied with your modem for specific information concerning the modem configuration. Call customer service for latest modem configuration information.

---

- Step 5** Disconnect the terminal and the straight-through cable from the IPX CONTROL port.
- Step 6** Connect the modem to the IPX AUX port using a null modem cable Figure C-2.
- Step 7** Ask customer service to assist in testing the operation of the modem setup.

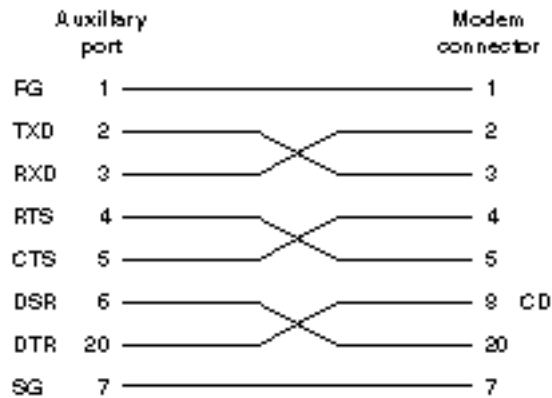
**Table C-8 V.34R Auto-Dial Configuration (dial-out to customer service)\***

| Step                                                                                                 | Command | Function                                       |
|------------------------------------------------------------------------------------------------------|---------|------------------------------------------------|
| <b>These configuration commands are for a V.34R modem that does not have a talk/data pushbutton.</b> |         |                                                |
| 1.                                                                                                   | AT&F    | Initializes factory defaults.                  |
| 2.                                                                                                   | ATL1    | Modem speaker at minimum volume.               |
| 3.                                                                                                   | AT*SM3  | Enables automatic MNP error correction.        |
| 4.                                                                                                   | AT*DC0  | Disables data compression.                     |
| 5.                                                                                                   | AT*SC1  | Enables DTE speed conversion                   |
| 6.                                                                                                   | AT*FL1  | Enables XON/XOFF flow control.                 |
| 7.                                                                                                   | AT*SI1  | Enables 5-minute inactivity disconnect.        |
| 8.                                                                                                   | AT&C1   | DCD controlled by modem.                       |
| 9.                                                                                                   | AT&D2   | Modem disconnects when IPX toggles DTR.        |
| 10.                                                                                                  | AT&V    | Verify entries.                                |
| 11.                                                                                                  | AT&W    | Saves current settings to non-volatile memory. |

**Table C-9 V.34R with talk/data, Auto-Dial Configuration (dial-out to customer service)\***

| Step                                                                                       | Command | Function                                               |
|--------------------------------------------------------------------------------------------|---------|--------------------------------------------------------|
| <b>These configuration commands are for a V.34R modem that has a talk/data pushbutton.</b> |         |                                                        |
| 1.                                                                                         | AT&F    | Initializes factory defaults.                          |
| 2.                                                                                         | ATL1    | Modem speaker at minimum volume.                       |
| 3.                                                                                         | AT\N3   | To enable MNP error correction                         |
| 4.                                                                                         | AT%C    | To disable data compression                            |
| 5.                                                                                         | AT\J    | Enables DTE speed conversion                           |
| 6.                                                                                         | AT\Q1   | Enables flow control                                   |
| 7.                                                                                         | AT\T3   | Enables 3-minute inactivity timer                      |
| 8.                                                                                         | AT&C1   | DCD controlled by modem.                               |
| 9.                                                                                         | AT&D2   | Modem disconnects when IPX toggles DTR.                |
| 10.                                                                                        | AT&V    | Verify entries. ( <i>shows current configuration</i> ) |
| 11.                                                                                        | AT&W    | Saves current settings to non-volatile memory.         |

**Figure C-2 Dial Modem Cabling for Auto Dial (dial-out to customer service)**



Note: Cable must be connected in direction shown from node to modem because wiring is not pin-to-pin symmetrical.

**Legend**

- FG - Frame Ground
- TXD - Transmit Data
- RXD - Receive Data
- RTS - Request To Send
- CTS - Clear To Send
- DSR - Data Set Ready
- DTR - Data Terminal Ready
- CD - Carrier Detect
- SG - Signal Ground

C-213-1



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