CISCO SYSTEMS

PA-2CE1 Channelized E1 Port Adapter Installation and Configuration

Product Number: PA-2CE1/PRI-75(=), PA-2CE1/PRI-120(=)
Platforms Supported: Cisco 7200 Series, VIP2 in the Cisco 7000 Series
and Cisco 7500 Series

CONTENTS

Preface

This preface describes the objectives and organization of this document and explains how to find additional information on related products and services. This preface contains the following sections:

- Objectives, page v
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- Obtaining Documentation, page vii
- Obtaining Technical Assistance, page viii

Objectives

This document describes how to install and configure the PA-2CE1 channelized E1 Integrated Services Digital Network (ISDN) Primary Rate Interface (PRI) port adapters (PA-2CE1/PRI-75[=] and PA-2CE1/PRI-120[=]), hereafter referred to as the PA-2CE1, which is used in the following platforms:

- Cisco 7200 series routers, consisting of the two-slot Cisco 7202, four-slot Cisco 7204, and the six-slot Cisco 7206
- VIP2 in Cisco 7000 series routers with the 7000 Series Route Switch Processor (RSP7000) and 7000 Series Chassis Interface (RSP7000CI) and Cisco 7500 series routers

Organization

This document contains the following chapters:

:

Section	Title	Description
Chapter 1	Overview	Describes the PA-2CE1 and its LED displays, cables, and receptacles.
Chapter 2	Preparing for Installation	Describes safety considerations, tools required, and procedures you should perform before the actual installation.
Chapter 3	Removing and Installing Port Adapters	Describes the procedures for installing and removing PA-2CE1 in the supported platforms.
Chapter 4	Configuring the PA-2CE1	Provides instructions for configuring the PA-2CE1 on the supported platforms.

Related Documentation

Your router or switch and the Cisco IOS software running on it contain extensive features and functionality, which are documented in the following resources:

- Cisco IOS software:

  For configuration information and support, refer to the modular configuration and modular command reference publications in the Cisco IOS software configuration documentation set that corresponds to the software release installed on your Cisco hardware.

  Note   You can access Cisco IOS software configuration and hardware installation and maintenance documentation on the World Wide Web at http://www.cisco.com, http://www-china.cisco.com, or http://www-europe.cisco.com.

- Cisco 7200 series routers:

  – For port adapter hardware and memory configuration guidelines, refer to the *Cisco 7200 Series Port Adapter Hardware Configuration Guidelines*.

  – For hardware installation and maintenance information, refer to the installation and configuration guide that shipped with your Cisco 7200 series router.

  – For information on Network Processing Engines or Network Services Engines, refer to the *Network Processing Engine and Network Services Engine Installation and Configuration* publication.

- VIP2 in Cisco 7000 series and Cisco 7500 series routers:

  For hardware installation and maintenance information, refer to the following publications:

  - The installation and configuration guide that shipped with your Cisco 7000 series or Cisco 7500 series router

  - *Second-Generation Versatile Interface Processor (VIP2) Installation and Configuration*

- For international agency compliance, safety, and statutory information for WAN interfaces:

  - *Site Preparation and Safety Guide*

  - *Regulatory Compliance and Safety Information for the Cisco 7200 Series Routers*

  - *Regulatory Compliance and Safety Information for the Cisco 7500 Series Routers*

- To view Cisco documentation or obtain general information about the documentation, refer to the following sources:

  - "Obtaining Documentation" section on page vii.

  - "Obtaining Technical Assistance" section on page viii.

  - Customer service at 800 553-6387 or 408 526-7208. Customer service hours are 5:00 a.m. to 6:00 p.m. Pacific time, Monday through Friday (excluding Cisco-observed holidays). You can also send e-mail to cs-rep@cisco.com.

  - *Cisco Information Packet* that shipped with your router or switch.

Obtaining Documentation

The following sections explain how to obtain documentation from Cisco Systems.

World Wide Web

You can access the most current Cisco documentation on the World Wide Web at the following URL:

http://www.cisco.com

Translated documentation is available at the following URL:

http://www.cisco.com/public/countries_languages.shtml

Documentation CD-ROM

Cisco documentation and additional literature are available in a Cisco Documentation CD-ROM package, which is shipped with your product. The Documentation CD-ROM is updated monthly and may be more current than printed documentation. The CD-ROM package is available as a single unit or through an annual subscription.

Ordering Documentation

Cisco documentation is available in the following ways:

- Registered Cisco Direct Customers can order Cisco product documentation from the Networking Products MarketPlace:

  http://www.cisco.com/cgi-bin/order/order_root.pl

- Registered Cisco.com users can order the Documentation CD-ROM through the online Subscription Store:

  http://www.cisco.com/go/subscription

- Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco corporate headquarters (California, USA) at 408 526-7208 or, elsewhere in North America, by calling 800 553-NETS (6387).

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You can e-mail your comments to bug-doc@cisco.com.

To submit your comments by mail, use the response card behind the front cover of your document, or write to the following address:

Cisco Systems
Attn: Document Resource Connection
170 West Tasman Drive
San Jose, CA 95134-9883

We appreciate your comments.

Obtaining Technical Assistance

Cisco provides Cisco.com as a starting point for all technical assistance. Customers and partners can obtain documentation, troubleshooting tips, and sample configurations from online tools by using the Cisco Technical Assistance Center (TAC) Web Site. Cisco.com registered users have complete access to the technical support resources on the Cisco TAC Web Site.

Cisco.com

Cisco.com is the foundation of a suite of interactive, networked services that provides immediate, open access to Cisco information, networking solutions, services, programs, and resources at any time, from anywhere in the world.

Cisco.com is a highly integrated Internet application and a powerful, easy-to-use tool that provides a broad range of features and services to help you to

- Streamline business processes and improve productivity

- Resolve technical issues with online support

- Download and test software packages

- Order Cisco learning materials and merchandise

- Register for online skill assessment, training, and certification programs

You can self-register on Cisco.com to obtain customized information and service. To access Cisco.com, go to the following URL:

http://www.cisco.com

Technical Assistance Center

The Cisco TAC is available to all customers who need technical assistance with a Cisco product, technology, or solution. Two types of support are available through the Cisco TAC: the Cisco TAC Web Site and the Cisco TAC Escalation Center.

Inquiries to Cisco TAC are categorized according to the urgency of the issue:

- Priority level 4 (P4)—You need information or assistance concerning Cisco product capabilities, product installation, or basic product configuration.

- Priority level 3 (P3)—Your network performance is degraded. Network functionality is noticeably impaired, but most business operations continue.

- Priority level 2 (P2)—Your production network is severely degraded, affecting significant aspects of business operations. No workaround is available.

- Priority level 1 (P1)—Your production network is down, and a critical impact to business operations will occur if service is not restored quickly. No workaround is available.

Which Cisco TAC resource you choose is based on the priority of the problem and the conditions of service contracts, when applicable.

Cisco TAC Web Site

The Cisco TAC Web Site allows you to resolve P3 and P4 issues yourself, saving both cost and time. The site provides around-the-clock access to online tools, knowledge bases, and software. To access the Cisco TAC Web Site, go to the following URL:

http://www.cisco.com/tac

All customers, partners, and resellers who have a valid Cisco services contract have complete access to the technical support resources on the Cisco TAC Web Site. The Cisco TAC Web Site requires a Cisco.com login ID and password. If you have a valid service contract but do not have a login ID or password, go to the following URL to register:

http://www.cisco.com/register/

If you cannot resolve your technical issues by using the Cisco TAC Web Site, and you are a Cisco.com registered user, you can open a case online by using the TAC Case Open tool at the following URL:

http://www.cisco.com/tac/caseopen

If you have Internet access, it is recommended that you open P3 and P4 cases through the Cisco TAC Web Site.

Cisco TAC Escalation Center

The Cisco TAC Escalation Center addresses issues that are classified as priority level 1 or priority level 2; these classifications are assigned when severe network degradation significantly impacts business operations. When you contact the TAC Escalation Center with a P1 or P2 problem, a Cisco TAC engineer will automatically open a case.

To obtain a directory of toll-free Cisco TAC telephone numbers for your country, go to the following URL:

http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml

Before calling, please check with your network operations center to determine the level of Cisco support services to which your company is entitled; for example, SMARTnet, SMARTnet Onsite, or Network Supported Accounts (NSA). In addition, please have available your service agreement number and your product serial number.

C H A P T E R 1

Overview

This chapter describes the PA-2CE1 port adapter and contains the following sections:

- Port Adapter Overview, page 1-1
- LEDs, page 1-2
- Cables, Connectors, and Pinouts, page 1-3
- Port Adapter Slot Locations on the Supported Platforms, page 1-5
- Identifying Interface Addresses, page 1-7

Port Adapter Overview

The PA-2CE1, shown in Figure 1-1 and Figure 1-2, provide up to two channelized E1 (unbalanced 75-ohm or balanced 120-ohm) or ISDN PRI interfaces for connecting Cisco 7000 series routers to channel service units (CSUs). Each 2CE1 interface can transmit and receive data bidirectionally at the E1 rate of 2.048 megabits-per-second (Mbps).

Each 2CE1 interface connects to external networks through a single port that has a 15-pin, D-shell receptacle. You must use G.703 serial interface cables to connect unbalanced 75-ohm or balanced 120-ohm 2CE1 interfaces to a CSU. 2CE1 interfaces are configurable for balanced and unbalanced connections by setting jumpers on the 2CE1 printed circuit board. See the "Setting the PA-2CE1 Jumpers" section on page 3-8 for balanced and unbalanced 2CE1 jumper settings.

> **Note** While the VIP2 supports online insertion and removal (OIR), individual port adapters do not. To replace port adapters, you must first remove the VIP2 from the chassis, then replace port adapters as required.
>
> The Cisco 7200 series routers support the OIR of all port adapter types.

Figure 1-1   PA-2CE1—Faceplate View—PA-2CE1/PRI-75 Shown
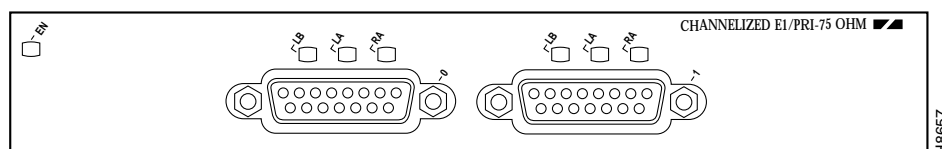
Figure 1-2   PA-2CE1—Faceplate View—PA-2CE1/PRI-120 Shown
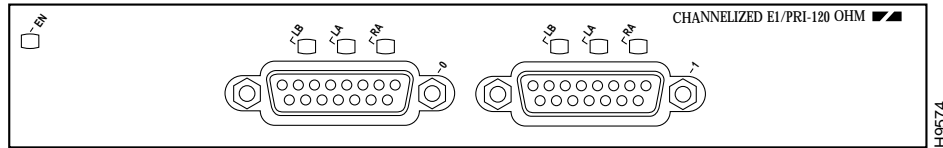
When running channelized E1, each 2CE1 interface provides up to 31 E1 channel groups, which are numbered from 0 to 30. Each channel group provides up to 31, 64 kilobit-per-second (kbps) timeslots (DS0 channels), which are numbered 1 to 31. Multiple DS0 channels can be mapped to a single channel group. Each channel group is presented to the system as a serial interface that can be configured individually. Usable bandwidth for each channel group is calculated as n x 64 kbps, where n is a number of DS0 channels (1 to 31).

When running ISDN PRI, each 2CE1 interface provides 30 bearer (B) channels that can transmit and receive data at the rate of 64 kbps, full duplex, and one data (D) channel that can transmit and receive data at the rate of 16 kbps, full duplex. The B channels are used for transmitting user data. The D channel is used for call setup control and network connection teardown, and provides the communication from the router to the ISDN switch. The B and D channels are presented to the system as serial interfaces that support High-Level Data Link Control (HDLC) and Point-to-Point protocol (PPP) encapsulation. The PA-2CE1 support dial-on-demand routing (DDR) when running ISDN PRI.

LEDs

The PA-2CE1 has an enabled LED, standard on all port adapters, and six status LEDs, three for each port. (See Figure 1-3.)

Figure 1-3   LEDs on the PA-2CE1—Horizontal Orientation
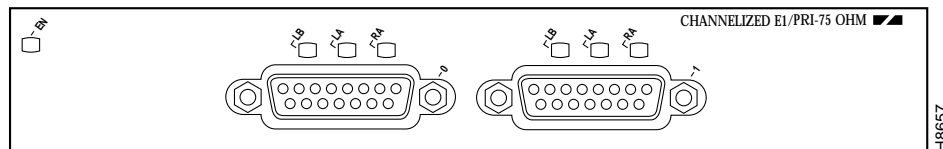
After system initialization, the enabled LED goes on to indicate that the port adapter has been enabled for operation.

The following conditions must be met before the PA-2CE1 is enabled:

•   The PA-2CE1 is correctly connected and is receiving power.

•   A valid system software image for the port adapter has been downloaded successfully.

•   The system recognizes the PA-2CE1 or PA-2CE1-equipped VIP2.

If any of the above conditions are not met, or if the initialization fails for other reasons, the enabled LED does not go on.

Table 1-1 lists LED colors and indications.

Table 1-1   PA-2CE1 LEDs

LED Label	Color	State	Meaning
ENABLED	Green	On	This green LED comes on when the port is in loopback mode (line or local). The LED remains off during normal operation of the port adapter.
LB (loopback)	Green	On	This green LED comes on when the incoming signal from a remote source has one of the following alarms: loss of frame (LOF), loss of signal (LOS), alarm indication signal (AIS). The LED remains off during normal operation of the port adapter.
LA (local alarm)	Green	On	This green LED comes on when the remote source's incoming signal contains a remote alarm (a yellow alarm). The LED remains off during normal operation of the port adapter.
RA (remote alarm)	Green	On	This green LED comes on when the port is in loopback mode (line or local). The LED remains off during normal operation of the port adapter.

Cables, Connectors, and Pinouts

Three G.703 serial interface cables are available for use with the PA-2CE1; two cables for balanced 120-ohm 2CE1 interface connections, and one cable for an unbalanced 75-ohm 2CE1 interface connection.

Note   The PA-2CE1 leave the factory configured for balanced 120-ohm or unbalanced 75-ohm connections. Depending on the circumstances, you might need to change the configuration of both PA-2CE1 interfaces. See the "Setting the PA-2CE1 Jumpers" section on page 3-8 for instructions that explain how to change the configuration of both PA-2CE1 interfaces.

All three cables have a 15-pin, D-shell (DB-15) connector at the router (VIP2 or Cisco 7200 series) end and either twin axial, RJ-45, or BNC connectors at the network end. Figure 1-4, Figure 1-5, and Figure 1-6 show the 2CE1 interface cables.

Following are the product numbers for the 2CE1 interface cables:

- Twin axial cable—CAB-E1-TWINAX(=) or equivalent
- RJ-45 cable—CAB-E1-PRI(=) or equivalent
- BNC cable—CAB-E1-BNC(=) or equivalent

Figure 1-4 L*2CE1 Twin Axial Cable for Balanced 120-Ohm Connections or ISDN PRI Connections*
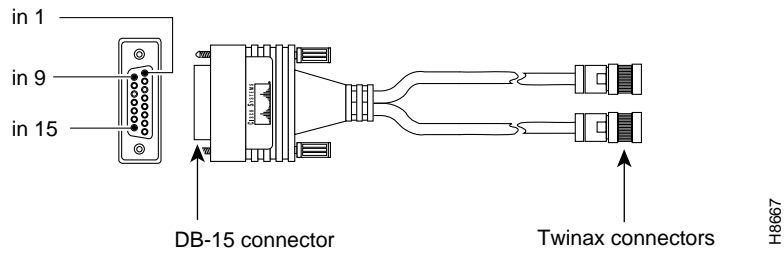
Figure 1-5 *2CE1 RJ-45 Cable for Balanced 120-Ohm or ISDN PRI Connections*
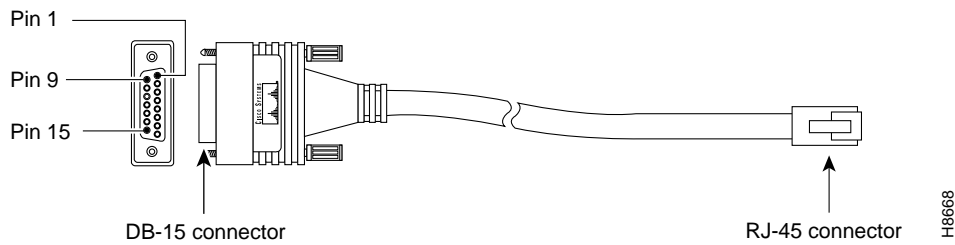
Figure 1-6 *2CE1 BNC Cable for Unbalanced 75-Ohm Connections or ISDN PRI Connections*
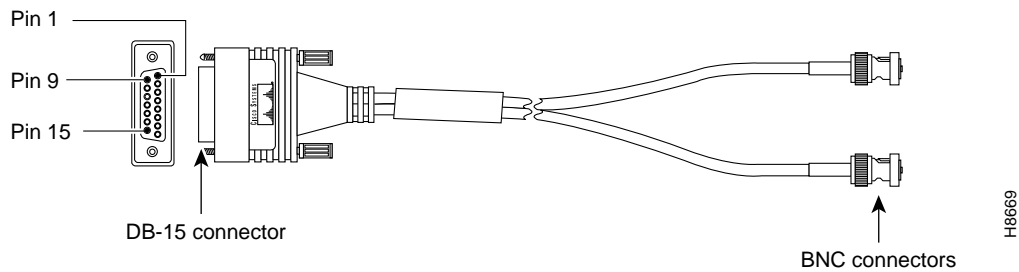
Table 1-2 lists connector pinouts for the 2CE1 interface cables.

Table 1-2 *2CE1 Interface Cable Pinouts*

2CE1 End		Network End				
DB-15		Twinax		RJ-45		BNC
Pin[1]	Signal[2]	Pin	Signal	Pin	Signal	Signal
9	Tx Tip	Tx-1	Tx Tip	1	Tx Tip	Tx Tip
2	Tx Ring	Tx-2	Tx Ring	2	Tx Ring	Tx Shield
10	Tx Shield	Shield	Tx Shield	3	Tx Shield	–
8	Rx Tip	Rx-1	Rx Tip	4	Rx Tip	Rx Tip
15	Rx Ring	Rx-2	Rx Ring	5	Rx Ring	Rx Shield
7	Rx Shield	Shield	Rx Shield	6	Rx Shield	–

1. Any pins not described in this table are not connected.

2. Tx = transmit. Rx = receive.

Port Adapter Slot Locations on the Supported Platforms

This section discusses port adapter slot locations on the supported platforms. The illustrations that follow summarize slot location conventions on each platform.

Cisco 7200 Series Routers Slot Numbering

Figure 1-7 shows a Cisco 7206 with port adapters installed. In the Cisco 7206, port adapter slot 1 is in the lower left position, and port adapter slot 6 is in the upper right position. (The Cisco 7202, Cisco 7204, are not shown; however, the PA-2CE1 can be installed in any available port adapter slot.)

Figure 1-7   Port Adapter Slots in the Cisco 7206
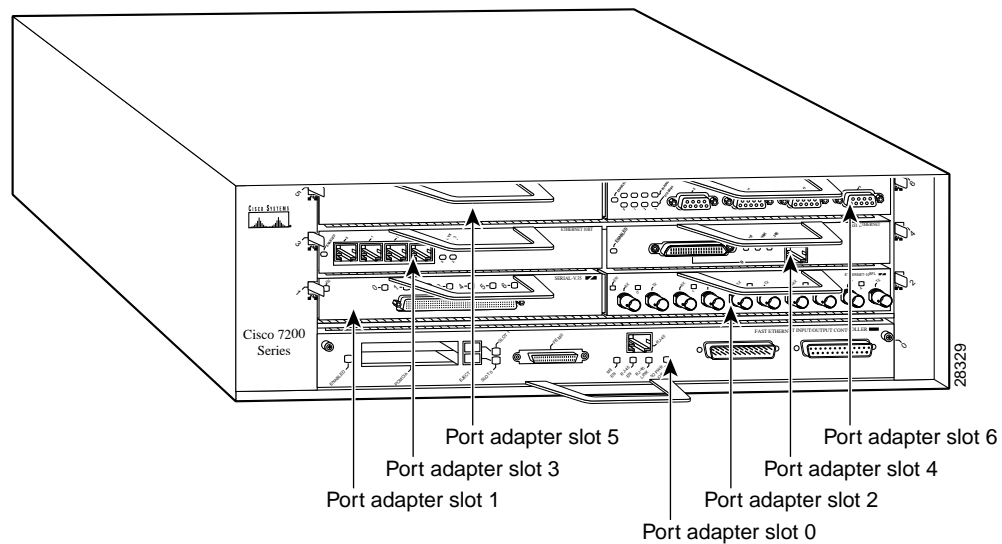
VIP2 Slot Numbering

Figure 1-8 shows a partial view of a VIP motherboard with installed port adapters. With the motherboard oriented as shown in Figure 1-8, the left port adapter is in port adapter slot 0, and the right port adapter is in port adapter slot 1. The port adapter slots are always numbered 0 and 1.

Figure 1-8   VIP Motherboard with Two Port Adapters Installed—Horizontal Orientation

Port adapter slot 0

Port adapter slot 1

Port adapter handles not shown
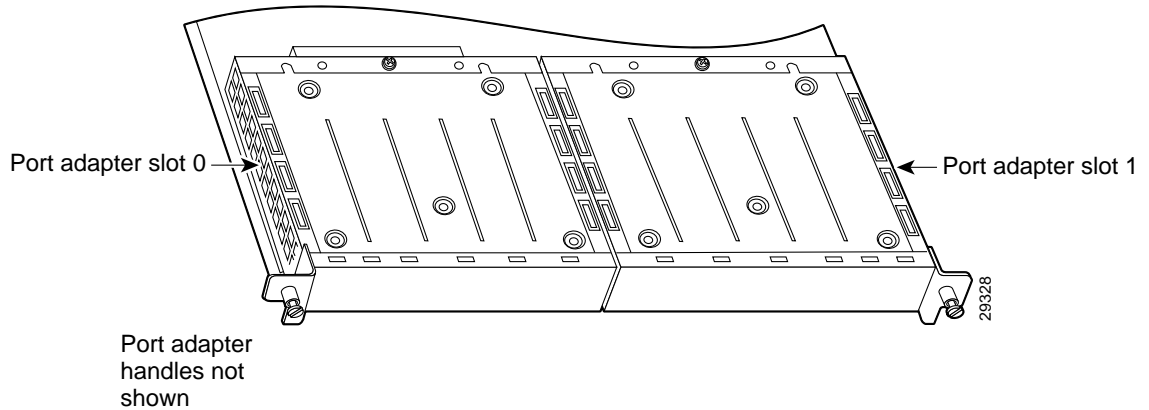
> **Note**   In the Cisco 7000, Cisco 7507, and Cisco 7513 chassis, the VIP motherboard is installed vertically. In the Cisco 7010 and Cisco 7505 chassis, the VIP motherboard is installed horizontally.

Interface processor slots are numbered as shown in Figure 1-9.

Figure 1-9   Interface Slot Numbers—Cisco 7505 Shown

VIP in interface processor slot 3

Slot 3
Slot 2
Slot 1
Slot 0

Interface processor slots
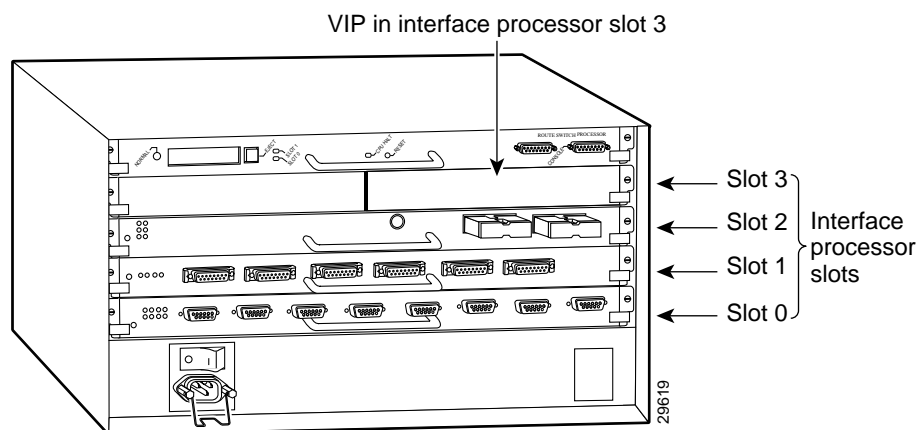
Identifying Interface Addresses

This section describes how to identify interface addresses for the PA-2CE1 in supported platforms. Interface addresses specify the actual physical location of each interface on a router or switch.

Interfaces on the PA-2CE1 installed in a router maintain the same address regardless of whether other port adapters are installed or removed. However, when you move a port adapter to a different slot, the first number in the interface address changes to reflect the new port adapter slot number.

Interfaces on a PA-2CE1 installed in a VIP2 maintain the same address regardless of whether other interface processors are installed or removed. However, when you move a VIP2 to a different slot, the interface processor slot number changes to reflect the new interface processor slot.

Note   Interface ports are numbered from left to right starting with 0.

Table 1-3 explains how to identify interface addresses.

Table 1-3   Identifying Interface Addresses

Platform	Interface Address Format	Numbers	Syntax
Cisco 7200 series routers	Port-adapter-slot-number/interface-port-number	Port adapter slot—0 through 6 (depends on the number of slots in the router)[1] Interface port—0 or 1	1/0
VIP2 in Cisco 7000 series or Cisco 7500 series routers	Interface-processor-slot-number/port-adapter-slot-number/interface-port-number	Interface processor slot—0 through 12 (depends on the number of slots in the router) Port adapter slot—0 or 1 Interface port—0 or 1	3/1/0

1.   Port adapter slot 0 is reserved for the Fast Ethernet port on the I/O controller (if present).

Cisco 7200 Series Routers Interface Addresses

This section describes how to identify the interface addresses used for the PA-2CE1 in Cisco 7200 series routers. The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See Table 1-3 for the interface address format.

In Cisco 7200 series routers, port adapter slots are numbered from the lower left to the upper right, beginning with port adapter slot 1 and continuing through port adapter slot 2 for the Cisco 7202, slot 4 for the Cisco 7204, and slot 6 for the Cisco 7206. (Port adapter slot 0 is reserved for the optional Fast Ethernet port on the I/O controller—if present.)

The interface addresses of the interfaces on the PA-2CE1 in port adapter slot 1 are 1/0 through 1/7 (port adapter slot 1 and interfaces 0 through 7). If the PA-2CE1 was in port adapter slot 4, these same interfaces would be numbered 4/0 through 4/7 (port adapter slot 4 and interfaces 0 through 7).

The interface addresses of the interfaces on a PA-2CE1 in port adapter slot 2 are 2/0 and 2/1 (port adapter slot 2 and interfaces 0 and 1). If the PA-2CE1 was in port adapter slot 1, these same interfaces would be numbered 1/0 and 1/1 (port adapter slot 1 and interfaces 0 and 1).

VIP2 Interface Addresses

This section describes how to identify the interface addresses used for the PA-2CE1 on a VIP2 in Cisco 7000 series and Cisco 7500 series routers.

Note Although the processor slots in the 7-slot Cisco 7000 and Cisco 7507 and the 13-slot Cisco 7513 and Cisco 7576 are vertically oriented and those in the 5-slot Cisco 7010 and Cisco 7505 are horizontally oriented, all Cisco 7000 series and Cisco 7500 series routers use the same method for slot and port numbering.

See Table 1-3 for the interface address format. The interface address is composed of a three-part number in the format *interface-processor-slot-number/port-adapter-slot-number/interface-port-number*.

If the VIP2 is inserted in interface processor slot 3, then the interface addresses of the PA-2CE1 are 3/1/0 through 3/1/7 (interface processor slot 3, port adapter slot 1, and interfaces 0 through 7). If the port adapter was in port adapter slot 0 on the VIP2, these same interface addresses would be numbered 3/0/0 through 3/0/7.

Note If you remove the VIP2 with the PA-2CE1 (shown in Figure 1-9) from interface processor slot 3 and install it in interface processor slot 2, the interface addresses become 2/1/0 through 2/1/7.

Preparing for Installation

This chapter describes the general equipment, safety, and site preparation requirements for installing the PA-2CE1. This chapter contains the following sections:

- Required Tools and Equipment, page 2-1
- Software and Hardware Requirements, page 2-2
- Checking Hardware and Software Compatibility, page 2-2
- Safety Guidelines, page 2-3
- FCC Class A Compliance, page 2-7

Required Tools and Equipment

You need the following tools and parts to install a port adapter. If you need additional equipment, contact a service representative for ordering information.

- PA-2CE1/PRI-75(=) or PA-2CE1/PRI-120(=).
- VIP2 (for installation in Cisco 7000 series or Cisco 7500 series chassis only). For information about the specific VIP2 models that support the PA-2CE1, see the "Software and Hardware Requirements" section on page 2-2.
- E1 interface cables. (See the "Cables, Connectors, and Pinouts" section on page 1-3.
- Number 1 Phillips and a 3/16-inch flat-blade screwdriver (for VIP2 installation only).
- Your own electrostatic discharge (ESD)-prevention equipment or the disposable grounding wrist strap included with all upgrade kits, field-replaceable units (FRUs), and spares.
- Antistatic mat.
- Antistatic container.

Software and Hardware Requirements

Table 2-1 lists the recommended minimum Cisco IOS software release required to use the PA-2CE1in supported router or switch platforms.

Table 2-1   PA-2CE1 Software Requirements

Platform	Recommended Minimum Cisco IOS Release
Cisco 7200 series[1]	
• Cisco 7204 and Cisco 7206	Cisco IOS Release 11.1(9)CA1 or a later release of Cisco IOS Release 11.1 CA Cisco IOS Release 12.2(4)B or a later release of Cisco IOS Release 12.2 B
• Cisco 7202	Cisco IOS Release 11.1(19)CC1 or a later release of Cisco IOS Release 11.1 CC Cisco IOS Release 11.3(4)AA or a later release of Cisco IOS Release 11.3 AA Cisco IOS Release 12.2(4)B or a later release of Cisco IOS Release 12.2 B
VIP2 in the Cisco 7000 series and Cisco 7500 series[2] [3] [4]	
• With VIP2-40(=)	Cisco IOS Release 11.1(7)CA or a later release of Cisco IOS Release 11.1 CA
• With VIP2-50(=)	Cisco IOS Release 11.1(14)CA or a later release of Cisco IOS Release 11.1 CA

1. Cisco 7200 series routers require a minimum of 32 MB of DRAM to support up to five installed PA-2CE1s that are running ISDN PRI or channelized E1.

2. The PA-2CE1 can be used in the VIP2 in all Cisco 7500 series routers using a Route Switch Processor (RSP), and in Cisco 7000 series routers using the RSP7000 and RSP7000CI.

3. The specific VIP2 models recommended for the PA-2CE1s are VIP2-40(=), which has 2 MB of SRAM and 32 MB of DRAM, and VIP2-50(=), which has 4 to 8 MB of SRAM and 32 to 128 MB of SDRAM. The VIP2-40 and VIP2-50 support two installed PA-2CE1s that are running ISDN PRI with distributed services or channelized E1 with distributed switching or distributed services. The VIP2-20=, which has 1 MB of SRAM and 16 MB of DRAM, supports two installed PA-2CE1 that are running ISDN PRI or channelized E1 with distributed switching. The VIP2-15(=), which has 1 MB of SRAM and 8 MB of DRAM, supports one installed PA-2CE1 that is running ISDN PRI or channelized E1 without distributed switching.

4. Cisco 7000, Cisco 7500, and Cisco 7200 series routers support up to five installed PA-2CE1 that are running ISDN PRI (ten E1 ports total, including E1 ports on MultiChannel Interface Processors installed in Cisco 7000 series or Cisco 7500 series routers). There are no such limitations when installed PA-2CE1s are running channelized E1.

For configuration guidelines on port adapters in the Cisco 7200 series, refer to the *Cisco 7200 Series Port Adapter Hardware Configuration Guidelines.*

Checking Hardware and Software Compatibility

To check the minimum software requirements of Cisco IOS software with the hardware installed on your router, Cisco maintains the Software Advisor tool on Cisco.com. This tool does not verify whether modules within a system are compatible, but it does provide the minimum IOS requirements for individual hardware modules or components.

✎

Note   Access to this tool is limited to users with Cisco.com login accounts.

To access Software Advisor, click **Login** at Cisco.com and go to **Technical Support Help—Cisco TAC**: **Tool Index**: **Software Advisor**. You can also access the tool by pointing your browser directly to http://www.cisco.com/cgi-bin/support/CompNav/Index.pl.

Choose a product family or enter a specific product number to search for the minimum supported software release needed for your hardware.

Safety Guidelines

This section provides safety guidelines that you should follow when working with any equipment that connects to electrical power or telephone wiring.

Safety Warnings

Safety warnings appear throughout this publication in procedures that, if performed incorrectly, might harm you. A warning symbol precedes each warning statement.

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

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. Voor vertalingen van de waarschuwingen die in deze publicatie verschijnen, kunt u het document *Regulatory Compliance and Safety Information* (Informatie over naleving van veiligheids- en andere voorschriften) raadplegen dat bij dit toestel is ingesloten.**

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. Tässä julkaisussa esiintyvien varoitusten käännökset löydät laitteen mukana olevasta *Regulatory Compliance and Safety Information* -kirjasesta (määräysten noudattaminen ja tietoa turvallisuudesta).**

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. Pour prendre connaissance des traductions d'avertissements figurant dans cette publication, consultez le document *Regulatory Compliance and Safety Information* (Conformité aux règlements et consignes de sécurité) qui accompagne cet appareil.**

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. Übersetzungen der in dieser Veröffentlichung enthaltenen Warnhinweise finden Sie im Dokument *Regulatory Compliance and Safety Information* (Informationen zu behördlichen Vorschriften und Sicherheit), das zusammen mit diesem Gerät geliefert wurde.**

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. La traduzione delle avvertenze riportate in questa pubblicazione si trova nel documento *Regulatory Compliance and Safety Information* (Conformità alle norme e informazioni sulla sicurezza) che accompagna questo dispositivo.**

Advarsel **Dette varselsymbolet betyr fare. Du befinner deg i en situasjon som kan føre til personskade. Før du utfører arbeid på utstyr, må du vare oppmerksom på de faremomentene som elektriske kretser innebærer, samt gjøre deg kjent med vanlig praksis når det gjelder å unngå ulykker. Hvis du vil se oversettelser av de advarslene som finnes i denne publikasjonen, kan du se i dokumentet *Regulatory Compliance and Safety Information* (Overholdelse av forskrifter og sikkerhetsinformasjon) som ble levert med denne enheten.**

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. Para ver as traduções dos avisos que constam desta publicação, consulte o documento *Regulatory Compliance and Safety Information* (Informação de Segurança e Disposições Reguladoras) que acompanha este dispositivo.**

¡Advertencia! **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. Para ver una traducción de las advertencias que aparecen en esta publicación, consultar el documento titulado *Regulatory Compliance and Safety Information* (Información sobre seguridad y conformidad con las disposiciones reglamentarias) que se acompaña con este dispositivo.**

Varning! **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. Se förklaringar av de varningar som förkommer i denna publikation i dokumentet *Regulatory Compliance and Safety Information* (Efterrättelse av föreskrifter och säkerhetsinformation), vilket medföljer denna anordning.**

Electrical Equipment Guidelines

Follow these basic guidelines when working with any electrical equipment:

- Before beginning any procedures requiring access to the chassis interior, locate the emergency power-off switch for the room in which you are working.

- Disconnect all power and external cables before moving a chassis; do not work alone when potentially hazardous conditions exist.

- Never assume that power has been disconnected from a circuit; always check.

- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe; carefully examine your work area for possible hazards such as moist floors, ungrounded power extension cables, and missing safety grounds.

Telephone Wiring Guidelines

Use the following guidelines when working with any equipment that is connected to telephone wiring or to other network cabling:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) damage, which can occur when electronic cards or components are improperly handled, results in complete or intermittent failures. Port adapters and processor modules comprise printed circuit boards that are fixed in metal carriers. Electromagnetic interference (EMI) shielding and connectors are integral components of the carrier. Although the metal carrier helps to protect the board from ESD, use a preventive antistatic strap during handling.

Following are guidelines for preventing ESD damage:

- Always use an ESD wrist or ankle strap and ensure that it makes good skin contact.
- Connect the equipment end of the strap to an unfinished chassis surface.
- When installing a component, use any available ejector levers or captive installation screws to properly seat the bus connectors in the backplane or midplane. These devices prevent accidental removal, provide proper grounding for the system, and help to ensure that bus connectors are properly seated.
- When removing a component, use any available ejector levers or captive installation screws to release the bus connectors from the backplane or midplane.
- Handle carriers by available handles or edges only; avoid touching the printed circuit boards or connectors.
- Place a removed board component-side-up on an antistatic surface or in a static shielding container. If you plan to return the component to the factory, immediately place it in a static shielding container.
- Avoid contact between the printed circuit boards and clothing. The wrist strap only protects components from ESD voltages on the body; ESD voltages on clothing can still cause damage.
- Never attempt to remove the printed circuit board from the metal carrier.

⚠
Caution For safety, periodically check the resistance value of the antistatic strap. The measurement should be between 1 and 10 megohms (Mohm).

FCC Class A Compliance

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

You can determine whether your equipment is causing interference by turning it off. If the interference stops, it was probably caused by the Cisco equipment or one of its peripheral devices. If the equipment causes interference to radio or television reception, try to correct the interference by using one or more of the following measures:

- Turn the television or radio antenna until the interference stops.
- Move the equipment to one side or the other of the television or radio.
- Move the equipment farther away from the television or radio.
- Plug the equipment into an outlet that is on a different circuit from the television or radio. (That is, make certain the equipment and the television or radio are on circuits controlled by different circuit breakers or fuses.)

Note The PA-2CE1 has been designed to meet these requirements. Modifications to this product that are not authorized by Cisco Systems, Inc. could void the various approvals and negate your authority to operate the product.

C H A P T E R 3

Removing and Installing Port Adapters

This chapter describes how to remove the PA-2CE1 port adapter from supported platforms and also how to install a new or replacement port adapter. This chapter contains the following sections:

- Handling Port Adapters, page 3-2
- Online Insertion and Removal, page 3-2
- Warnings and Cautions, page 3-3
- Port Adapter Removal and Installation, page 3-4
- Connecting a PA-2CE1 Interface Cable, page 3-7
- Setting the PA-2CE1 Jumpers, page 3-8

Each port adapter circuit board is mounted to a metal carrier and is sensitive to electrostatic discharge (ESD) damage.

Note When a port adapter slot is not in use, a blank port adapter must fill the empty slot to allow the router or switch to conform to electromagnetic interference (EMI) emissions requirements and to allow proper airflow across the port adapters. If you plan to install a new port adapter in a slot that is not in use, you must first remove the blank port adapter.

Caution When powering off the router, wait a minimum of 30 seconds before powering it on again.

Handling Port Adapters

⚠
Caution   Always handle the port adapter by the carrier edges and handle; never touch the port adapter components or connector pins. (See Figure 3-1.)

Figure 3-1   Handling a Port Adapter
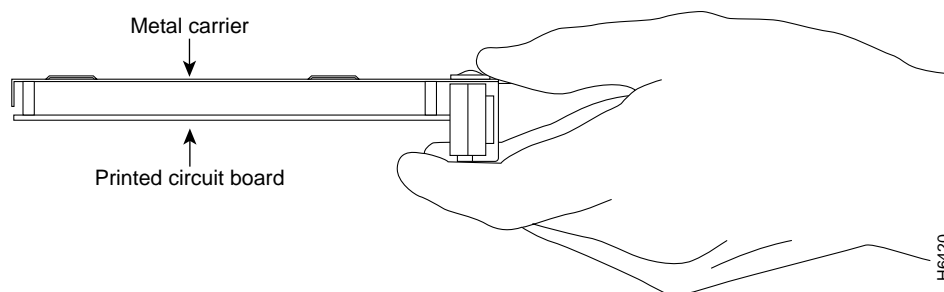
Online Insertion and Removal

Several platforms support online insertion and removal (OIR) of port adapters; therefore, you do not have to power down routers when removing and replacing a PA-2CE1 in Cisco 7200 series routers.

Although the VIP2 supports online insertion and removal, individual port adapters do not. To replace port adapters, you must first remove the VIP2 from the chassis and then install or replace port adapters as required. If a blank port adapter is installed on the VIP2 on which you want to install a new port adapter, you must first remove the VIP2 from the chassis and then remove the blank port adapter.

⚠
Caution   To prevent system problems, do not remove port adapters from the VIP2 motherboard or attempt to install other port adapters on the motherboard when the system is operating. To install or replace port adapters, first remove the VIP2 from its interface processor slot.

It is wise to gracefully shut down the system before removing a port adapter that has active traffic moving through it. Removing a module while traffic is flowing through the ports can cause system disruption. Once the module is inserted, the ports can be brought back up.

✎
Note   As you disengage the module from the router or switch, online insertion and removal (OIR) administratively shuts down all active interfaces in the module.

OIR allows you to install and replace modules while the router is operating; you do not need to notify the software or shut down the system power, although you should not run traffic through the module you are removing while it is being removed. OIR is a method that is seamless to end users on the network, maintains all routing information, and preserves sessions.

The following is a functional description of OIR for background information only; for specific procedures for installing and replacing a module in a supported platform, refer to the "Port Adapter Removal and Installation" section on page 3-4.

Each module has a bus connector that connects it to the router. The connector has a set of tiered pins in three lengths that send specific signals to the system as they make contact with the module. The system assesses the signals it receives and the order in which it receives them to determine if a module is being removed from or introduced to the system. From these signals, the system determines whether to reinitialize a new interface or to shut down a disconnected interface.

Specifically, when you insert a module, the longest pins make contact with the module first, and the shortest pins make contact last. The system recognizes the signals and the sequence in which it receives them.

When you remove or insert a module, the pins send signals to notify the system of changes. The router then perfoms the following procedure:

1. Rapidly scans the system for configuration changes.

2. Initializes newly inserted port adapters or administratively shuts down any vacant interfaces.

3. Brings all previously configured interfaces on the module back to their previously installed state. Any newly inserted interface is put in the administratively shutdown state, as if it was present (but not configured) at boot time. If a similar module type is reinserted into a slot, its ports are configured and brought online up to the port count of the originally installed module of that type.

Note Before you begin installation, read Chapter 2, "Preparing for Installation," for a list of parts and tools required for installation.

Warnings and Cautions

Observe the following warnings and cautions when installing or removing port adapters.

Caution Do not slide a port adapter all the way into the slot until you have connected all required cables. Trying to do so disrupts normal operation of the router or switch.

Note If a port adapter lever or other retaining mechanism does not move to the locked position, the port adapter is not completely seated in the midplane. Carefully pull the port adapter halfway out of the slot, reinsert it, and move the port adapter lever or other mechanism to the locked position.

Caution To prevent jamming the carrier between the upper and the lower edges of the port adapter slot, and to ensure that the edge connector at the rear of the port adapter mates with the connection at the rear of the port adapter slot, make certain that the carrier is positioned correctly, as shown in the cutaway in the following illustrations.

Warning **When performing the following procedures, wear a grounding wrist strap to avoid ESD damage to the card. Some platforms have an ESD connector for attaching the wrist strap. Do not directly touch the midplane or backplane with your hand or any metal tool, or you could shock yourself.**

Port Adapter Removal and Installation

In this section, the illustrations that follow give step-by-step instructions on how to remove and install port adapters. This section contains the following illustrations:

- Cisco 7200 Series—Removing and Installing a Port Adapter, page 3-5
- VIP2—Removing and Installing a Port Adapter, page 3-6

Cisco 7200 Series—Removing and Installing a Port Adapter

Step 1

To remove the port adapter, place the port adapter lever in the unlocked position. (See A.) The port adapter lever remains in the unlocked position.

Step 2

Grasp the handle of the port adapter and pull the port adapter from the router, about halfway out of its slot. If you are removing a blank port adapter, pull the blank port adapter completely out of the chassis slot.

Step 3

With the port adapter halfway out of the slot, disconnect all cables from the port adapter. After disconnecting the cables, pull the port adapter from its chassis slot.

Step 4

To insert the port adapter, carefully align the port adapter carrier between the upper and the lower edges of the port adapter slot. (See B.)

Step 5

Carefully slide the new port adapter halfway into the port adapter slot. (See B.)

Step 6

With the port adapter halfway into the slot, connect all required cables to the port adapter. After connecting all required cables, carefully slide the port adapter all the way into the slot until the port adapter is seated in the router midplane.

Step 7

After the port adapter is properly seated, lock the port adapter lever. (See A.)

Port adapter lever (locked position)

A
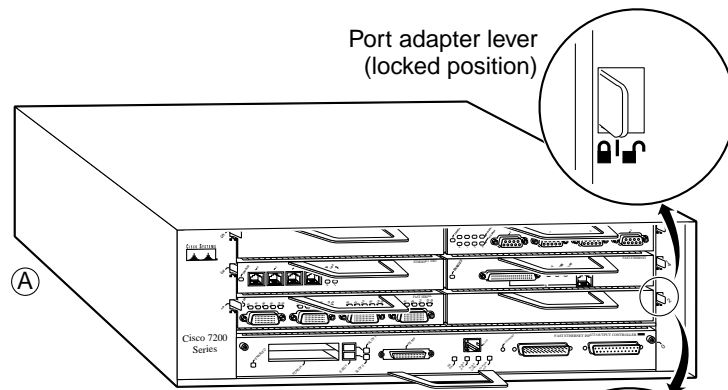
Note: This adapter removal applies to any port or service adapter.

Port adapter lever (unlocked position)

Slot guide

B

27996
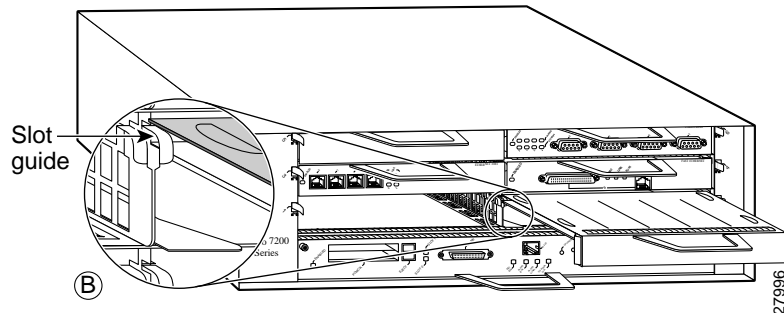
Cisco uBR7200 Series—Removing a Port Adapter

VIP2—Removing and Installing a Port Adapter

Note: You must first remove the VIP from the chassis before removing a port adapter from the VIP.

Step 1

To remove the port adapter, remove the screw that secures the port adapter (or blank port adapter). (See A.)
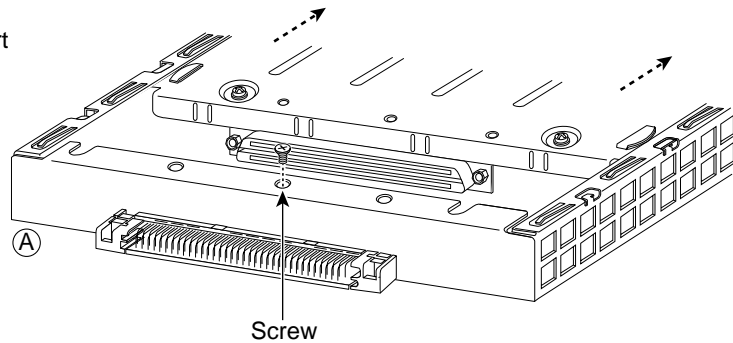
Step 2

With the screw removed, grasp the handle on the front of the port adapter (or blank port adapter) and carefully pull it out of its slot, away from the edge connector at the rear of the slot. (See A.)

Step 3

To insert the port adapter, carefully align the port adapter carrier between the upper and the lower edges of the port adapter slot. (See B.)
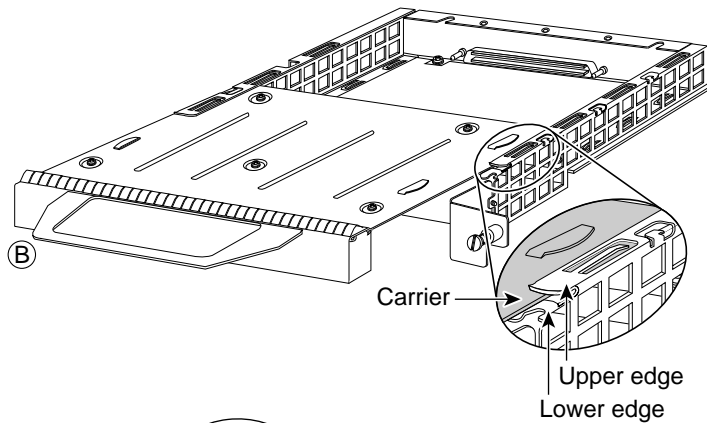
Step 4

Carefully slide the new port adapter into the port adapter slot until the connector on the port adapter is completely seated in the connector at the rear of the port adapter slot. (See B.)

Step 5

Install the screw in the rear of the port adapter slot on the VIP. Do not overtighten the screw. (See A.)
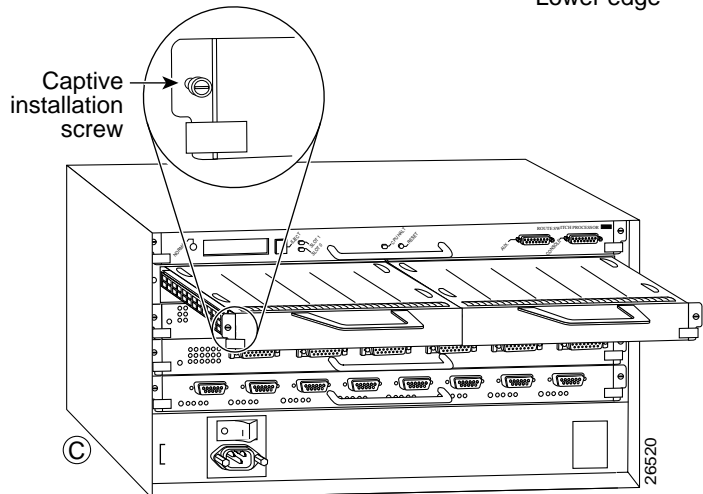
Step 6

Carefully slide the VIP motherboard into the interface processor slot until the connectors at the rear of the VIP are completely seated in the connectors at the rear of the interface processor slot. Use the ejector levers to seat the VIP in the interface processor slot. Tighten the captive installation screws on the VIP. (See C.)

Connecting a PA-2CE1 Interface Cable

On a single PA-2CE1, you can use up to two G.703 serial connections.

Use the following procedure to connect a PA-2CE1 interface cable:

Step 1   Attach the cable directly to the receptacle on the PA-2CE1 and tighten the strain-relief screws. (See Figure 3-2.)

✎
Note   Port adapters have a handle attached, but this handle is not shown to allow a detailed view of each port adapter faceplate.

Figure 3-2   Connecting a PA-2CE1 Interface Cable (Front View—Shown without Handle)

To PRI CSU
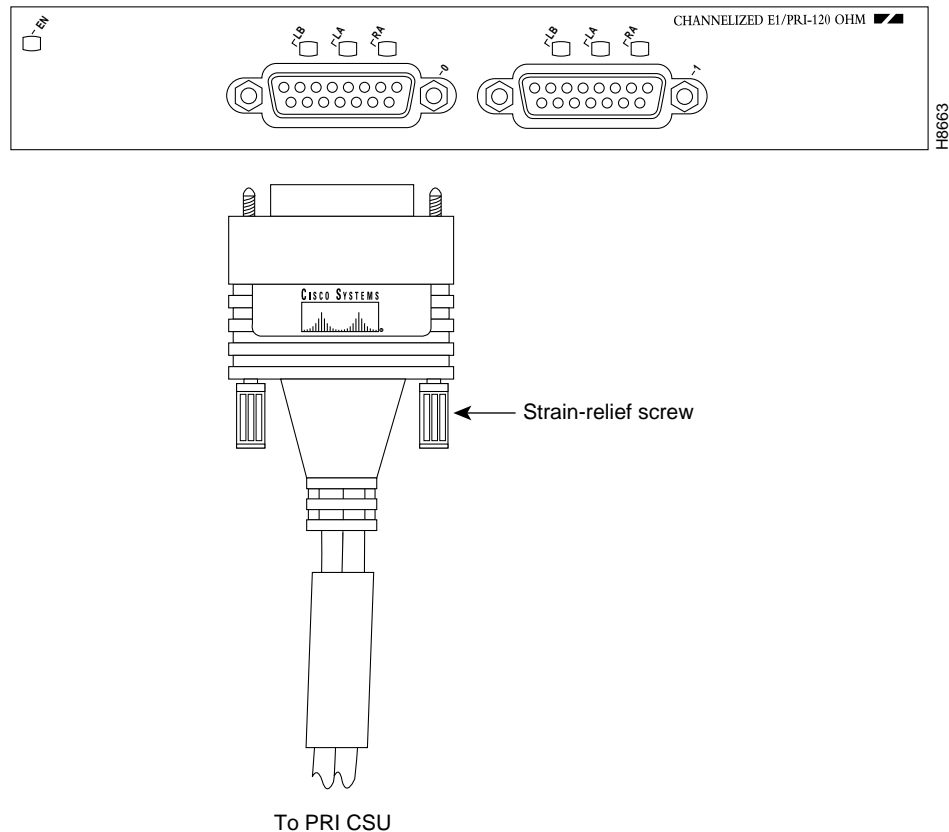
Step 2   Attach the network end of the cable to your Primary Rate Interface (PRI) channel service unit (CSU) and tighten the strain-relief screws.

Step 3   Repeat Step 1 and Step 2 for additional cables you want to install.

This completes the procedure for attaching a PA-2CE1 interface cable.

Setting the PA-2CE1 Jumpers

Depending on the circumstances, you might need to change the configuration of both PA-2CE1 interfaces for balanced 120-ohm connections or unbalanced 75-ohm connections.

Configuring PA-2CE1 interfaces for balanced 120-ohm or unbalanced 75-ohm connections requires setting ten jumpers on the 2CE1 printed circuit board and attaching the appropriate interface cable (balanced or unbalanced) to both 2CE1 ports. See the "Cables, Connectors, and Pinouts" section on page 1-3 for 2CE1 interface cable types. The following steps explain how to set 2CE1 jumpers for balanced 120-ohm or unbalanced 75-ohm connections.

✎
Note Both 2CE1 ports must be configured for balanced 120-ohm or unbalanced 75-ohm connections. The PA-2CE1 does not support a mixed connection configuration.

Step 1 Attach an ESD-preventive wrist strap between you and an unfinished chassis surface.

Step 2 Remove the VIP2 from the chassis. To do so, follow the steps in the section "Removing a VIP2" in the configuration note *Second-Generation Versatile Interface Processor (VIP2) Installation and Configuration*, which shipped with your VIP2.

Step 3 Remove the installed PA-2CE1 from the VIP2. See the "VIP2—Removing and Installing a Port Adapter" section on page 3-6 for port adapter removal procedures.

Step 4 With the PA-2CE1 on an antistatic mat, use a number 1 Phillips screwdriver to remove the three screws that secure the plastic jumper cover to the 2CE1 printed circuit board. (See Figure 3-3.) Save the screws.

Figure 3-3   Removing the Jumper Cover (Bottom View of the PA-2CE1)
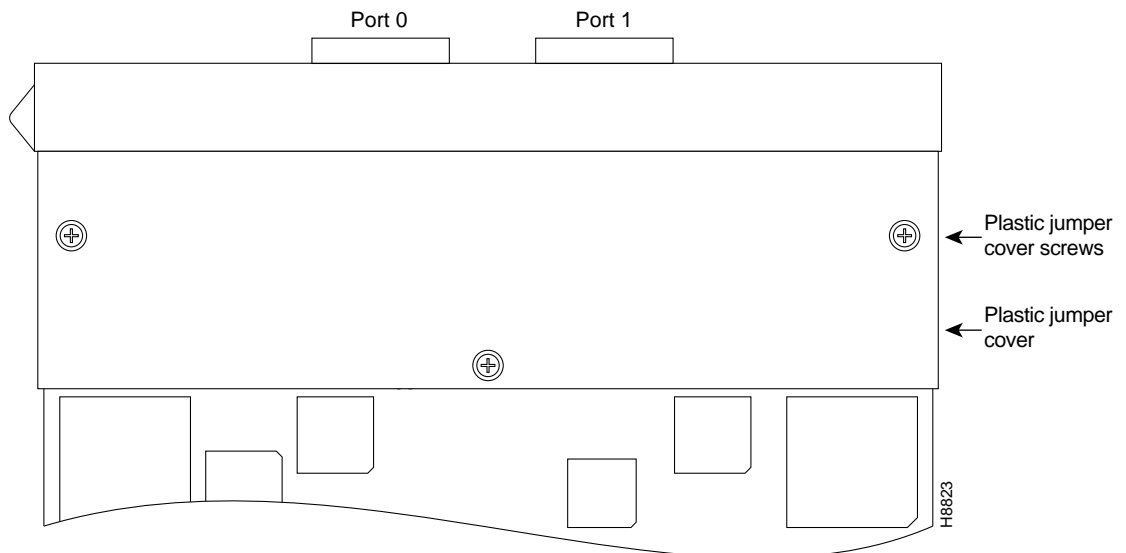
Step 5 Set the ten jumpers on the 2CE1 printed circuit board for balanced 120-ohm or unbalanced 75-ohm interface connections.

Jumper locations J2, J3, J5, J8, J9, J11, J12, and J14 have three pins, and jumper locations J4 and J10 have two pins. Each jumper location is configured by placing an insulated jumper over two pins (leaving the third pin of a three-pin jumper location exposed). In balanced 120-ohm configurations, the insulated jumper covers both pins of jumper locations J4 and J10. In unbalanced 75-ohm configurations, the

insulated jumper is not present on jumper locations J4 and J10. Table 3-1 lists the 2CE1 jumper locations and their jumper settings. Figure 3-4 and Figure 3-5 show balanced 120-ohm and unbalanced 75-ohm 2CE1 jumper configurations, respectively.

Note In balanced 120-ohm and unbalanced 75-ohm configurations, an insulated jumper covers the left two pins of jumper locations J7 and J13; it is not present on jumper location J15. (See Table 3-1.)

Table 3-1   2CE1 Jumper Locations and Settings

Balanced 120-Ohm Configuration		Unbalanced 75-Ohm Configuration	
Jumper Location	Jumper Setting	Jumper Location	Jumper Setting
J2	Right two pins	J2	Left two pins
J3	Right two pins	J3	Left two pins
J5	Right two pins	J5	Left two pins
J7	Left two pins	J7	Left two pins
J8	Right two pins	J8	Left two pins
J9	Right two pins	J9	Left two pins
J11	Right two pins	J11	Left two pins
J12	Right two pins	J12	Left two pins
J13	Left two pins	J13	Left two pins
J14	Right two pins	J14	Left two pins
J4	Present	J4	Not present
J10	Present	J10	Not present
J15	Not present	J15	Not Present

Figure 3-4 **2CE1 Balanced 120-Ohm Jumper Configuration (Bottom View of the PA-2CE1—Cover Removed)**
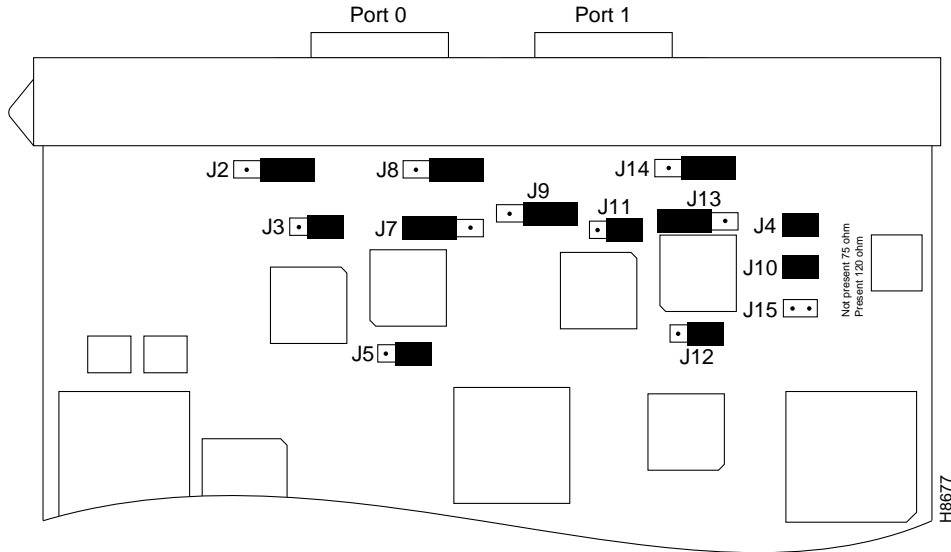
Figure 3-5 **2CE1 Unbalanced 75-Ohm Jumper Configuration (Bottom View of the PA-2CE1—Cover Removed)**
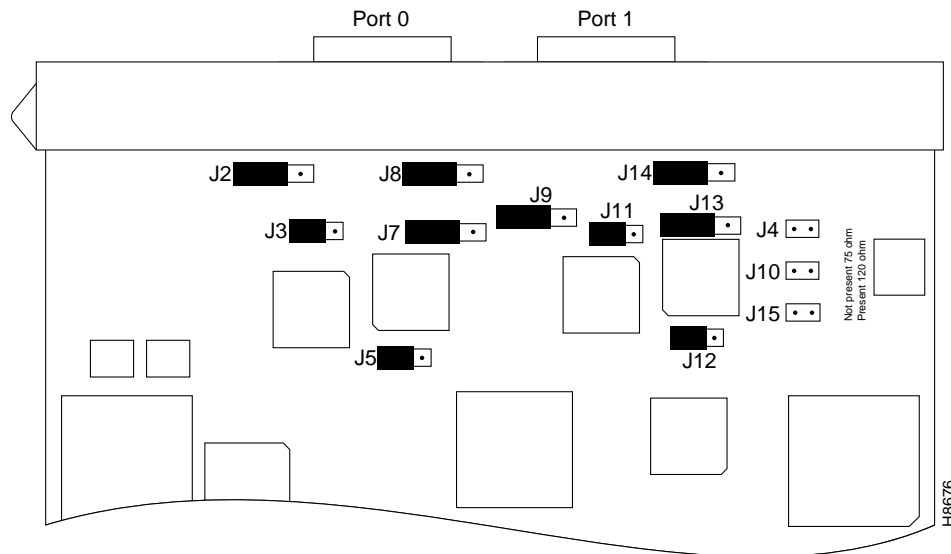
Step 6 Replace the plastic jumper cover over the 2CE1 jumpers and secure it to the port adapter printed circuit board using a number 1 Phillips screwdriver and the screws that you saved in Step 4.

Step 7 Replace the PA-2CE1 in the VIP2. See the "VIP2—Removing and Installing a Port Adapter" section on page 3-6 for port adapter replacement procedures.

Step 8 Replace the VIP2 in the chassis. To do so, follow the steps in the section "Installing a VIP2" in the configuration note *Second-Generation Versatile Interface Processor (VIP2) Installation and Configuration*, which shipped with your VIP2.

C H A P T E R 4

Configuring the PA-2CE1

To continue your PA-2CE1 installation, you must configure the 2CE1 interfaces. The instructions that follow apply to all supported platforms. Minor differences between the platforms—with Cisco IOS software commands—are noted.

This chapter contains the following sections:

- Using the EXEC Command Interpreter, page 4-1
- Configuring the PA-2CE1 Interfaces, page 4-2
- Checking the Configuration, page 4-12

Using the EXEC Command Interpreter

You modify the configuration of your router through the software command interpreter called the *EXEC* (also called enable mode). You must enter the privileged level of the EXEC command interpreter with the **enable** command before you can use the **configure** command to configure a new interface or change the existing configuration of an interface. The system prompts you for a password if one has been set.

The system prompt for the privileged level ends with a pound sign (#) instead of an angle bracket (>). At the console terminal, use the following procedure to enter the privileged level:

Step 1 At the user-level EXEC prompt, enter the **enable** command. The EXEC prompts you for a privileged-level password as follows:

```
Router> enable

Password:
```

Step 2 Enter the password (the password is case sensitive). For security purposes, the password is not displayed.

When you enter the correct password, the system displays the privileged-level system prompt (#):

```
Router#
```

To configure the new interface, proceed to the "Configuring the PA-2CE1 Interfaces" section on page 4-2.

Configuring the PA-2CE1 Interfaces

After you verify that the new PA-2CE1 is installed correctly (the enabled LED goes on), use the privileged-level **configure** command to configure the new interface. Have the following information available:

- ISDN switch type, when configuring ISDN PRI (Table 4-1 lists ISDN service provider switch types)

- E1 information, for example, line code, framing type, and so on

- Channel group and PRI group information and timeslot mapping

- Protocols and encapsulations you plan to use on the new interfaces

- Protocol specific information, such as internet protocol (IP) addresses, if you plan to configure the interfaces for IP routing

- Whether the new interface will use bridging

Table 4-1   ISDN Service Provider

Keywords by Area	Switch Type
Australia	
• basic-ts013	Australian TS013 switches
Europe	
• basic-1tr6	German 1TR6 ISDN switches
• basic-nwnet3	Norwegian NET3 ISDN switches (phase 1)
• basic-net3	NET3 ISDN switches (UK, Denmark, and other nations); covers the Euro-ISDN E-DSSI signaling system).
• basic-net5	NET5 switches (UK and Europe)
• primary-net5	European ISDN PRI switches (UK and Europe)
• vn2	French VN2 ISDN switches
• vn3	French VN3 ISDN switches
Japan	
• ntt	Japanese NTT ISDN switches
• primary-ntt	Japanese ISDN PRI switches

Table 4-1 ISDN Service Provider (continued)

Keywords by Area	Switch Type
North America	
• basic-5ess	AT&T basic rate switches
• basic-dms100	NT DMS-100 basic rate switches
• basic-ni1	National (North American) ISDN-1 switches
• primary-4ess	AT&T 4ESS switch type for the U.S. (ISDN PRI only)
• primary-5ess	AT&T 5ESS switch type for the U.S. (ISDN PRI only)
• primary-dms100	NT DMS-100 switch type for the U.S. (ISDN PRI only)
New Zealand	
• basic-nznet3	New Zealand NET3 switches

If you installed a new PA-2CE1 or if you want to change the configuration of the existing interface, you must enter configuration mode to configure the new interface. If you replaced a PA-2CE1 that was previously configured, the system recognizes the new interfaces and brings each of them up in their existing configuration.

For a summary of the configuration options available and instructions for configuring a PA-2CE1, refer to the appropriate configuration publications listed in the "Related Documentation" section on page vi.

You execute configuration commands from the privileged level of the EXEC command interpreter, which usually requires password access. Contact your system administrator, if necessary, to obtain password access. (See the "Using the EXEC Command Interpreter" section on page 4-1 for an explanation of the privileged level of the EXEC.)

This section contains the following subsections:

- Shutting Down the Interface, page 4-3
- Performing a Basic Configuration, page 4-5

Shutting Down the Interface

Before you remove an interface that you will not replace, use the **shutdown** command to shut down (disable) the interface to prevent anomalies when you reinstall the new or reconfigured interface. When you shut down an interface, it is designated *administratively down* in the **show** command displays.

Follow these steps to shut down an interface:

Step 1 Enter the privileged level of the EXEC command interpreter (also called enable mode). (See the "Using the EXEC Command Interpreter" section on page 4-1 for instructions.)

Step 2 At the privileged-level prompt, enter configuration mode and specify that the console terminal is the source of the configuration subcommands, as follows:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
```

Step 3 Shut down the interface by entering the **interface serial** subcommand (followed by the interface address of the interface), and then enter the **shutdown** command. Table 4-2 shows the command syntax.

When you have finished, press **Ctrl-Z**—hold down the **Control** key while you press **Z**—or enter **end** or **exit** to exit configuration mode and return to the EXEC command interpreter.

Table 4-2   Syntax of the shutdown Command

Platform	Command	Example

Cisco 7200 series routers	**interface**, followed by the *type* (**serial**) and *slot/port* (port-adapter-slot-number/ interface-port-number)	The example is for interface 0 in port adapter slot 1 being shut down.
		
		 ```Router(config-if)# interface serial 1/0```
		```Router(config-if)# shutdown```
		```Ctrl-Z```
		```Router#```

VIP2 in Cisco 7000 series and Cisco 7500 series routers	**interface**, followed by the *type* (**serial**) and *slot/port adapter/port* (interface-processor-slot-number port-adapter-slot-number/ interface-port-number)	The example is for interface 0 on a port adapter in port adapter slot 0 of a VIP installed in interface processor slot 1.
		
		 ```Router(config-if)# interface serial 1/0/0```
		```Router(config-if)# shutdown```
		```Ctrl-Z```
		```Router#```

Step 4 Write the new configuration to NVRAM as follows:

```
Router# copy running-config startup-config
[OK]
Router#
```

The system displays an OK message when the configuration has been stored in NVRAM.

Step 5 Verify that new interfaces are now in the correct state (shut down) using the **show interfaces** command (followed by the interface type and interface address of the interface) to display the specific interface. Table 4-3 provides examples.

Table 4-3   Examples of the show interfaces Command

Platform	Command	Example
Cisco 7200 series routers	**show interfaces serial**, followed by *slot/port* (port-adapter-slot-number/ interface-port-number)	The example is for interface 0 on a port adapter in port adapter slot 1. Router# **show interfaces serial 1/0** srp 1/0 is administratively down, line protocol is down [Additional display text omitted from this example]
VIP2 in Cisco 7000 series and Cisco 7500 series routers	**show interfaces serial**, followed by *slot/port adapter/port* (interface-processor-slot-number/ port-adapter-slot-number/ interface-port-number)	The example is for interface 0 on a port adapter in port adapter slot 0 of a VIP in interface processor slot 1. Router# **show interfaces serial 1/0/0** atm 1/0/0 is administratively down, line protocol is down [Additional display text omitted from this example]

Step 6   Reenable interfaces by doing the following:

a. Repeat Step 3 to reenable an interface. Substitute the **no shutdown** command for the **shutdown** command.

b. Repeat Step 4 to write the new configuration to memory.
Use the **copy running-config startup-config** command.

c. Repeat Step 5 to verify that the interfaces are in the correct state. Use the **show interfaces** command followed by the interface type and interface address of the interface.

For complete descriptions of software configuration commands, refer to the publications listed in the "Related Documentation" section on page vi.

Performing a Basic Configuration

This section contains guidelines for performing a basic channelized E1 configuration and a basic channelized E1 ISDN PRI configuration: enabling a controller and specifying IP routing. You might also need to enter other configuration subcommands, depending on the requirements for your system configuration and the protocols you plan to route on the interface. This section contains the following subsections:

- Configuring Channelized E1 Interfaces, page 4-6
- Configuring Channelized E1 ISDN Interfaces, page 4-8

Configuring Channelized E1 Interfaces

Channel groups must be mapped before the 2CE1 controller can be configured. Following are controller commands used to map the channel group (the default variable is listed first):

- **controller e1** *chassis slot number/port adapter number/interface port number*
- **linecode** [*ami* | *hdb3*]
- **framing** [*crc4* | *no -crc4*]
- **loopback**
- **shutdown**
- **channel-group** *number* **timeslots** *list* [*speed* {**48** | **56** | **64**}]

  number is the channel group 0 to 30.

  timeslots is a number between 1 to 31. You can enter timeslots individually and separate them by commas or enter them as a range separated by a hyphen (for example, 1-3, 8, 9-18). Timeslot 0 is an illegal configuration.

  speed specifies the DS0 speed of the channel group; 64 kbps is the default.

> ✎
> **Note**　Cisco 7000 series and Cisco 7500 series routers identify channel groups as serial interfaces by chassis slot number, port adapter (0 or 1), interface port number (0 or 1), and channel-group number (0 to 30). For example, the address of the 2CE1 installed in chassis slot 4, port adapter slot 1, interface port 1, and channel group 5 would be serial 4/1/1:5.

Before using the **configure** command, you must enter the privileged level of the EXEC command interpreter with the **enable** command. The system prompts you for a password if one has been set.

Use the following procedure to configure the PA-2CE1. Press the **Return** key after each configuration step, unless otherwise noted.

Step 1　Confirm that the system recognizes the PA-2CE1 by entering the **show running-config** command:

```
Router# show running-config
```

Step 2　Enter configuration mode and specify that the console terminal is the source of the configuration subcommands:

```
Router# configure terminal
```

Step 3　At the prompt, specify the controller to configure by entering the command **controller**, followed by **e1**, and *chassis slot number/port adapter number/interface port number*. The following example is for the 2CE1 in chassis slot 3, port adapter slot 1, interface port 1.

```
Router(config)# controller e1 3/1/1
```

Step 4　Specify the controller's framing type by entering the **framing** command:

```
Router(config-controller)# framing crc4
```

Step 5　Specify the controller's linecode format by entering the **linecode** command:

```
Router(config-controller)# linecode hdb3
```

Step 6 Specify a channel group and map timeslots to the channel group by entering the **channel-group** command. The following example specifies channel group 0 and maps timeslots 1, 3 through 5, and 7 to channel group 0:

```
Router(config-controller)# channel-group 0 timeslots 1,3-5,7
Router(config-controller)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/1/1:0,
changed state to down
%LINK-3-UPDOWN: Interface Serial3/1/1:0, changed state to up
```

Note Each channel group is presented to the system as a serial interface that can be configured individually.

Step 7 If IP routing is enabled on the system, assign an IP address and subnet mask to the channel group with the **interface** and **ip address** commands as follows:

```
Router(config-controller)# interface serial 3/1/1:0
Router(config-if)# ip address 10.1.15.1 255.255.255.0
Router(config-if)#
```

Step 8 Add any additional configuration commands required to enable routing protocols and adjust the interface characteristics.

Step 9 Use the **no shutdown** and **exit** commands respectively to reenable the interface and return to configuration mode as follows:

```
Router(config-if)# no shutdown
Router(config-if)# exit
Router(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/1/1:0,
changed state to up
%LINK-3-UPDOWN: Interface Serial3/1/1:0, changed state to up
```

Step 10 Repeat Step 6 through Step 9 for additional channel groups and timeslots.

Step 11 After configuring additional channel groups and timeslots, map all unused timeslots to an unused channel group and shut down the unused channel group by entering the **channel-group** and **shutdown** commands, respectively.

In the following example, unused timeslots 2, 6, and 8 through 31 are mapped to unused channel group 1, and channel group 1 is shut down:

```
Router(config)# controller e1 3/1/1
Router(config-controller)# channel-group 1 timeslots 2,6,8-31
Router(config-controller)#
Router(config-controller)# int serial 3/1/1:1
Router(config-if)# shutdown
Router(config-if)# exit
Router(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/1/1:1,
changed state to down
%LINEPROTO-5-UPDOWN: Interface Serial3/1/1:1, changed state to
administratively down
```

Step 12 After including all of the configuration commands, to complete the configuration, press **Ctrl-Z**—(hold down the **Control** key while you press **Z**—) or enter **end** to exit configuration mode and return to the EXEC command interpreter prompt as follows:

```
Router(config)#
Ctrl-Z
Router#
```

Step 13   Write the new configuration to memory as follows:

```
Router# copy running-config startup-config
[OK]
Router#
```

The system displays an OK message when the configuration is stored.

Step 14   Exit the privileged level and return to the user level by entering **disable** at the prompt as follows:

```
Router# disable

Router>
```

This completes the procedure for creating a basic channelized E1 configuration. Proceed to the "Checking the Configuration" section on page 4-12 to check the interface configuration using **show** commands. For additional information about configuring channelized E1 interfaces, refer to the publications *Wide-Area Networking Configuration Guide* and *Wide-Area Networking Command Reference*.

Configuring Channelized E1 ISDN Interfaces

The PRI group must be mapped before the 2CE1 controller can be configured (there is only one PRI group for each controller). The following are controller commands used to map the PRI group:

- **isdn switch-type** *switch-type*
- **controller e1** *chassis slot number/port adapter number/interface port number*
- **linecode** *hdb3*
- **framing** *crc4*
- **loopback**
- **shutdown**
- **pri-group** [**timeslots** *list*]

    pri-group timeslots is a number between 1 to 31. (Timeslots 1 to 15 and 17 to 31 represent the B channels, and timeslot 16 represents the D channel. While the numbering scheme for entering timeslots is 1 to 31, the system recognizes the numbering of timeslots as 0 to 30. The PRI group is configured by using timeslot 16 [the D channel], which is recognized by the system as timeslot 15.) You can enter timeslots individually and separate them by commas or enter them as a range separated by a hyphen (for example, 1-3, 8, 9-18). The default DS0 speed of the PRI group is 64 kbps.

Note   If you do not specify the timeslots, the controller is configured for 30 B channels (timeslots 1 to 15 and 17 to 31) and one D channel (timeslot 16).

Note   Cisco 7000 series and Cisco 7500 series routers identify the PRI group as a serial interface by chassis slot number, port adapter slot (0 or 1), interface port number (0 or 1), and timeslot 16. For example, the address of the 2CE1 installed in chassis slot 3, port adapter slot 1, interface port 1, and timeslot 16 would be recognized by the system as serial 3/1/1:15.

In the following procedure, press the **Return** key after each configuration step:

Step 1   At the privileged-level prompt, enter configuration mode and specify that the console terminal will be the source of the configuration commands as follows:

```
Router# configure t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
```

Step 2   Identify the ISDN switch type. In the following example, the switch primary-net5 (a switch for the European Community) is identified as the switch type:

```
Router(config)# isdn switch-type primary-net5
```

> **Note**   The ISDN switch type that you identify is for all ISDN interface ports installed in the router.

Step 3   Specify the controller to configure by entering the command **controller** followed by **e1**, and *chassis slot number/port adapter number/interface port number*. The example that follows is for the 2CE1 in chassis slot 3, port adapter slot 1, interface port 1:

```
Router(config)# controller e1 3/1/1
```

Step 4   Specify the controller's framing type by entering the **framing** command as follows:

```
Router(config-controller)# framing crc4
```

Step 5   Specify the controller's linecode format by entering the **linecode** command as follows:

```
Router(config-controller)# linecode hdb3
```

Step 6   Map timeslots to the controller's PRI group by entering the **pri-group** command. The following example shows PRI-group timeslots 1, 3 through 5, and 7 (the B channels) selected and mapped to timeslot 16 (the D channel), which is recognized by the system as timeslot 15:

```
Router(config-controller)# pri-group timeslots 1,3-5,7
Router(config-controller)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/1/1:15,
changed state to down
%LINK-3-UPDOWN: Interface Serial3/1/1:15, changed state to up
```

> **Note**   In the above example, the line-protocol status for timeslot 16 (listed in the output as timeslot 15) represents the entire PRI group.
>
> Each PRI group is presented to the system as a serial interface that can be configured individually.

Step 7   If IP routing is enabled on the system, assign an IP address and subnet mask to the PRI group with the **interface** and **ip address** commands as follows.

> ✎
>
> **Note** For channelized E1 ISDN PRI, the PRI group is configured by using timeslot 16, which is recognized by the system as timeslot 15.

```
Router(config-controller)# interface serial 3/1/1:15
Router(config-if)# ip address 10.1.15.1 255.255.255.0
Router(config-if)#
```

Step 8 Add any additional configuration commands required to enable routing protocols and adjust the interface characteristics.

Step 9 Use the **no shutdown** and **exit** commands respectively to reenable the interface and return to configuration mode as follows:

```
Router(config-if)# no shutdown
Router(config-if)# exit
Router(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/1/1:15,
changed state to up
%LINK-3-UPDOWN: Interface Serial3/1/1:15, changed state to up
```

Step 10 After configuring the PRI group and timeslots, map all unused timeslots to an unused channel group and shut down the unused channel group by entering the **channel-group** and **shutdown** commands, respectively.

> ✎
>
> **Note** Both PA-2CE1 interfaces support simultaneous operation in channelized E1 and ISDN PRI modes.

In the following example, unused timeslots 2, 6, 8 through 15, and 17 through 31 are mapped to unused channel group 2, and channel group 2 is shut down:

```
Router(config)# controller e1 3/1/1
Router(config-controller)# channel-group 2 timeslots 2,6,8-15,17-31
Router(config-controller)#
Router(config-controller)# interface serial 3/1/1:2
Router(config-if)# shutdown
Router(config-if)# exit
Router(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/1/1:2,
changed state to down
%LINEPROTO-5-UPDOWN: Interface Serial3/1/1:2, changed state to
administratively down
```

Step 11 After including all of the configuration commands, to complete the configuration, press **Ctrl-Z** (hold down the **Control** key while you press **Z**) or enter **end** to exit configuration mode and return to the EXEC command interpreter prompt as follows:

```
Router(config)#
Ctrl-Z
Router#
```

Step 12 Write the new configuration to memory as follows:

```
Router# copy running-config startup-config
[OK]
Router#
```

Step 13 The system displays an OK message when the configuration is stored.

Step 14   Exit the privileged level and return to the user level by entering **disable** at the prompt as follows:

```
Router# disable

Router>
```

This completes the procedure for creating a basic channelized E1 ISDN PRI configuration. Proceed to the "Checking the Configuration" section on page 4-12 to check the interface configuration using **show** commands. For dialer interface configuration and additional channelized E1 ISDN PRI interface configuration information, refer to the publications *Wide-Area Networking Configuration Guide* and *Wide-Area Networking Command Reference*.

Checking the Configuration

After configuring the new interface, use the **show** commands to display the status of the new interface or all interfaces, and use the **ping** and **loopback** commands to check connectivity. This section includes the following subsections:

- Using show Commands to Verify the New Interface Status, page 4-12
- Using the ping Command to Verify Network Connectivity, page 4-23

Using show Commands to Verify the New Interface Status

Table 4-4 demonstrates how you can use the **show** commands to verify that new interfaces are configured and operating correctly and that the PA-2CE1 appears in them correctly. Sample displays of the output of selected **show** commands appear in the sections that follow. For complete command descriptions and examples, refer to the publications listed in the "Related Documentation" section on page vi.

✎
Note   The outputs that appear in this document may not match the output you receive when running these commands. The outputs in this document are examples only.

Table 4-4   Using show Commands

Command	Function	Example
show version or **show hardware**	Displays system hardware configuration, the number of each interface type installed, Cisco IOS software version, names and sources of configuration files, and boot images	`Router# ` **`show version`**
show diag *slot*	Displays types of port adapters installed in your system and information about a specific port adapter slot, interface processor slot, or chassis slot	`Router# ` **`show diag 2`**
show interfaces *type port-adapter-slot-number/ interface-port-number*	Displays status information about a specific type of interface (for example, srp) in a Cisco 7200 series router	`Router# ` **`show interfaces srp 1/0`**
show controllers	Displays all the current interface processors and their interfaces	`Router# ` **`show controllers`**
show protocols	Displays protocols configured for the entire system and for specific interfaces	`Router# ` **`show protocols`**
show running-config	Displays the running configuration file	`Router# ` **`show running-config`**
show startup-config	Displays the configuration stored in NVRAM	`Router# ` **`show startup-config`**

If an interface is shut down and you configured it as up, or if the displays indicate that the hardware is not functioning properly, ensure that the interface is properly connected and terminated. If you still have problems bringing up the interface, contact a service representative for assistance. This section includes the following subsections:

- Using the show version or show hardware Commands, page 4-13
- Using the show diag Command, page 4-16
- Using the show interfaces Command, page 4-18
- Using the show controllers e1 Command, page 4-21

Choose the subsection appropriate for your system. Proceed to the "Using the ping Command to Verify Network Connectivity" section on page 4-23 when you have finished using the **show** commands.

Using the show version or show hardware Commands

Display the configuration of the system hardware, the number of each interface type installed, the Cisco IOS software version, the names and sources of configuration files, and the boot images, using the **show version** (or **show hardware**) command.

> **Note** The outputs that appear in this document may not match the output you receive when running these commands. The outputs in this document are examples only.

Cisco 7200 Series Routers

Following is an example of the **show version** command from a Cisco 7206 router with the PA-2CE1:

```
Router# show version

Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-J-M), Version 11.1(9)CA1
Copyright (c) 1986-1996 by cisco Systems, Inc.
Compiled Sun 04-Aug-96 06:00 by biff
Image text-base: 0x600088A0, data-base: 0x605A4000

ROM: System Bootstrap, Version 11.1(5) RELEASED SOFTWARE
ROM: 7200 Software (C7200-BOOT-M), RELEASED SOFTWARE 11.1(9)CA1

Router uptime is 4 hours, 22 minutes
System restarted by reload
System image file is "c7200-j-mz", booted via slot0

cisco 7206 (NPE150) processor with 12288K/4096K bytes of memory.
R4700 processor, Implementation 33, Revision 1.0 (Level 2 Cache)
Last reset from power-on
Bridging software.
Channelized E1, Version 1.0.
SuperLAT software copyright 1990 by Meridian Technology Corp.
X.25 software, Version 2.0, NET2, BFE and GOSIP compliant.
TN3270 Emulation software (copyright 1994 by TGV INC).
Primary Rate ISDN software, Version 1.0.
Chassis Interface.
4 Ethernet/IEEE 802.3 interfaces.
1 FastEthernet/IEEE 802.3 interface.
4 Token Ring /IEEE802.5 interfaces.
12 Serial network interfaces.
2 Channelized E1/PRI ports.
125K bytes of non-volatile configuration memory.
1024K bytes of packet SRAM memory.

20480K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
8192K bytes of Flash internal SIMM (Sector size 256K).
```

VIP2 in Cisco 7000 Series and Cisco 7500 Series Routers

Following is an example of the **show version** command used with a Cisco 7500 series router with an RSP2 installed:

```
Router# show version

Cisco Internetwork Operating System Software
IOS (tm) GS Software (RSP-A), Version 11.1(10)CA
Copyright (c) 1986-1996 by cisco Systems, Inc.
Compiled Sat 10-Aug-96 17:56 by biff
Image text-base: 0x600108A0, data-base: 0x60952000

ROM: System Bootstrap, Version 11.1(5), RELEASE SOFTWARE
ROM: GS Software (RSP-BOOT-M), Version 11.1(10)CA, RELEASE SOFTWARE

Router uptime is 5 days, 4 minutes
System restarted by reload
System image file is "rsp-jv-mz", booted via slot0

cisco RSP2 (R4600) processor with 32768K bytes of memory.
R4600 processor, Implementation 32, Revision 2.0
Last reset from power-on
G.703/E1 software, Version 1.0.
Channelized E1, Version 1.0.
SuperLAT software copyright 1990 by Meridian Technology Corp).
Bridging software.
X.25 software, Version 2.0, NET2, BFE and GOSIP compliant.
TN3270 Emulation software (copyright 1994 by TGV Inc).
Primary Rate ISDN software, Version 1.0.
Chassis Interface.
1 EIP controller (6 Ethernet).
1 TRIP controller (4 Token Ring).
2 MIP controllers (4 E1).
1 VIP2 controller (2 E1)(4 Token Ring).
6 Ethernet/IEEE 802.3 interfaces.
8 Token Ring/IEEE 802.5 interfaces.
3 Serial network interfaces.
6 Channelized E1/PRI ports.
125K bytes of non-volatile configuration memory.

8192K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
8192K bytes of Flash internal SIMM (Sector size 256K).
No slave installed in slot 7.
Configuration register is 0x0
```

Using the show diag Command

Display the types of port adapters installed in your system (and specific information about each) using the **show diag** *slot* command, where *slot* is the *port adapter slot* in a Cisco 7200 series router and the *interface processor slot* in a Cisco 7000 series or Cisco 7500 series router with a VIP2.

✎

Note   The ouputs that appear in this document may not match the output you receive when running these commands. The outputs in this document are examples only.

Cisco 7200 Series Routers

Following is an example of the **show diag** *slot* command that shows a PA-2CE1 in port adapter slot 1:

```
Router# show diag 1

Slot 1:
        Channelized E1 port adapter, 2 ports
        Port adapter is analyzed
        Port adapter insertion time 02:18:20 ago
        Hardware revision 255.255              Board revision UNKNOWN
        Serial number     4294967295    Part number     255-65535-255
        Test history      0xFF          RMA number      255-255-255
        EEPROM format version 255
        EEPROM contents (hex):
          0x20: FF 06 FF FF FF FF FF FF FF FF FF FF FF FF FF FF
          0x30: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
```

VIP2 in Cisco 7000 Series and Cisco 7500 Series Routers

Following is an example of the **show diag** *slot* command that shows a PA-2CE1 on a VIP2 in interface processor slot 3:

```
Router# show diag 3
Slot 3:
        Physical slot 3, ~physical slot 0x7, logical slot 8, CBus 0
        Microcode Status 0xC
        Master Enable, LED, WCS Loaded
        Board is analyzed
        Pending I/O Status: Console I/O
        EEPROM format version 1
        VIP2 controller, HW rev 2.3, board revision UNKNOWN
        Serial number: 03513619  Part number: 73-1684-03
        Test history: 0x00        RMA number: 00-00-00
        Flags: cisco 7000 board; 7500 compatible

        EEPROM contents (hex):
          0x20: 01 15 02 03 00 35 9D 13 49 06 94 03 00 00 00 00
          0x30: 06 3D 00 2A 1A 00 00 00 00 00 00 00 00 00 00 00

        Slot database information:
        Flags: 0x4      Insertion time: 0x12A0 (08:56:58 ago)

        Controller Memory Size: 8 MBytes

        PA Bay 0 Information:
                Token Ring PA, 4 ports
                EEPROM format version 1
                HW rev 1.0, Board revision B0
                Serial number: 02825610  Part number: 73-1390-04

        PA Bay 1 Information:
Multi-channel (E1) port adapter, 2 ports
                EEPROM format version 255
                HW rev FF.FF, Board revision UNKNOWN
                Serial number: 4294967295  Part number: 255-65535-255
```

Using the show interfaces Command

The **show interfaces** command displays status information (including the physical slot and interface address) for the interfaces you specify. The example that follows specifies an ATM interface.

For complete descriptions of interface subcommands and the configuration options available for VIP2 interfaces, refer to the publications listed in the "Related Documentation" section on page vi.

Note The ouputs that appear in this document may not match the output you receive when running these commands. The outputs in this document are examples only.

Cisco 7200 Series Routers

The following example of the **show interfaces serial** *port adapter slot number/interface port number:channel-group* command shows all of the information specific to the second 2CE1 interface port (interface port 1) in port adapter slot 1, channel group 0:

```
Router# show interfaces serial 1/1:0
Serial1/1:0 is up, line protocol is up
  Hardware is MPA-E1
  Internet address is 10.1.15.1
  MTU 1500 bytes, BW 1984 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set
  Last input 00:00:42, output 00:00:56, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/64/0 (size/threshold/drops)
     Conversations  0/1 (active/max active)
     Reserved Conversations 0/0 (allocated/max allocated)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     149 packets input, 40207 bytes, 0 no buffer
     Received 298 broadcasts, 0 runts, 0 giants
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     128 packets output, 44416 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
     20 carrier transitions no alarm present
  Timeslot(s) Used:1-31, subrate: 64Kb/s, transmit delay is 0 flags
```

The following example of the **show interfaces serial** *port adapter slot number/interface port number:pri-group* command shows all of the information specific to the same interface (interface port 1 in port adapter slot 1) when the interface is configured for ISDN PRI:

```
Router# show interfaces serial 1/1:15
Serial1/1:15 is up, line protocol is up (spoofing)
  Hardware is MPA-E1
  Internet address is 10.1.15.1
  MTU 1500 bytes, BW 1984 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set
  Last input 00:00:42, output 00:00:56, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/64/0 (size/threshold/drops)
     Conversations  0/1 (active/max active)
     Reserved Conversations 0/0 (allocated/max allocated)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     149 packets input, 40207 bytes, 0 no buffer
     Received 298 broadcasts, 0 runts, 0 giants
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     128 packets output, 44416 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
     20 carrier transitions no alarm present
  Timeslot(s) Used:1-31, subrate: 64Kb/s, transmit delay is 0 flags
```

VIP2 in Cisco 7000 Series and Cisco 7500 Series Routers

The following example of the **show interfaces serial** *slot/port adapter/port:channel-group* command shows all of the information specific to the second 2CE1 interface port (interface port 1) in chassis slot 3, port adapter slot 1, channel group 2:

```
Router# show interface serial 3/1/1:2
Serial3/1/1:2 is up, line protocol is up
  Hardware is cxBus E1
  Internet address is 10.1.15.1
  MTU 1500 bytes, BW 1536 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 1 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions alarm present
  Timeslot(s) Used:1-31, Transmitter delay is 0 flags, transmit queue length 0
```

The following example of the **show interfaces serial** *slot/port adapter/port:pri-group* command shows all of the information specific to the same interface port (interface port 1 in chassis slot 3, port adapter slot 1) when the port is configured for ISDN PRI:

```
Router# show interfaces serial 3/1/1:15
Serial3/1/1:15 is up, line protocol is up (spoofing)
  Hardware is cxBus E1
  Internet address is 10.1.15.1
  MTU 1500 bytes, BW 1536 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 1 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions alarm present
  Timeslot(s) Used:1-31, Transmitter delay is 0 flags, transmit queue length 0
```

Note In the above example, the term "spoofing" indicates that the interface is configured for ISDN PRI. The term "spoofing" is indicated only on timeslot 16 (the D channel), which is recognized by the system as timeslot 15.

Using the show controllers e1 Command

Use the **show controllers e1** command to identify the E1 cable type (balanced or unbalanced) attached to a PA-2CE1 that is configured for channelized E1.

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Following is an example of the **show controllers e1** command that shows a channelized E1 interface port (1/0) with an unbalanced cable attached:

```
Router# show controllers e1 1/0
E1 1/0 is up.
  Applique type is Channelized E1 - unbalanced
No far end block errors detected
  No alarms detected.
  Framing is CRC4, Line Code is HDB3, Clock Source is Line.
  Data in current interval (710 seconds elapsed):
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
  Data in Interval 1:
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
[display text omitted]
```

Following is an example of the **show controllers e1** command that shows an E1 interface port (1/0) that is configured for ISDN PRI:

```
Router# show controllers e1 1/0
E1 1/0 is up.
  No alarms detected.
No far end block errors detected
  Framing is CRC4, Line Code is HDB3, Clock Source is Line.
  Data in current interval (710 seconds elapsed):
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
  Data in Interval 1:
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
[display text omitted]
```

VIP2 in Cisco 7000 Series and Cisco 7500 Series Routers

Following is an example of the **show controllers e1** command that shows the status of a PA-2CE1 installed in port adapter slot 1 on a VIP2 in interface processor slot 3:

```
Router# show controllers e1
E1 3/1/0 is up.
  Applique type is Channelized E1 - unbalanced
No far end block errors detected
  No alarms detected.
  Framing is CRC4, Line Code is HDB3, Clock Source is Line.
  Data in current interval (700 seconds elapsed):
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
  Data in Interval 1:
     10 Line Code Violations, 1 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 2 Line Err Secs, 0 Degraded Mins
     1 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 1 Unavail Secs
  Total Data (last 1 15 minute intervals):
     10 Line Code Violations, 1 Path Code Violations,
     0 Slip Secs, 0 Fr Loss Secs, 2 Line Err Secs, 0 Degraded Mins,
     1 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 1 Unavail Secs
E1 3/1/1 is up.
  Applique type is Channelized E1 - unbalanced
No far end block errors detected
  No alarms detected.
  Framing is CRC4, Line Code is HDB3, Clock Source is Line.
  Data in current interval (700 seconds elapsed):
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
  Data in Interval 1:
     10 Line Code Violations, 1 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 2 Line Err Secs, 0 Degraded Mins
     1 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 1 Unavail Secs
  Total Data (last 1 15 minute intervals):
     10 Line Code Violations, 1 Path Code Violations,
     0 Slip Secs, 0 Fr Loss Secs, 2 Line Err Secs, 0 Degraded Mins,
     1 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 1 Unavail Secs
```

Proceed to the next section, "Using the ping Command to Verify Network Connectivity" to check network connectivity of the PA-2CE1 and switch or router.

Using the ping Command to Verify Network Connectivity

Using the **ping** command, you can verify that an interface port is functioning properly. This section provides a brief description of this command. Refer to the publications listed in the "Related Documentation" section on page vi for detailed command descriptions and examples.

The **ping** command sends echo request packets out to a remote device at an IP address that you specify. After sending an echo request, the system waits a specified time for the remote device to reply. Each echo reply is displayed as an exclamation point (!) on the console terminal; each request that is not returned before the specified timeout is displayed as a period (.). A series of exclamation points (!!!!!) indicates a good connection; a series of periods (.....) or the messages [timed out] or [failed] indicate a bad connection.

Following is an example of a successful **ping** command to a remote server with the address 10.0.0.10:

```
Router# ping 10.0.0.10 <Return>
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 10.0.0.10, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/15/64 ms
Router#
```

If the connection fails, verify that you have the correct IP address for the destination and that the device is active (powered on), and repeat the **ping** command.