CISCO SYSTEMS

®

PA-E3 Serial Port Adapter Installation and Configuration

Product Number: PA-E3(=) and PA-2E3(=)

Platforms Supported: Cisco 7500 Series, Cisco 7000 Series, VIP2, Cisco 7200 Series, Cisco uBR7200 Series, Cisco 7100 Series, Catalyst 5000 Family Switches

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Preface

This preface describes how to find additional information on the PA-E3 serial port adapter and other Cisco products, services, and documentation. This preface contains the following sections:

Objectives

This document describes how to install and configure the PA-E3 serial port adapter (PA-E3[=] and PA-2E3[=]) in the following platforms:

- Second-generation Versatile Interface Processor (VIP2) in Cisco 7500 series routers and Cisco 7000 series routers with the Cisco 7000 Series Route Switch Processor (RSP7000) and Cisco 7000 Series Chassis Interface (RSP7000CI).

- Cisco 7200 series routers, which consist of the two-slot Cisco 7202, four-slot Cisco 7204 and Cisco 7204VXR, and six-slot Cisco 7206 and Cisco 7206VXR

- Cisco uBR7200 series universal broadband routers

- Cisco 7100 series routers, which consist of the Cisco 7120 and Cisco 7140

- Catalyst Route Switch Module (RSM)/VIP2 in the Catalyst 5000 family switches

Organization

This document is organized into the following chapters:

Section	Title	Description
Chapter 1	Overview	Describes the PA-E3 port adapter and describes 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*.

Section	Title	Description
Chapter 3	VIP2 and the PA-E3	Provides instructions for installing the PA-E3 port adapter on a VIP2 interface processor installed in Cisco 7500 or Cisco 7000 series routers.
Chapter 4	Catalyst RSM/VIP2 and the PA-E3	Provides instructions for installing the PA-E3 port adapter on a Catalyst RSM/VIP2 installed in Catalyst 5000 family switches.
Chapter 5	Cisco 7200 Series and the PA-E3	Provides instructions for installing the PA-E3 port adapter on a VIP2 interface processor installed in a Cisco 7500 or Cisco 7000 series router.
Chapter 6	Cisco uBR7200 Series and the PA-E3	Provides instructions for installing the PA-E3 port adapter in the Cisco uBR7200 series universal broadband router.
Chapter 7	Cisco 7100 Series and the PA-E3	Provides information on the PA-E3 port adapter and its use in Cisco 7100 series routers.
Chapter 8	Configuring the PA-E3 Interfaces	Provides instructions for configuring your port adapter on the supported platforms. The instructions given in this chapter apply to all supported platforms described in this document.

Related Documentation

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

- For Cisco IOS software 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.

- For hardware installation and maintenance information on the Cisco 7000 series and Cisco 7500 series routers, and the VIP2, 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 VIP2 users only)

- For hardware installation and maintenance information on the Catalyst 5000 family switches, and the Catalyst RSM/VIP2, refer to the following publications:

  — The installation and configuration guide that shipped with your Catalyst 5000 family switches

— *Route Switch Module Catalyst VIP2-15 and VIP2-40 Installation and Configuration Note* (Document Number 78-4780-01) which shipped with your Catalyst RSM/VIP2.

- For hardware installation and maintenance information on Cisco 7100 series routers, refer to the *Cisco 7100 Series Installation and Configuration Guide* publication that shipped with your Cisco 7100 series router.

- For information on setting up a Virtual Private Network, see the *Cisco 7100 Series VPN Configuration Guide*.

- For hardware installation and maintenance information on the Cisco 7200 VXR routers, refer to the *Cisco 7200 VXR Installation and Configuration Guide* publication that shipped with your Cisco 7200 VXR router.

- For hardware installation and maintenance information on the Cisco 7200 routers, refer to the following publications that shipped with your router:

  — *Cisco 7202 Installation and Configuration Guide*

  — *Cisco 7204 Installation and Configuration Guide*

  — *Cisco 7206 Installation and Configuration Guide*

- For hardware installation and maintenance information on the Cisco uBR7200 series routers, refer to the *Cisco uBR72xx Universal Broadband Router Installation and Configuration Guide* that shipped with your Cisco uBR7200 series router.

- For international agency compliance, safety, and statutory information for WAN interfaces for the Cisco 7500 series routers, Cisco 7000 series routers, Cisco 7200 series routers, Cisco ubr7200 series routers, and Cisco 7100 series routers, refer to the following publications:

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

  — *Regulatory Compliance and Safety Information for the Cisco 7000 Series Routers*

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

  — *Regulatory Compliance and Safety Information for the Cisco 7100 Series Routers*

  — *Regulatory Compliance and Safety Information for the Cisco uBR72xx Universal Broadband Router*

Note The regulatory compliance and safety information documentation listed above applies to the Catalyst 5000 family switches and the Catalyst RSM/VIP2.

- For port adapter hardware and memory configuration guidelines for the Cisco 7200 series routers, refer to the document *Cisco 7200 Series Port Adapter Hardware Configuration Guidelines*.

To view Cisco documentation or obtain general information about the documentation, see the "Cisco Connection Online" section on page viii or the "Related Documentation" section on page vi, or call 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.

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Cisco Connection Online (CCO) is Cisco Systems' primary, real-time support channel. Maintenance customers and partners can self-register on CCO to obtain additional information and services.

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You can access CCO in the following ways:

WWW: http://www.cisco.com

WWW: http://www-europe.cisco.com

WWW: http://www-china.cisco.com

Telnet: cco.cisco.com

Modem: From North America, 408 526-8070; from Europe, 33 1 64 46 40 82. Use the following terminal settings: VT100 emulation; databits: 8; parity: none; stop bits: 1; and connection rates up to 28.8 kbps.

For a copy of CCO's Frequently Asked Questions (FAQ), contact cco-help@cisco.com. For additional information, contact cco-team@cisco.com.

If you are a network administrator and need personal technical assistance with a Cisco product that is under warranty or covered by a maintenance contract, contact Cisco's Technical Assistance Center (TAC) at 800 553-2447, 408 526-7209, or tac@cisco.com. To obtain general information about Cisco Systems, Cisco products, or upgrades, contact 800 553-6387, 408 526-7208, or cs-rep@cisco.com.

Documentation CD-ROM

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

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

Overview

This chapter describes the one-port PA-E3 and two-port PA-2E3 E3 serial port adapters. This chapter contains the following sections:

- Port Adapter Overview, page 1-1
- PA-E3 Serial Port Adapter Features, page 1-2
- Management Information Base, page 1-3
- PA-E3 Port Adapter LEDs, page 1-3
- PA-E3 Receptacles and Cables, page 1-4
- Interoperability Guidelines for PA-E3 DSUs, page 1-5

Port Adapter Overview

The PA-E3 is a single-width, one-port or two-port module that integrates data service unit (DSU) functionality into the Cisco router (see Figure 1-1 and Figure 1-2). The module provides one or two high-speed serial E3 interfaces on:

- Cisco 7100 series routers
- Cisco 7200 series routers
- Cisco uBR7200 series routers
- Second-generation Versatile Interface Processors (VIP2) in all Cisco 7000 series and Cisco 7500 series routers
- Catalyst RSM/VIP2 in the Catalyst 5000 family switches

Note   Port adapters have a handle attached, but this handle is occasionally not shown in figures in this publication to allow a full view of detail on the port adapter's faceplate.

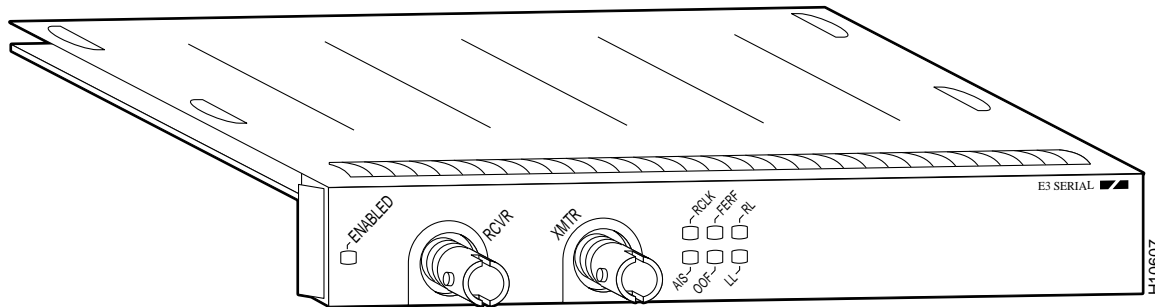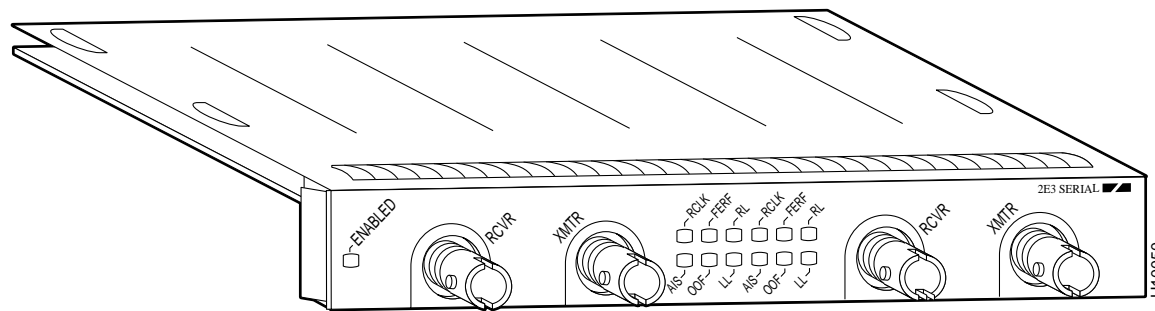**Figure 1-1   One-Port PA-E3 Serial Port Adapter**

Figure 1-2   Two-Port PA-2E3 Serial Port Adapter

The one-port PA-E3 provides two network interfaces per VIP2 for Cisco 7000 series and Cisco 7500 series routers and the Catalyst RSM/VIP2 for Catalyst 5000 family switches, and one high-speed interface on the Cisco 7100 series, Cisco 7200 series, and Cisco uBR7200 series routers.

The two-port PA-2E3 provides four network interfaces per VIP2 for Cisco 7000 series and Cisco 7500 series routers and the Catalyst RSM/VIP2 for Catalyst 5000 family switches, and two high-speed interfaces on the Cisco 7100 series, Cisco 7200 series, and Cisco uBR7200 series routers.

Serial network interfaces reside on modular port adapters, which provide a direct connection between the high-speed bus in the router and the external networks. The PA-E3 provides a full-duplex synchronous serial E3 interface for transmitting and receiving data at rates of up to 34 megabits per second (Mbps).

The port adapter supports both 16- and 32-bit cyclic redundancy checks (CRCs). The default is 16-bit CRCs; to enable 32-bit CRCs, you use a configuration command. For a description of the CRC function, see the "Configuring Cyclic Redundancy Checks" section on page 8-10.

Note   Although the VIP2 and Catalyst RSM/VIP2 supports online insertion and removal (OIR), individual port adapters do not. To replace port adapters, you must first remove the VIP2 and Catalyst RSM/VIP2 from the chassis, and then replace port adapters as required.

The Cisco 7100 series, Cisco 7200 series, and Cisco uBR7200 series routers support the OIR of all port adapter types.

PA-E3 Serial Port Adapter Features

The PA-E3 serial port adapter has the following features:

- Single-width port adapter for the VIP2 in all Cisco 7000 series and Cisco 7500 routers, and in Cisco 7100 series, Cisco 7200 series, and Cisco uBR7200 series routers

- Single-width port adapter for the Catalyst RSM/VIP2 in the Catalyst 5000 family switches

- Single- or double-port E3 rate (34 Mbps) connectivity

- Full-duplex synchronous serial E3 interface

- High-speed High-Level Data Link Control (HDLC) data

- Integrated data service unit (DSU) functionality

- Support for 16- and 32-bit cyclic redundancy checks (CRCs)

- Support for G.751 framing or bypass framing

- Support for ATM-DXI, Frame Relay, HDLC, SMDS, and PPP serial encapsulations

- Support for national service bits

- Support for E3 MIB (RFC 1407)

- Support for remote and local loopback

- HDB3 line coding

- Scrambling and bandwidth reduction

- Online insertion and removal (OIR)

Management Information Base

Management Information Base (MIB) attributes are readable and writable across the Interim Local Management Interface (ILMI) through use of the Simple Network Management Protocol (SNMP).

The one-port PA-E3 supports MIB-II (RFC 1213) and the E3 interface MIB (RFC 1407).

The two-port PA-2E3 supports MIB-II (RFC 1213) and the E3 interface MIB (RFC 1407).

PA-E3 Port Adapter LEDs

The one-port PA-E3 port adapter has one status LED and six uplink port status LEDs (RCLK, FERF, OOF, AIS, RL, and LL) for the serial E3 port. (See Figure 1-3.)

Figure 1-3   One-Port PA-E3 Port Adapter LEDs—Partial Front View Shown
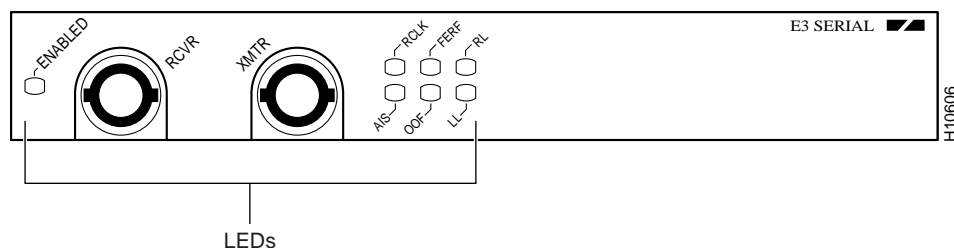
The two-port PA-2E3 port adapter has one status LED and six uplink port status LEDs (RCLK, FERF, OOF, AIS, RL, and LL) for each serial E3 port. (See Figure 1-4.)

Figure 1-4   Two-Port PA-2E3 Port Adapter LEDs—Partial Front View Shown
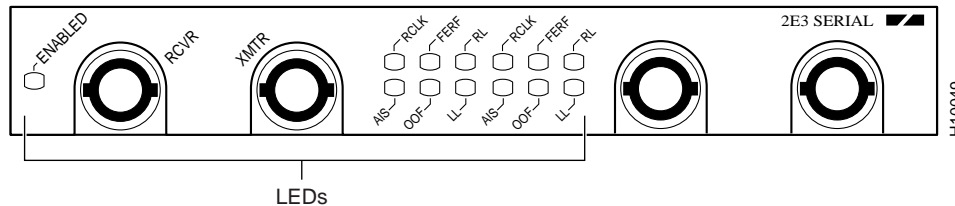
After system initialization, the ENABLED LED goes on, indicating that the port adapter has been enabled for operation.

The following conditions must be met before the PA-E3 port adapter is enabled:

- The port adapter contains a valid microcode version that has been downloaded successfully.

- For Cisco 7000 and 7500 series routers, the port adapter is correctly connected to the VIP2 and the midplane and is receiving power in the Cisco router.

- For the Catalyst 5000 family switches, the port adapter is correctly connected to the Catalyst RSM/VIP2 and is receiving power in the switch.

- The bus recognizes the port adapter.

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

Table 1-1 describes the PA-E3 LEDs.

Table 1-1   PA-E3 Port Adapter LEDs

| Name	Color	State	Description
ENABLED	Green	On	Indicates that the port adapter is ready.
Uplink port status			
RCLK	Green	On	Indicates that a receive clock has been detected.
FERF	Yellow	On	Indicates that Framer detected Far End Receive Failure.
OOF	Yellow	On	Indicates that Framer detected Out of Frame.
AIS	Yellow	On	Indicates that Framer detected Alarm Indication Signal.
RL	Yellow	On	Indicates that port is in remote loopback mode.
LL	Yellow	On	Indicates that port is in local loopback mode.

PA-E3 Receptacles and Cables

The serial interface cable for the PA-E3, which is a 75-ohm coaxial cable, is used to connect your router to a serial E3 network. Serial cables conform to EIA/TIA-612 and EIA/TIA-613 specifications. The serial ports on the PA-E3 are considered to be DTE devices.

On a single PA-E3, there are one or two serial E3 ports, each with two connectors (receive and transmit), where you connect the Cisco 75-ohm coaxial cable. The 75-ohm coaxial cable (Cisco part number CAB-ATM-DS3/E3) for the PA-E3 is available only from Cisco Systems; it is *not* available from outside commercial cable vendors.

The Cisco E3 75-ohm coaxial cable, which comes with an attached ferrite sleeve (see Figure 1-5), is available only in 10-foot (3.05-meter) lengths. The typical maximum distance between stations for E3 transmissions is 1300 feet (396 meters).

Note For E3 (75-ohm) connections, you must have ferrite beads on the 75-ohm coaxial cable and EMI decoupling clips on the Rcvr end of the cable (see Figure 1-5) if compliance with European certification standards for emission control is required (EN55022/CISPR22 Class B for radiated emission levels).

Figure 1-5   PA-E3 Cables
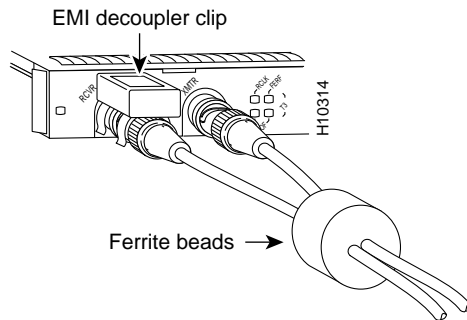
You can test the DTE-to-DCE cable connection by using the **loopback dte** command. See the "Using the loopback Command to Verify the Physical Interface" section on page 8-20 for more information.

Interoperability Guidelines for PA-E3 DSUs

The PA-E3 supports several types of integrated DSUs. Table 1-2 lists the feature compatibilities of the PA-E3 DSUs.

Table 1-2   Feature Compatibilities of PA-E3 DSUs

DSU	Full Rate Support	Scrambling Support	Subrate Support
DL3100E	Yes	No[1]	Yes[1]
Kentrox	Yes	Yes[2]	Yes[2]

1   DL3100E does not support scrambling. However, the PA-E3 can turn on scrambling in DSU mode 0 for connecting to another PA-E3. The PA-E3 supports either scrambling (in mode 0) or DL3100E subrate, not both at the same time.
2   The PA-E3 supports either scrambling or Kentrox subrate, not both at the same time.

Preparing for Installation

This chapter describes the general equipment, safety, and site preparation requirements for installing PA-E3 port adapters.

- Parts and Tools Required, page 2-1

- Software and Hardware Requirements, page 2-2

- Safety Guidelines, page 2-3

- Compliance Information, page 2-6

Parts and Tools Required

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-E3 serial port adapter and one of the following:

  — VIP2-15(=) if you are installing only one PA-E3 port adapter; otherwise, we recommend a VIP2-40(=) or VIP2-50(=).

  — Catalyst RSM/VIP2-15(=) if you are installing only one PA-E3 port adapter; otherwise, we recommend a Catalyst RSM/VIP2-40(=).

  — Cisco 7100 series router with at least one available port adapter slot.

  — Cisco 7200 series router with at least one available port adapter slot.

  — Cisco uBR7200 series router with at least one available port adapter slot.

- Cisco 75-ohm coaxial serial interface cables. (The PA-E3's 75-ohm cables are available *only* from Cisco Systems; they are *not* available from outside commercial vendors.)

- Number 1 Phillips screwdriver and a 3/16-inch flat-blade screwdriver (for VIP2 and Catalyst RSM/VIP2 installation only).

- Your own ESD-prevention equipment or the disposable grounding wrist strap included with all upgrade kits, field-replaceable units (FRUs), and spares.

Software and Hardware Requirements

Table 2-1 lists the minimum Cisco IOS software release required to use the one-port PA-E3 and two-port PA-2E3 in supported router platforms.

Table 2-1   PA-E3 and PA-2E3 Software Requirements

Platforms	Recommended Minimum Cisco IOS Release	
Cisco 7000 and Cisco 7500 Series	**PA-E3**	**PA-2E3**
• With VIP2-15(=) or VIP2-40(=)	Cisco IOS Release 11.1(13)CA or a later release of Cisco IOS Release 11.1 CA	Cisco IOS Release 11.1(16)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	Cisco IOS Release 11.1(16)CA or a later release of Cisco IOS Release 11.1 CA
Cisco 7200 Series		
• Cisco 7204VXR and Cisco 7206VXR	Cisco IOS Release 12.0(2)XE2 or a later release of Cisco IOS Release 12.0 XE Cisco IOS Release 12.0(3)T or a later release of Cisco IOS Release 12.0 T	Cisco IOS Release 12.0(2)XE2 or a later release of Cisco IOS Release 12.0 XE Cisco IOS Release 12.0(3)T or a later release of Cisco IOS Release 12.0 T
• Cisco 7204 and Cisco 7206	Cisco IOS Release 11.1(16)CA or a later release of Cisco IOS Release 11.1 CA	Cisco IOS Release 11.1(16)CA or a later release of Cisco IOS Release 11.1 CA
• 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 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 uBR7200 Series		
• Cisco uBR7246 and Cisco uBR7223	Cisco IOS Release 12.0(2)XA or a later release of Cisco IOS Release 12.0 XA	Cisco IOS Release 12.0(2)XA or a later release of Cisco IOS Release 12.0 XA
Cisco 7100 Series		
• Cisco 7120 series and Cisco 7140 series	Cisco IOS Release 12.0(4)XE or a later release of Cisco IOS Release 12.0 XE Cisco IOS Release 12.0(5)T or a later release of Cisco IOS Release 12.0 T	
Catalyst 5000 Family Switches		
• With Catalyst RSM/VIP2-15(=) or Catalyst RSM/VIP2-40(=)	Cisco IOS Release 12.0(1) or a later release of Cisco IOS Release 12.0	Cisco IOS Release 12.0(1) or a later release of Cisco IOS Release 12.0

⚠ **Caution**   The VIP2 requires that the host Cisco 7000 series router have the RSP7000 and RSP7000CI installed. The VIP2 does not operate properly with the Route Processor (RP), Switch Processor (SP), or Silicon Switch Processor (SSP) installed in the host Cisco series router.

The PA-E3 is considered a *high-bandwidth* port adapter; therefore at a minimum, Cisco recommends that the PA-E3 be installed on the VIP2-15 or Catalyst RSM/VIP2-15 motherboard (with 1 MB of SRAM and 8 MB of DRAM). Installation of the PA-E3 on the VIP2-10 (with 512 KB of SRAM and 8 MB of DRAM) is not recommended.

> **Note** The VIP2 and Catalyst RSM/VIP2 supports online insertion and removal (OIR), but individual port adapters do not. To replace the port adapters, you must first remove the VIP2 or Catalyst RSM/VIP2 from the chassis and then replace port adapters as required. OIR is supported for port adapters in the Cisco 7100 series, Cisco 7200 series, and Cisco uBR7200 series routers. Port adapters have a handle attached, but this handle is occasionally not shown in illustrations in this publication to allow a full view of detail on the port adapter's faceplate.

In the Cisco 7000 series, Cisco 7100 series, Cisco 7500 series, Cisco uBR7200 series routers and Catalyst 5000 family switches, there are no restrictions on slot locations or sequence; however, in the Cisco 7200 series routers, there are specific configuration guidelines that must be observed for high-bandwidth port adapters.

For specific Cisco 7200 series hardware configuration information and for memory configuration guidelines for Cisco 7200 series routers, refer to the document *Cisco 7200 Series Port Adapter Hardware Configuration Guidelines*, which shipped with your Cisco 7200 series chassis and is also available on the Cisco Connection Documentation, Enterprise Series CD-ROM.

To determine if your Cisco 7000 series, Cisco 7100 series, Cisco 7500 series, Cisco 7200 series, or Cisco uBR7200 series router, or the Catalyst RSM/VIP2 is compatible with the PA-E3, use the **show version** command to display the current hardware configuration of the router, including the system software version that is currently loaded and running.

You can check the version of the default ROM image by removing the board and checking the ROM labels, or by configuring the interface or system software to boot from ROM, restarting the system, and using the **show version** command to check the running version.

To display the current system software version, use the **show version** command. In the following example, the running system software is Release 11.1(16)CA.

```
Router> show version
Cisco Internetwork Operating System Software
IOS (tm) GS Software, Version 11.1(16)CA
Synced to mainline version: 11.1(10.5)
Copyright (c) 1986-1997 by cisco Systems, Inc.
Compiled Thu 22-May-97 14:32
```

If your system lacks the required system software and microcode, contact a customer service representative for upgrade information.

Safety Guidelines

The following are safety guidelines that you should follow when working with any equipment that connects to electrical power or telephone wiring.

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 and 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 consist of 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.

The 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 component board-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).

Compliance Information

The following sections provide compliance information that applies to the FCC and the PA-E3 serial port adapter, which 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.

BABT Compliance

The BABT607116 marking on the PA-E3 signifies that it meets United Kingdom directive 607116 and has been designed to BABT standards. The BABT label is located on the top of the PA-E3; Figure 2-1 shows the BABT label for the PA-E3.

Figure 2-1   BABT Label for PA-E3 Serial Port Adapter

ITI-T Compliance

ITI-T recommendation G.823 specifies that it is important to restrict jitter gain. Figure 4 of G.823 shows a typical jitter transfer characteristic. (Note that small jitter gain is allowed.) British Standard 6328: Section 8.1 1990 gives the allowable gain as 0.5 dB. The PA-E3's line mode clocking complies with these sections.

TBR24 Compliance

When the PA-E3 is in line clocking mode, jitter is not attenuated, and any jitter received is transferred to the line. If input jitter exceeds the limits of TBR24, then output jitter will not meet TBR24 transfer specifications. Line clocking mode is intended for use only where the connection involves a single hop, and where clock timing will not be transferred to other network equipment.

When not in line clocking mode, the PA-E3 complies with TBR24 standards.

VIP2 and the PA-E3

This chapter provides information on the PA-E3 serial port adapter and its use on the VIP2 in Cisco 7000 series and Cisco 7500 series routers. This chapter contains the following sections:

- Overview, page 3-1
- Removing a Port Adapter, page 3-4
- Installing a Port Adapter, page 3-5

Overview

The PA-E3 is used on the VIP2 in Cisco 7000 series and Cisco 7500 series routers and can be installed in either port adapter slot 0 or slot 1 on the VIP2 motherboard.

Note   You can have up to three E3 serial interfaces on a VIP2 motherboard. Cisco recommends a configuration of one PA-E3 (with one E3 serial interface) and one PA-2E3 (with two serial interfaces) for a total of three E3 serial interfaces per VIP2.

Figure 3-1 shows two one-port PA-E3 port adapters installed in port adapter slot 0 and slot 1, on a VIP2-15 or VIP2-40.

Figure 3-1 **VIP2-15 or VIP2-40 with One-Port PA-E3 Port Adapters in Port Adapter Slots 0 and 1**
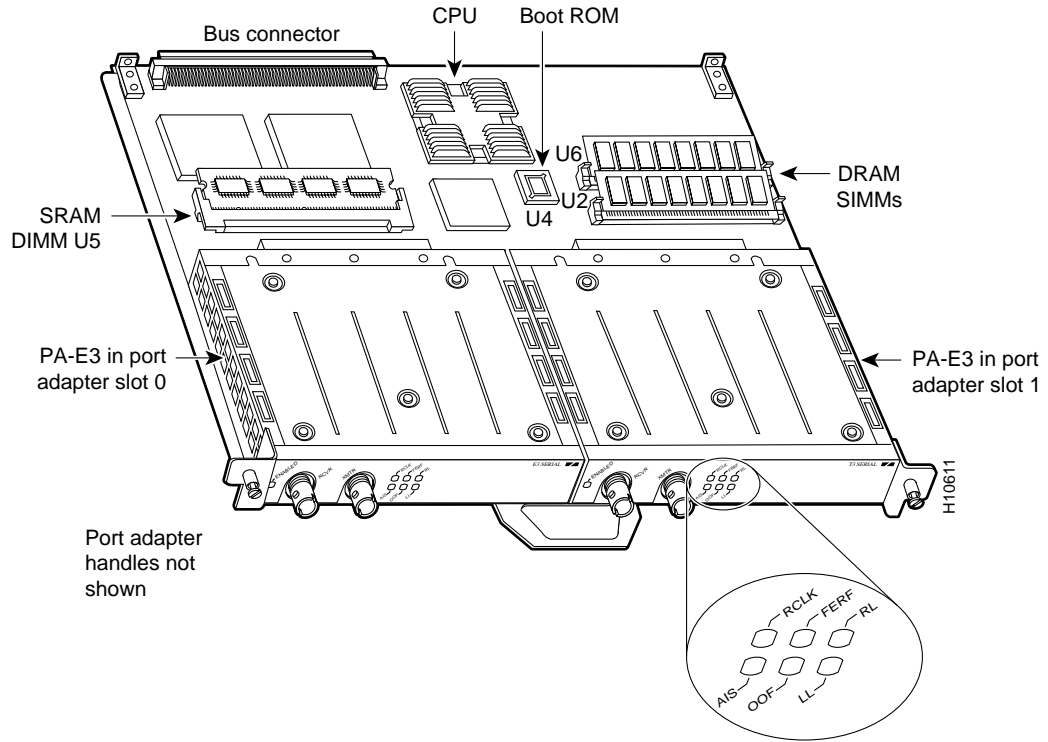
Note Port adapters have a handle attached, but this handle is not shown to allow a full view of detail on each port adapter's faceplate.

Figure 3-2 shows two one-port E3 port adapters installed in port adapter slots 0 and 1, on a VIP2-50.

Figure 3-2   VIP2-50 with One-Port PA-E3 Port Adapters in Port Adapter Slots 0 and 1
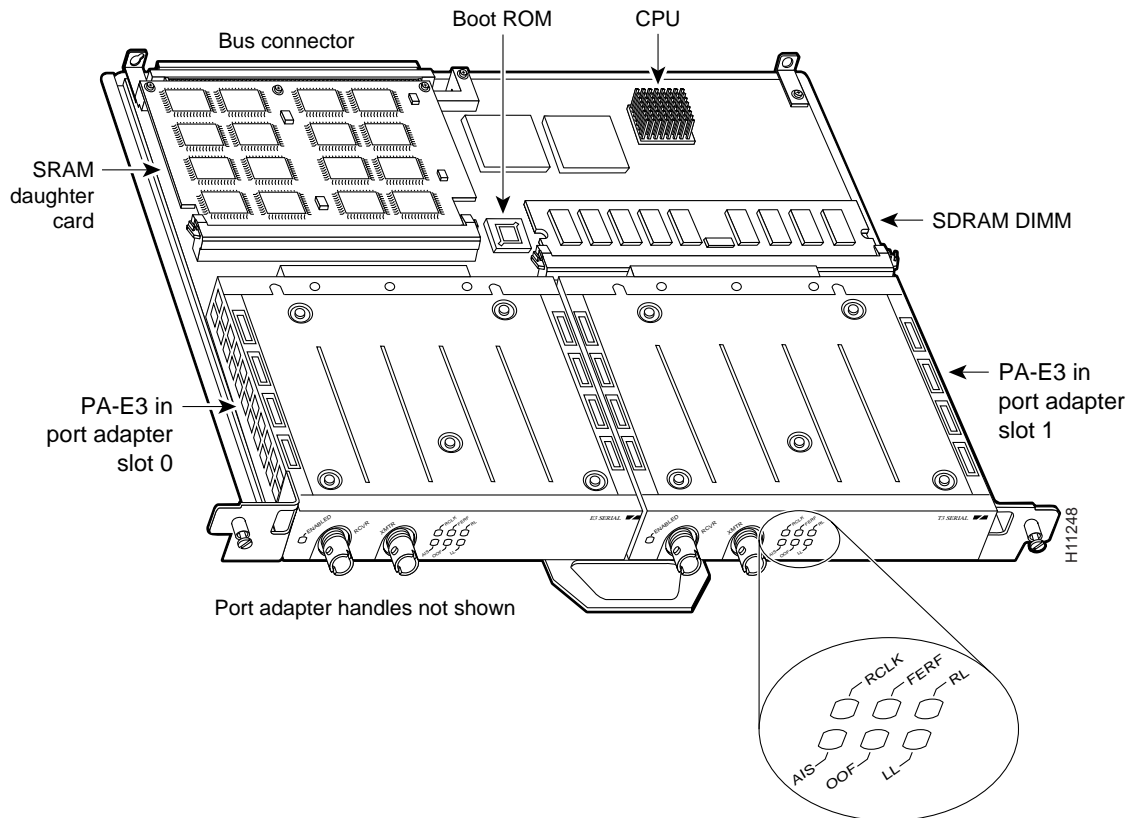
Depending on the circumstances, you might need to install a new port adapter on a VIP2 motherboard or replace a failed port adapter in the field. In either case, you need a number 1 Phillips screwdriver, an antistatic mat on which you can place the removed interface processor, and an antistatic container in which you can place a failed port adapter for shipment back to the factory.

Note   The PA-E3 can be installed on a VIP2-15, VIP2-20, VIP2-40, or VIP2-50 motherboard; however, installation on the VIP2-10 is not recommended.

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

Note   Each port adapter circuit board is mounted to a metal carrier and is sensitive to ESD damage. The following procedures should be performed by a Cisco-certified service provider only. The VIP2 supports online insertion and removal (OIR), but 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 in 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.

VIP2 and the PA-E3   **3-3**

When only one port adapter is installed on a VIP2, a blank port adapter must fill the empty slot. This allows the VIP2 and router chassis to conform to electromagnetic interference (EMI) emissions requirements, and encourages air to flow through the chassis properly. If you plan to install a new port adapter, you must first remove the blank port adapter.

Removing a Port Adapter

Following is the standard procedure for removing any type of port adapter on the VIP2:

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

> **Note**   If you want to install a new port adapter on a VIP2 with a single port adapter, you must first remove the blank port adapter from the port adapter slot in which you want to install the new port adapter.

Step 2   For a new port adapter installation or a port adapter replacement, disconnect any interface cables from the ports on the front of the port adapter, although this is not required. You can remove VIP2s with cables attached; however, we do not recommend it.

Step 3   To remove the VIP2 from the chassis, 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. Place the removed VIP2 on an antistatic mat.

Step 4   Locate the screw at the rear of the port adapter (or blank port adapter) to be replaced. (See Figure 3-3.) This screw secures the port adapter (or blank port adapter) to its slot.

Figure 3-3   Location of Port Adapter Screw—Partial Port Adapter View
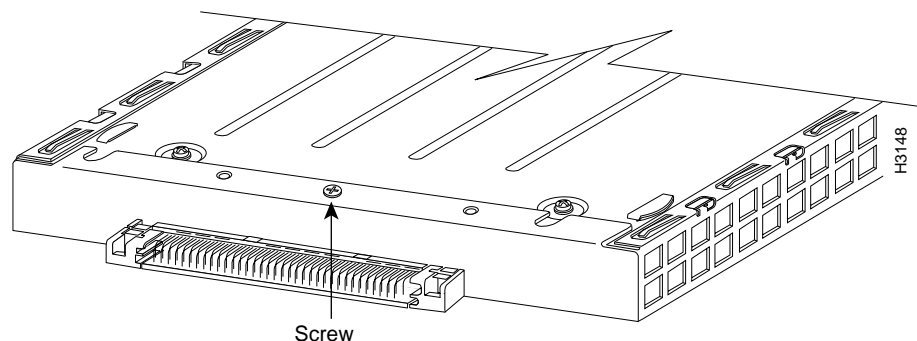
Screw

Step 5   Remove the screw that secures the port adapter (or blank port adapter).

Step 6   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 Figure 3-4.)

Figure 3-4   Pulling a Port Adapter Out of a Slot—Partial Port Adapter View
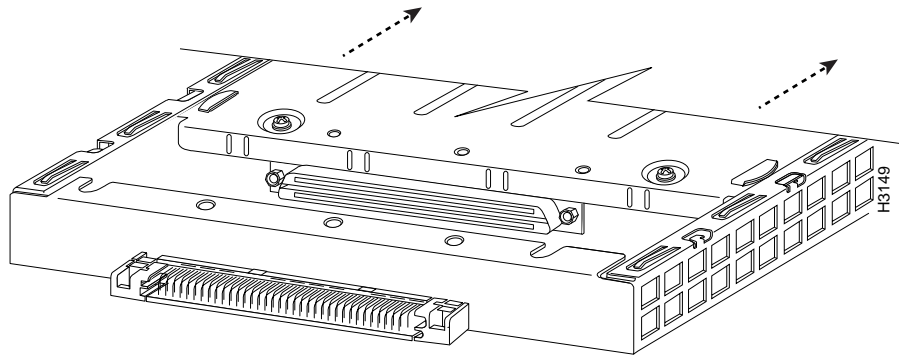
Step 7   If you removed a port adapter, place it in an antistatic container for safe storage or shipment back to the factory. If you removed a blank port adapter, no special handling is required; however, store the blank port adapter for potential future use.

This completes the procedure for removing a new port adapter on a VIP2.

Installing a Port Adapter

Following is the standard procedure for replacing a port adapter on the VIP2:

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

Step 2   Remove the new port adapter from its antistatic container and position it at the opening of the slot.

Step 3   Carefully align the port adapter carrier between the upper and the lower edges of the port adapter slot, as shown in Figure 3-5.

Figure 3-5   Aligning a Port Adapter in a Port Adapter Slot
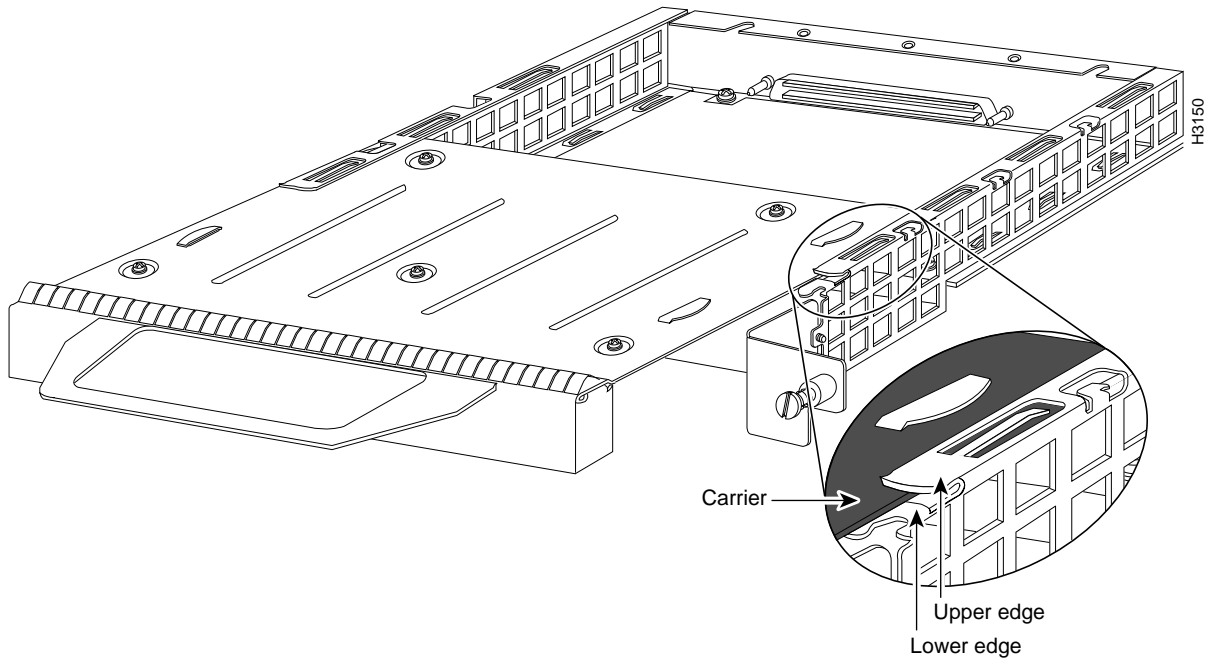
Carrier

Upper edge

Lower edge

> ⚠ **Caution**   To prevent jamming the carrier between the upper and lower edges of the port adapter slot and to ensure that the edge connector at the rear of the port adapter mates with the connector at the rear of the port adapter slot, make certain that the leading edges of the carrier are between the upper and lower slot edges, as shown in the cutaway in Figure 3-5.

> ⚠ **Caution**   To ensure a positive ground attachment between the port adapter carrier and the VIP2 motherboard and port adapter slot, and to ensure that the connectors at the rear of the port adapter and slot mate properly, position the carrier between the upper and lower slot edges, as shown in Figure 3-5.

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 on the motherboard. (See Figure 3-6.)

Figure 3-6 **Port Adapter Installed in a Port Adapter Slot**—**Partial Port Adapter View**

H3152
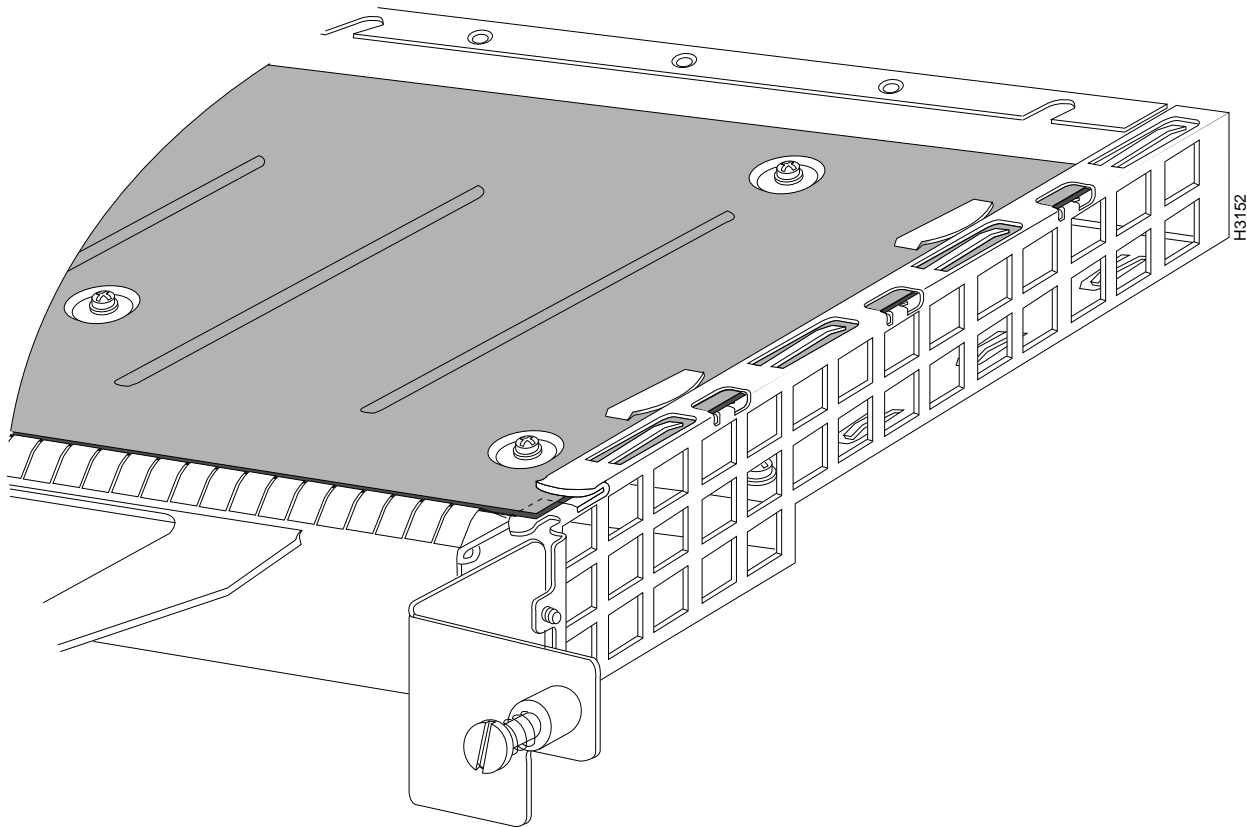
Step 5 Replace the screw in the rear of the port adapter slot. (See Figure 3-3 for its location.) Do not overtighten this screw.

Step 6 To reinstall the VIP2 in the system, 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.

Step 7 If the interface cables have been disconnected, reconnect the interface cables to the port adapters.

This completes the procedure for installing a port adapter on a VIP2. Proceed to Chapter 8, "Configuring the PA-E3 Interfaces," for information on how to configure your port adapter interfaces.

Catalyst RSM/VIP2 and the PA-E3

This chapter provides information on the PA-E3 serial port adapter and its use on the Catalyst RSM/VIP2 in the Catalyst 5000 family switches. This chapter contains the following sections:

- Overview, page 4-1
- Removing a Port Adapter, page 4-3
- Installing a Port Adapter, page 4-4

Overview

The PA-E3 is used on the Catalyst RSM/VIP2 in the Catalyst 5000 family switches and can be installed in either port adapter slot 0 or slot 1 on the Catalyst RSM/VIP2 motherboard.

Note   You can have up to three E3 serial interfaces on a Catalyst RSM/VIP2 motherboard. Cisco recommends a configuration of one PA-E3 (with one E3 serial interface) and one PA-2E3 (with two serial interfaces) for a total of three E3 serial interfaces.

Figure 4-1 shows two one-port PA-E3 port adapters installed in port adapter slot 0 and slot 1, on a Catalyst RSM/VIP2-40.

Figure 4-1   Catalyst RSM/VIP2-40 with One-Port PA-E3 Port Adapters in Port Adapter Slots 0 and 1
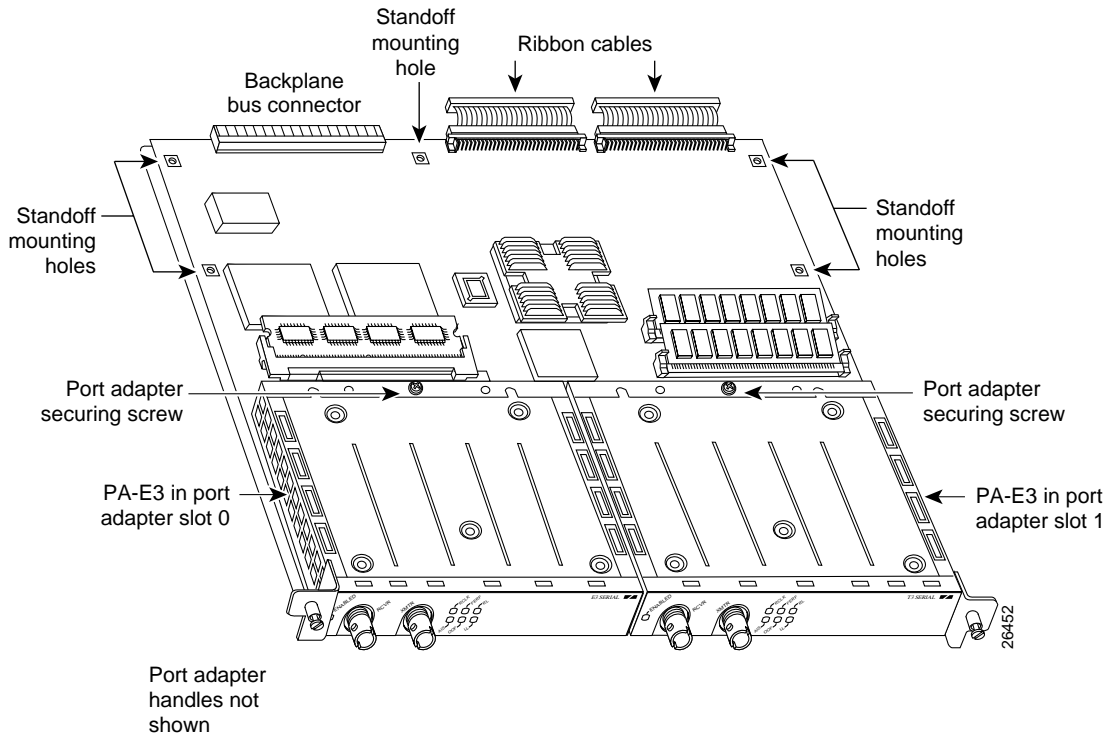
Note   Port adapters have a handle attached, but this handle is not shown in the figure to allow a full view of detail on each port adapter's faceplate.

Depending on the circumstances, you might need to install a new port adapter on a Catalyst RSM/VIP2 motherboard or replace a failed port adapter in the field. In either case, you need the following items:

- Number 1 Phillips screwdriver
- Antistatic mat on which you can place the removed interface processor
- Antistatic container in which you can place a failed port adapter for shipment back to the factory

Caution   To prevent system problems, do not remove port adapters from the Catalyst RSM/VIP2 motherboard or attempt to install other port adapters on the Catalyst RSM/VIP2 motherboard while the system is operating. To install or replace port adapters, first remove the Catalyst RSM/VIP2 from its slot.

Note   Each port adapter circuit board is mounted to a metal carrier and is sensitive to ESD damage. The following procedures should be performed by a Cisco-certified service provider only. The Catalyst RSM/VIP2 supports online insertion and removal (OIR), but individual port adapters do not. To replace port adapters, you must first remove the Catalyst RSM/VIP2 from the chassis and then install or replace port adapters as required. If a blank port adapter is installed on the Catalyst RSM/VIP2 in which you want to install a new port adapter, you must first remove the Catalyst RSM/VIP2 from the chassis and then remove the blank port adapter.

When only one port adapter is installed on a Catalyst RSM/VIP2, a blank port adapter must fill the empty slot to conform to electromagnetic interference (EMI) emissions requirements and to allow air to flow through the chassis properly. If you plan to install a new port adapter, you must first remove the blank port adapter.

Removing a Port Adapter

The following is the standard procedure for removing any type of port adapter on the Catalyst RSM/VIP2:

Step 1   Attach an antistatic wrist strap between you and an unfinished chassis surface.

> **Note**   If you want to install a new port adapter on a Catalyst RSM/VIP2 with a single port adapter, you must first remove the blank port adapter from the port adapter slot in which you want to install the new port adapter.

Step 2   For a new port adapter installation or a port adapter replacement, disconnect any interface cables from the ports on the front of the port adapter, although this is not required. You can remove a Catalyst RSM/VIP2 with cables attached; however, we do not recommend this action.

Step 3   To remove the Catalyst RSM/VIP2 from the chassis, follow the steps in the *Route Switch Module Catalyst VIP2-15 and VIP2-40 Installation and Configuration Note* (Document Number 78-4780-01), which shipped with your Catalyst RSM/VIP2.

Step 4   Place the removed Catalyst RSM/VIP2 on an antistatic mat.

Step 5   Locate the screw at the rear of the port adapter (or blank port adapter) to be replaced. (See Figure 4-2.) This screw secures the port adapter (or blank port adapter) to its slot.

Figure 4-2   Location of Port Adapter Screw—Partial Port Adapter View
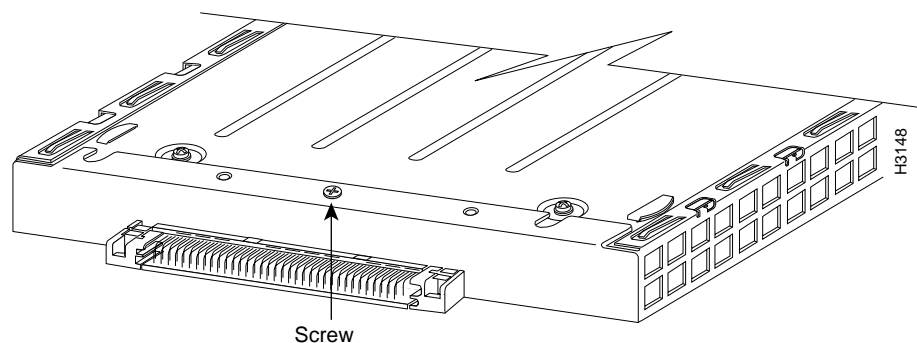
Screw

Step 6   Remove the screw that secures the port adapter (or blank port adapter).

Step 7   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 Figure 4-3.)

Figure 4-3   Pulling a Port Adapter Out of a Slot—Partial Port Adapter View
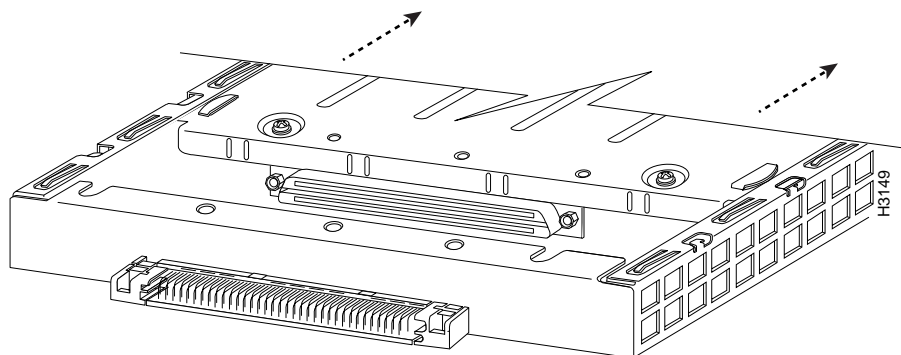
Step 8   If you removed a port adapter, place it in an antistatic container for safe storage or shipment back to the factory. If you removed a blank port adapter, no special handling is required; however, store the blank port adapter for potential future use.

This completes the procedure for removing a new port adapter on a Catalyst RSM/VIP2.

Installing a Port Adapter

The following is the standard procedure for replacing a port adapter on the Catalyst RSM/VIP2:

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

Step 2   Remove the new port adapter from its antistatic container and position it at the opening of the slot.

Step 3   Carefully align the port adapter carrier between the upper and the lower edges of the port adapter slot, as shown in Figure 4-4.

Figure 4-4   Aligning a Port Adapter in a Port Adapter Slot
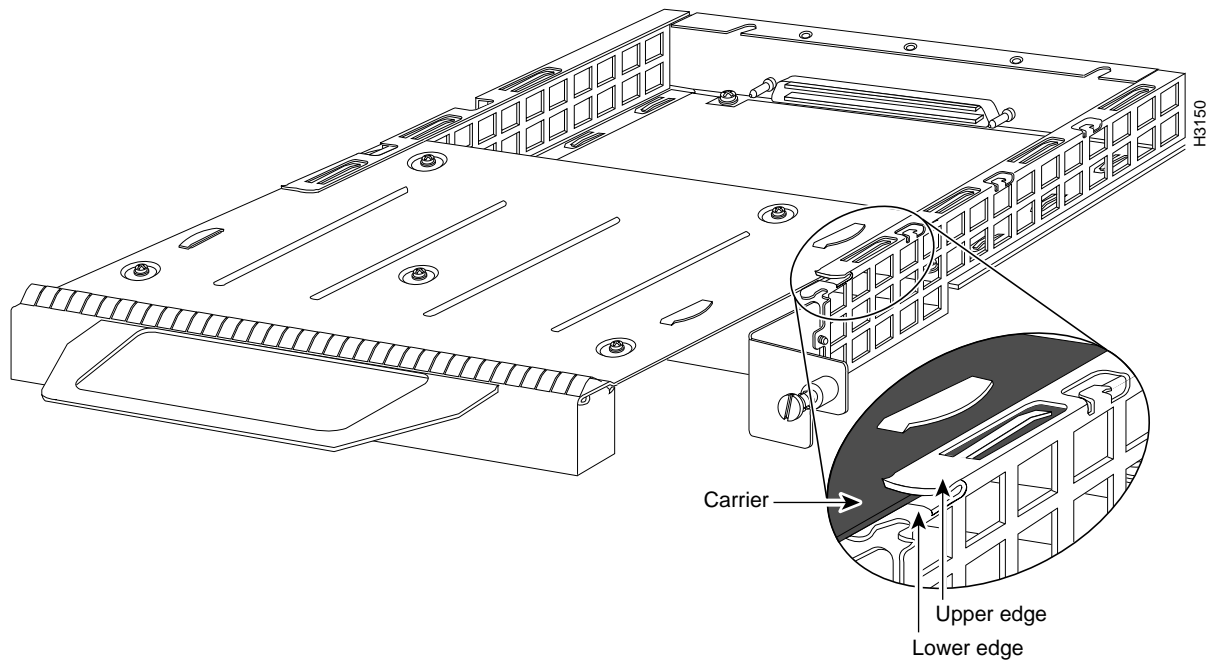
Carrier

Upper edge

Lower edge

> ⚠ **Caution**   To prevent jamming the carrier between the upper and lower edges of the port adapter slot and to ensure that the edge connector at the rear of the port adapter mates with the connector at the rear of the port adapter slot, make certain that the leading edges of the carrier are between the upper and lower slot edges, as shown in the cutaway in Figure 4-5.

> ⚠ **Caution**   To ensure a positive ground attachment between the port adapter carrier and the Catalyst RSM/VIP2 motherboard and port adapter slot, and to ensure that the connectors at the rear of the port adapter and slot mate properly, position the carrier between the upper and lower slot edges, as shown in Figure 4-5.

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 on the motherboard. (See Figure 4-5.)

Figure 4-5 **Port Adapter Installed in a Port Adapter Slot—Partial Port Adapter View**
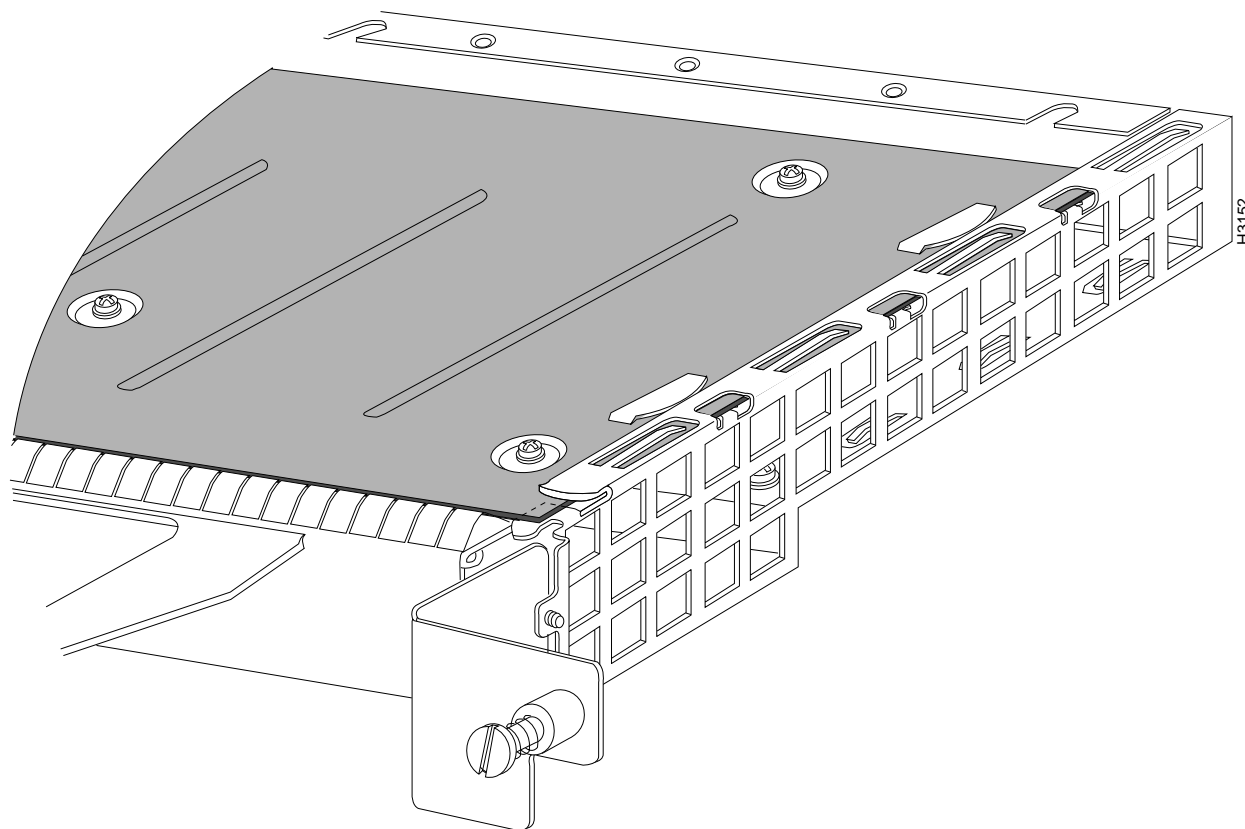
Step 5 Replace the screw in the rear of the port adapter slot. (See Figure 4-2 for its location.) Do not overtighten this screw.

Step 6 To reinstall the Catalyst RSM/VIP2 in the system, follow the steps in the *Route Switch Module Catalyst VIP2-15 and VIP2-40 Installation and Configuration Note* (Document Number 78-4780-01), which shipped with your Catalyst RSM/VIP2.

Step 7 If the interface cables have been disconnected, reconnect the interface cables to the port adapters.

This completes the procedure for installing a port adapter on a Catalyst RSM/VIP2. Proceed to Chapter 8, "Configuring the PA-E3 Interfaces," for information on how to configure your port adapter interfaces.

Cisco 7200 Series and the PA-E3

This chapter provides information on the PA-E3 serial port adapter and its use in Cisco 7200 series routers. This chapter contains the following sections:

- Overview, page 5-1
- Removing a Port Adapter, page 5-2
- Installing a Port Adapter, page 5-3

Overview

The PA-E3 can be installed in any available port adapter slot in Cisco 7200 series routers (which consist of the two-slot Cisco 7202, four-slot Cisco 7204 and Cisco 7204VXR, and the six-slot Cisco 7206 and Cisco 7206VXR). Figure 5-1 shows a one-port PA-E3 installed in port adapter slot 3 of a Cisco 7206.

Figure 5-1   Cisco 7206 with a PA-E3 in Port Adapter Slot 3
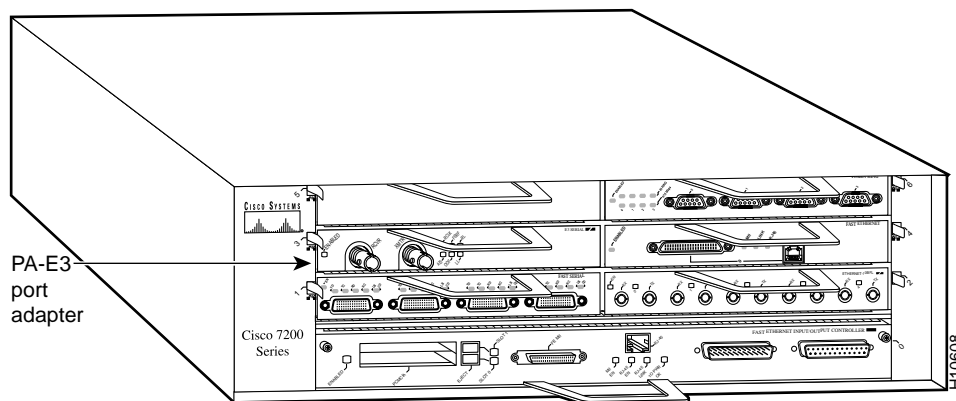
Depending on your circumstances, you might need to install a new port adapter in a Cisco 7200 series router or replace a failed port adapter in the field. In either case, no tools are necessary; all port adapters available for the Cisco 7200 series connect directly to the router midplane and are locked into position by a port adapter lever. When removing and replacing a port adapter, you need an antistatic mat onto which you can place a removed port adapter and an antistatic container into which you can place a failed port adapter for shipment back to the factory.

> **Note** The Cisco 7200 series routers support online insertion and removal(OIR); therefore, you do not have to power down the Cisco 7200 series routers when removing and replacing a port adapter.

When a port adapter slot is not in use, a blank port adapter must fill the empty slot to allow the router to conform to 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 a blank port adapter.

Removing a Port Adapter

Following is the procedure for removing a port adapter from a Cisco 7200 series router:

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

Step 2   Place the port adapter lever for the desired port adapter slot in the unlocked position. The port adapter lever remains in the unlocked position. (See Figure 5-2.)

Figure 5-2   Placing the Port Adapter Lever in the Unlocked Position—Cisco 7206 Shown

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

Port adapter handle

Port adapter lever (unlocked position)
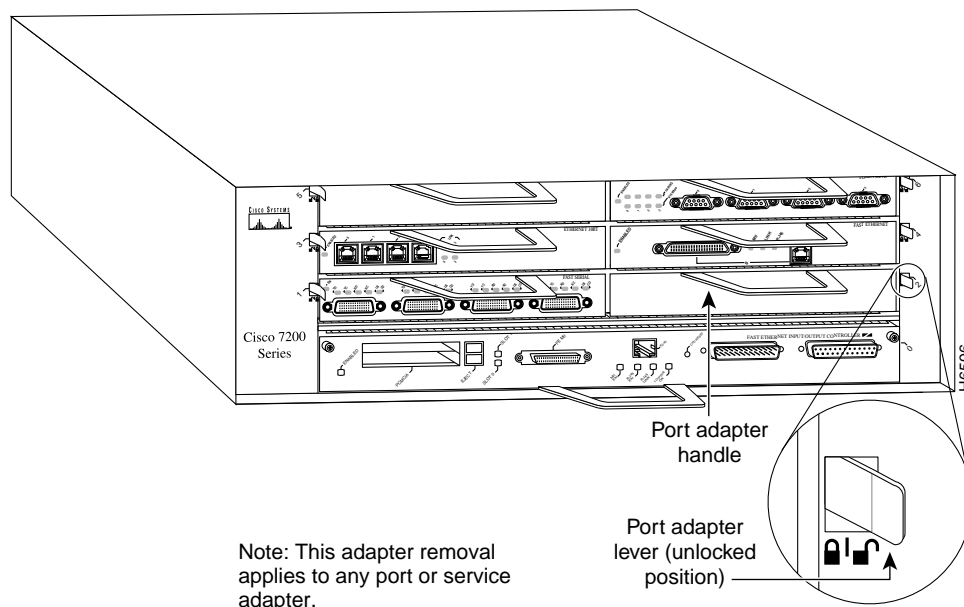
Step 3   Grasp the handle on the port adapter and pull the port adapter from the midplane, about halfway out of its slot. If you are removing a blank port adapter, pull the blank port adapter completely out of the chassis slot.

> **Note** As you disengage the port adapter from the router midplane, OIR administratively shuts down all active interfaces on the port adapter.

Step 4   With the port adapter halfway out of the slot, disconnect all cables from the port adapter.

Step 5   After disconnecting the cables, pull the port adapter from its chassis slot.

⚠ **Caution**   Always handle the port adapter by the carrier edges and handle; never touch the port adapter's components or connector pins. (See Figure 5-3.)

Figure 5-3   **Handling a Port Adapter**
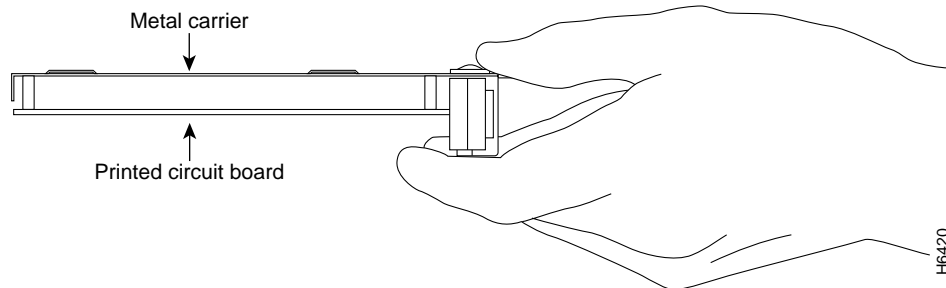
Step 6   Place the port adapter on an antistatic surface with its components facing upward, or in a static shielding bag. If the port adapter will be returned to the factory, immediately place it in a static shielding bag.

This completes the procedure for removing a port adapter from a Cisco 7200 series router.

Installing a Port Adapter

Following is the procedure for installing a new port adapter in a Cisco 7200 series router:

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

Step 2   Remove the new port adapter from its antistatic container and position it at the opening of the slot. (See Figure 5-4.)

Step 3   Use both hands to grasp the port adapter by its metal carrier edges and position the port adapter so that its components face downward. (See Figure 5-3.)

Step 4   Align the left and the right edge of the port adapter metal carrier between the guides in the port adapter slot. (See Figure 5-4.)

Figure 5-4   **Aligning the Port Adapter Metal Carrier Between the Slot Guides—Cisco 7206 Shown**
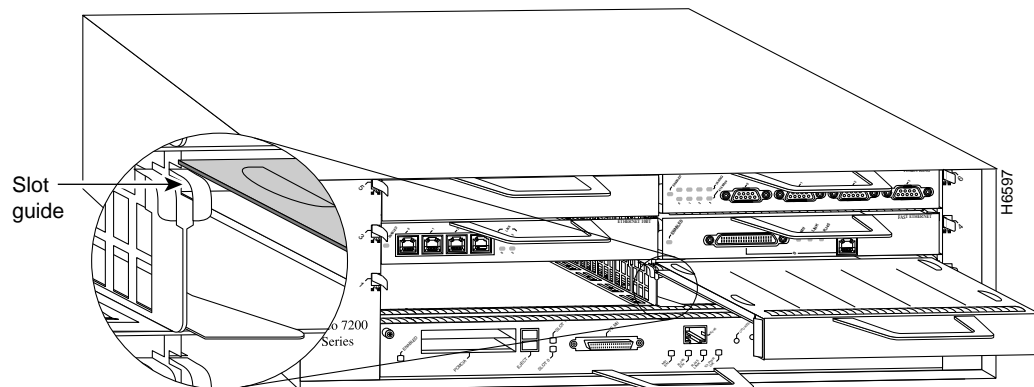
Note: This adapter alignment applies to any port or service adapter.

Cisco 7200 Series and the PA-E3   **5-3**

Step 5 With the metal carrier aligned in the slot guides, gently slide the port adapter halfway into the slot.

⚠ **Caution** Do not slide the 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.

Step 6 With the port adapter halfway in the slot, connect all required cables to the port adapter.

Step 7 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 8 After seating the port adapter in the router midplane, move the port adapter lever to the locked position. Figure 5-5 shows the port adapter lever in the locked position.

Note If the port adapter lever 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 to the locked position.

Figure 5-5　　**Placing the Port Adapter Lever in the Locked Position—Cisco 7206 Shown**
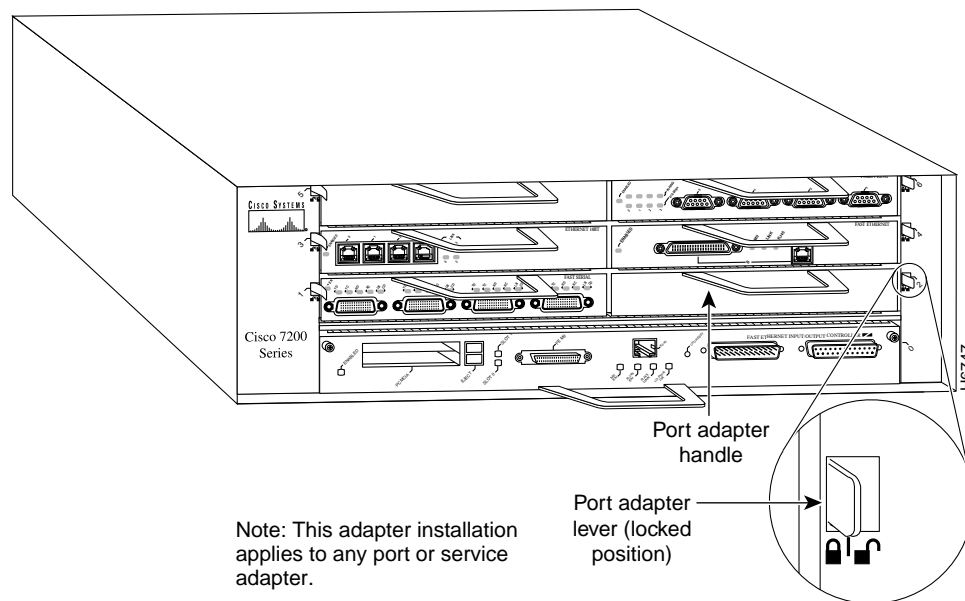
Port adapter handle

Port adapter lever (locked position)

Note: This adapter installation applies to any port or service adapter.

This completes the procedure for installing a new port adapter in a Cisco 7200 series router. Proceed to Chapter 8, "Configuring the PA-E3 Interfaces," for information on how to configure your port adapter interfaces.

Cisco uBR7200 Series and the PA-E3

This chapter provides information on the PA-E3 serial port adapter and its use in Cisco uBR7200 series universal broadband routers. This chapter includes the following sections:

- Overview, page 6-1
- Removing a Port Adapter, page 6-2
- Installing a Port Adapter, page 6-4

Overview

The PA-E3 can be installed in any of the available port adapter slots in Cisco uBR7200 series routers. Figure 6-1 shows a PA-E3 installed in port adapter slot 2 of a Cisco uBR7200 series router.

Figure 6-1   Cisco uBR7200 Series with a PA-E3 Port Adapter in Port Adapter Slot 2
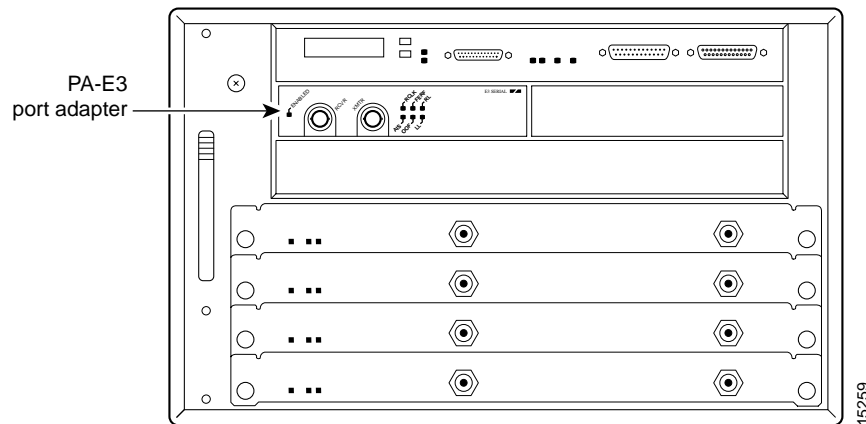
Depending on the circumstances, you might need to install a new port adapter or replace a failed port adapter in a Cisco uBR7200 series router. In either case, no tools are necessary; all port adapters available for the Cisco uBR7200 series routers connect directly to the router midplane and are locked into position by a port adapter retention clip (Cisco uBR7246) or lever (Cisco uBR7223). When removing and replacing a port adapter, you need an antistatic mat onto which you can place a removed port adapter and an antistatic container into which you can place a failed port adapter for shipment back to the factory.

> **Note** The Cisco uBR7200 series routers support online Insertion and Removal (OIR); therefore, you do not have to power down the router when removing and replacing a PA-E3.

When a port adapter slot is not in use, blank port adapters must fill empty slots to allow the router to conform to 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.

Removing a Port Adapter

Following is the procedure for removing a port adapter from a Cisco uBR7200 series router:

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

Step 2 Unlock the port adapter retaining mechanism.

- For a Cisco uBR7246, place the port adapter retention clip for the desired port adapter slot in the unlocked position. The retention clip remains in the unlocked position. (See Figure 6-2.)

Figure 6-2   Placing the Port Adapter Retention Clip in the Unlocked Position—Cisco uBR7246 Shown
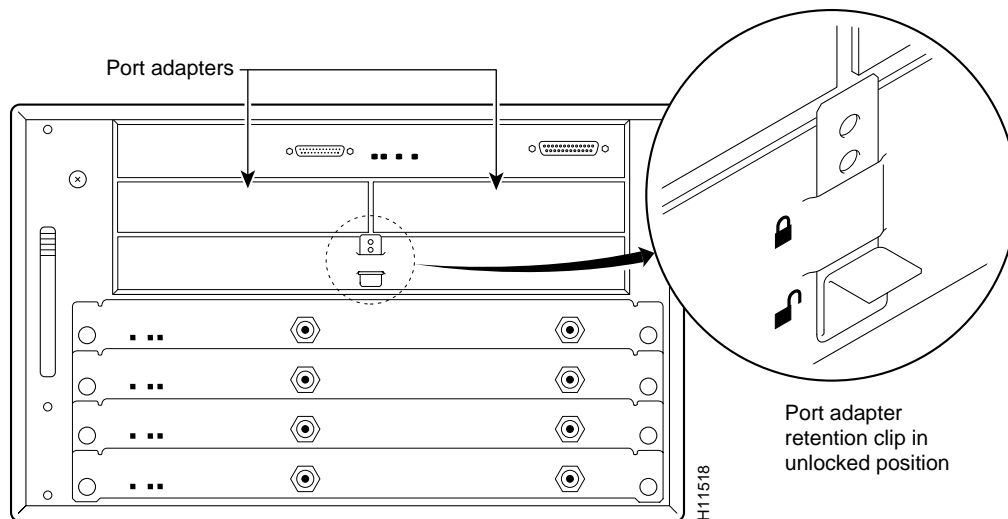
- For a Cisco uBR7223, place the port adapter lever in the unlocked position. (See Figure 6-3.)

Figure 6-3   Placing the Port Adapter Lever in the Unlocked Position—**Cisco uBR7223 Shown**
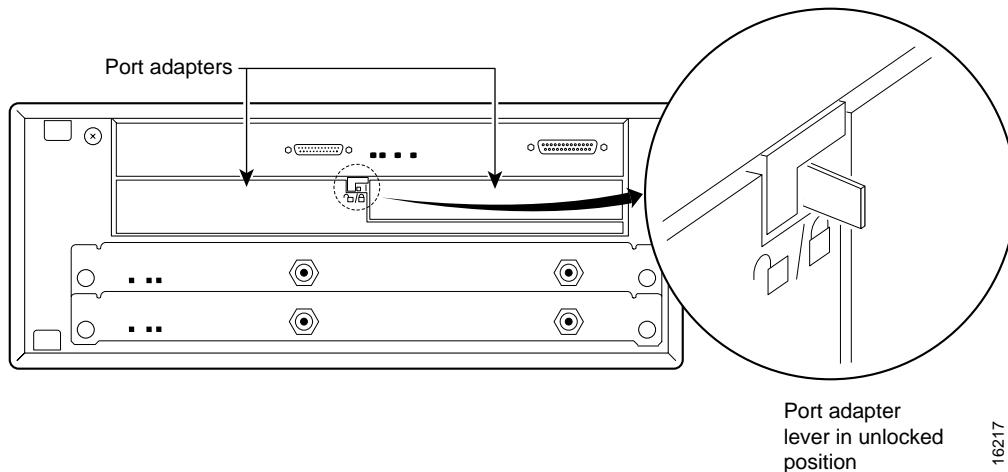
Port adapters

Port adapter lever in unlocked position

16217

Step 3   Grasp the handle on the port adapter and pull the port adapter from the router midplane, 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.

Note   As you disengage the port adapter from the midplane, OIR administratively shuts down all active interfaces on the port adapter.

Step 4   With the port adapter halfway out of the slot, disconnect all cables from the port adapter.

Step 5   After disconnecting the cables, pull the port adapter from its chassis slot.

⚠ **Caution**   Always handle the port adapter by the carrier edges and handle; never touch the port adapter's components or connector pins. (See Figure 6-4.)

Figure 6-4   Handling a Port Adapter
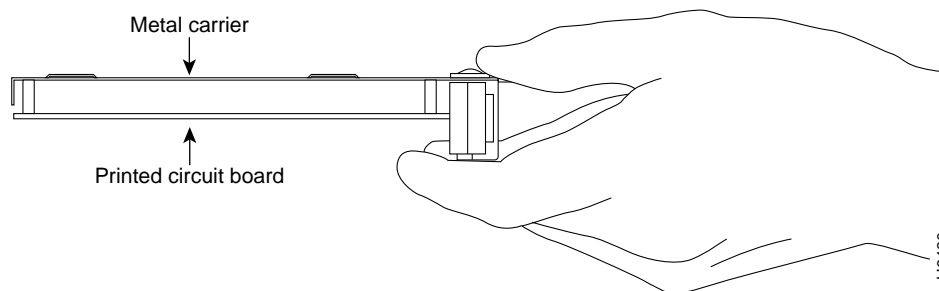
Metal carrier

Printed circuit board

H6420

Step 6 Place the port adapter on an antistatic surface with its components facing upward, or in a static shielding bag. If the port adapter will be returned to the factory, immediately place it in a static shielding bag.

This completes the procedure for removing a port adapter from a Cisco uBR7200 series router.

Installing a Port Adapter

Following is the procedure for installing a port adapter in a Cisco uBR7200 series router:

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

Step 2 Use both hands to grasp the port adapter by its metal carrier edges and position the port adapter so that its components are downward. (See Figure 6-4.)

Step 3 Align the left and the right edge of the port adapter metal carrier between the guides in the port adapter slot. (See Figure 6-5.)

Figure 6-5 **Aligning the Port Adapter Metal Carrier Between the Slot Guides**
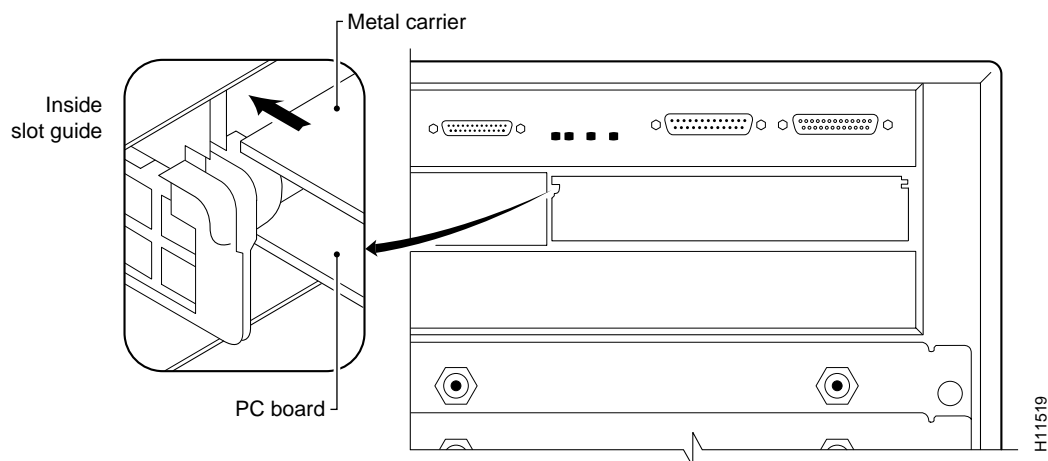
Step 4 With the metal carrier aligned in the slot guides, gently slide the port adapter halfway into the slot.

⚠ **Caution** Do not slide the 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.

Step 5 With the port adapter halfway in the slot, connect all required cables to the port adapter.

Step 6 After connecting the cables, carefully slide the port adapter all the way into the slot until the port adapter is seated in the router midplane.

Step 7 Secure the port adapter:

• For a Cisco uBR7246, slide the port adapter retention clip up to the locked position. See Figure 6-6.

Note If the retention clip does not slide up 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 slide the retention clip up to the locked position.

Figure 6-6   Placing the Port Adapter Retention Clip in the Locked Position—**Cisco uBR7246 Shown**

Port adapters

Port adapter retention clip in locked position

H11517
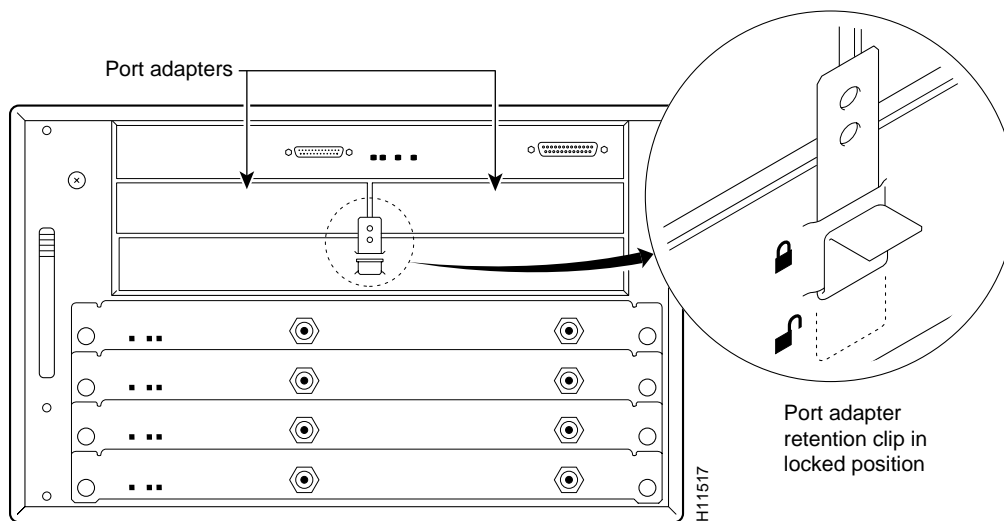
- For a Cisco uBR7223, place the port adapter lever in the locked position. (See Figure 6-7.)

Figure 6-7   Placing the Port Adapter Lever in the Locked Position—**Cisco uBR7223 Shown**
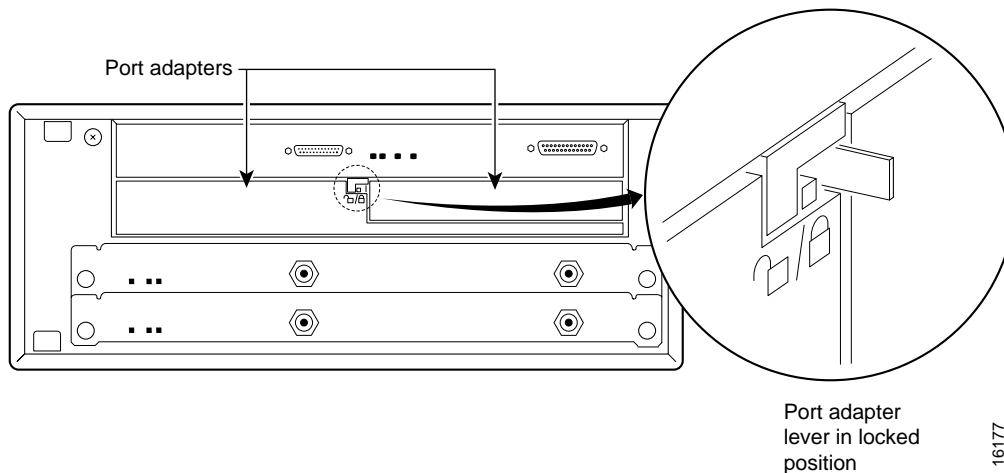
Port adapters

Port adapter lever in locked position

16177

Note   If the port adapter lever 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 to the locked position.

This completes the procedure for installing a port adapter in a Cisco uBR7200 series router. Proceed to Chapter 8, "Configuring the PA-E3 Interfaces," for information on how to configure your port adapter interfaces.

Cisco uBR7200 Series and the PA-E3   **6-5**

Cisco 7100 Series and the PA-E3

This chapter provides information on the PA-E3 serial port adapter and its use in the Cisco 7100 series routers. This chapter contains the following sections:

- Installation Overview, page 7-1
- Removing a Port Adapter, page 7-2
- Installing a Port Adapter, page 7-3

Installation Overview

The PA-E3 can be installed in port adapter slot 3 in Cisco 7120 series routers and in port adapter slot 4 in Cisco 7140 series routers. Figure 7-1 shows port adapter slot 3 of a Cisco 7120 series router. Figure 7-2 shows port adapter slot 4 of a Cisco 7140 series router.

Figure 7-1   **Cisco 7120 Series Router—Port Adapter Slot 3 Location**

Figure 7-2   Cisco 7140 Series Router—Port Adapter Slot 4 Location
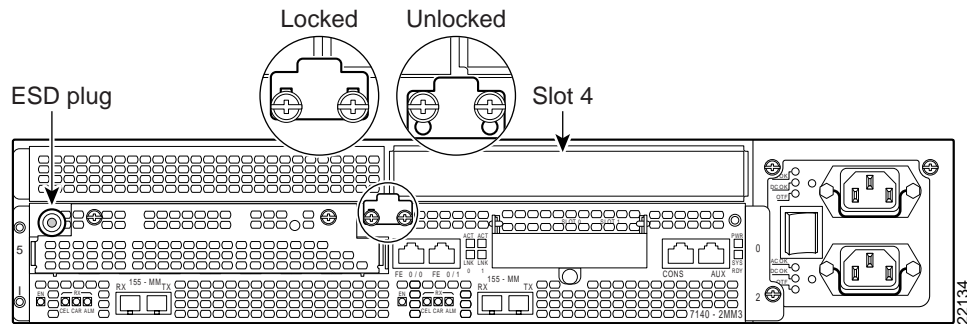
Depending on your circumstances, you might need to install a new port adapter in a Cisco 7100 series router or replace a failed port adapter in the field. All port adapters available for the Cisco 7100 series conne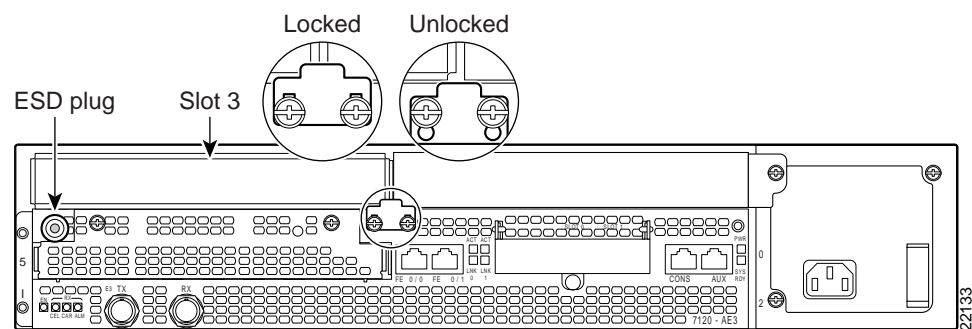ct directly to the router and are locked into position by a locking tab with two screws (see Figure 7-1 or Figure 7-2). You need a number 2 Phillips screwdriver to loosen the screws.

Note   Cisco 7100 series routers support online insertion and removal (OIR); therefore, you do not have to power down the router when removing and replacing a port adapter.

When a port adapter slot is not in use, a blank port adapter must fill the empty slot to allow the router to conform to 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 a blank port adapter.

Removing a Port Adapter

Follow these steps to remove a port adapter from a Cisco 7100 series router:

Step 1   Attach an ESD-preventive wrist strap between you and the chassis. (See Figure 7-1 or Figure 7-2 for the location of the ESD plug.)

Step 2   Use a number 2 Phillips screwdriver to loosen the screws on the locking tab; then slide the tab down to the unlocked position. (See Figure 7-1 or Figure 7-2.)

Step 3   Grasp the handle on 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.

Note   As you disengage the port adapter from the router, OIR administratively shuts down all active interfaces on the port adapter.

Step 4   With the port adapter halfway out of the slot, disconnect all cables from the port adapter.

Step 5   After disconnecting the cables, pull the port adapter from its chassis slot.

⚠ **Caution**   Always handle the port adapter by the carrier edges and handle; never touch the port adapter's components or connector pins. (See Figure 7-3.)

Figure 7-3   Handling a Port Adapter
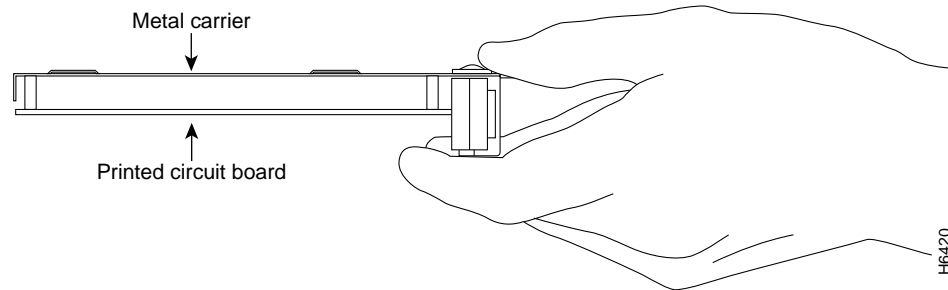
Metal carrier

Printed circuit board

H6420

Step 6   Place the port adapter on an antistatic surface with its components facing upward, or in a static shielding bag. If the port adapter will be returned to the factory, immediately place it in a static shielding bag.

Step 7   Install a blank port adapter or replacement port adapter to maintain proper flow of cooling air across the internal components. For procedures on how to install a port adapter, see the next section, "Installing a Port Adapter".

Note   The blank port adapter is available from Cisco Systems as a spare. The blank port adapter product number is MAS-7100-PABLANK.

This completes the procedure for removing a port adapter from a Cisco 7100 series router.

Installing a Port Adapter

Follow these steps to install a new port adapter in a Cisco 7100 series router:

**Step 1**   Attach an ESD-preventive wrist strap between you and the chassis. (See Figure 7-1 for the location of the ESD plug.)

Step 2   Ensure that the locking tab is down in the unlocked position. If it is locked, use a number 2 Phillips to loosen the screws; then slide the tab down to the unlocked position. (See Figure 7-1.)

Step 3   Remove the new port adapter from its antistatic container and position it at the opening of the slot.

Step 4   Use both hands to grasp the port adapter by its metal carrier edges, and position the port adapter so that its components face downward. (See Figure 7-3.)

Step 5   Align the left and the right edge of the port adapter metal carrier between the guides in the port adapter slot. (See Figure 7-4.)

Step 6   With the metal carrier aligned in the slot guides, gently slide the port adapter halfway into the slot.

⚠ **Caution**   Do not slide the 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.

Figure 7-4   Aligning the Single-Width Port Adapter Between the Slot Guides
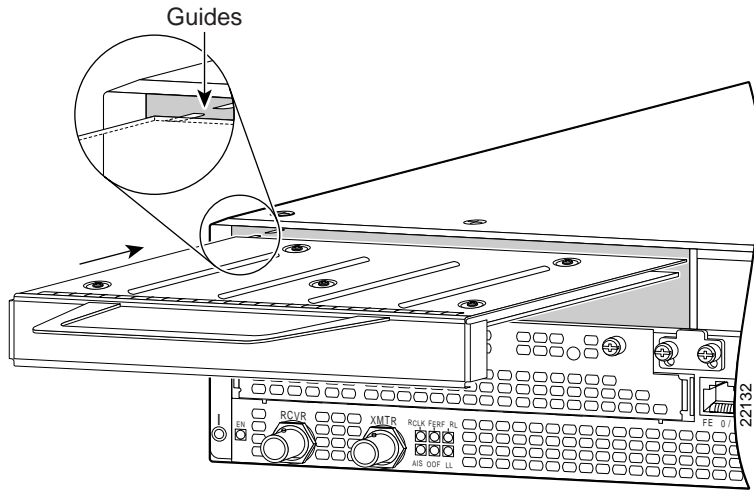
Step 7   With the port adapter halfway in the slot, connect all required cables to the port adapter.

Step 8   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.

Step 9   After seating the port adapter in the router, slide the locking tab up to the locked position and tighten the screws. (Figure 7-1 or Figure 7-2 shows the locking tab in the locked position.)

Note   If the port adapter lever is not in the locked position, the port adapter is not completely seated in the router. Carefully pull the port adapter halfway out of the slot, reinsert it, and move the port adapter lever to the locked position.

This completes the procedure for installing a new port adapter in a Cisco 7100 series router. Proceed to Chapter 8, "Configuring the PA-E3 Interfaces," to connect the necessary cables to your port adapter.

Configuring the PA-E3 Interfaces

To continue your PA-E3 serial port adapter installation, you must configure the E3 interfaces. The instructions that follow apply to all supported platforms. Minor differences between the platforms are noted. This chapter contains the following sections:

- Using the EXEC Command Interpreter, page 8-1

- Identifying Port Adapter Slot and PA-E3 Interface Port Numbers, page 8-2

- Performing a Basic Configuration, page 8-7

- Configuration Example, page 8-8

- Customizing the PA-E3, page 8-8

- Configuring Cyclic Redundancy Checks, page 8-10

- Checking the Configuration, page 8-11

If you installed a new PA-E3 or if you want to change the configuration of an existing interface, you must enter configuration mode using the **configure** command. If you replaced a PA-E3 that was previously configured, the system recognizes the new PA-E3 interfaces and brings each of them up in their existing configuration.

After you verify that the new PA-E3 is installed correctly (the enabled LED goes on), use the privileged-level **configure** command to configure the new interfaces. You will need the following information for your configuration:

- Protocols you plan to route on each new interface

- Internet Protocol (IP) addresses if you are configuring the interfaces for IP routing

- Plan to use bridging or not on the new interfaces

- Timing source for each new interface and clock speeds for external timing

For a summary of the configuration options available and instructions for configuring interfaces on the PA-E3, refer to the appropriate configuration publications listed in the "Related Documentation" section on page vi.

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 to change the existing configuration of an interface. The system prompts you for a password if one is 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.

Step 3   When you enter the correct password, the system displays the privileged-level system prompt (#):

```
Router#
```

Proceed to the following section to configure the new interfaces.

Identifying Port Adapter Slot and PA-E3 Interface Port Numbers

This section describes how to identify port adapter slot and PA-E3 interface port numbers for Cisco 7200 series routers, Cisco 7100 series routers, Cisco uBR7200 series routers, and the VIP2.

You can identify interface ports by physically checking the port location on the back of the router or by using software commands to display information about a specific interface or all interfaces in the router.

The PA-E3 can be installed in the following slots on the hardware platforms described in this document:

- VIP2—Port adapter slot 0 and slot 1

- Catalyst RSM/VIP2—Port adapter slot 0 and slot 1

- Cisco 7100 series routers—Port adapter slot 3 in a Cisco 7120 series router and port adapter slot 4 in a Cisco 7140 series router

- Cisco 7200 series routers—Port adapter slot 1 and slot 2 in a Cisco 7202; port adapter slot 1 through slot 4 in a Cisco 7204 and Cisco 7204VXR; port adapter slot 1 through slot 6 in a Cisco 7206 and Cisco 7206VXR

- Cisco uBR7200 series—Port adapter slot 1 and slot 2 in a Cisco uBR7246 and port adapter slot 1 in a Cisco uBR7223

Port adapters have a handle attached, but this handle is occasionally not shown in this document to allow a full view of detail on the port adapter's faceplate.

Cisco 7200 Series and Cisco uBR7200 Series Ports

Physical port addresses specify the actual physical location of each interface port on a Cisco 7200 series router (see Figure 8-1) or a Cisco uBR7200 series router (see Figure 8-2). This address is composed of a two-part number in the format *port adapter slot number/interface port number*, as follows:

- The first number identifies the chassis slot in which the PA-E3 is installed.

- The second number identifies the interface port on each PA-E3; the interface port is always numbered as interface 0 for the one-port PA-E3 and 0 or 1 for the two-port PA-2E3.

Interface ports maintain the same address regardless of whether other port adapters are installed or removed from the slot. However, when you move a port adapter to a different slot, the first number in the address changes to reflect the new chassis slot number.

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 Cisco 7204VXR, and slot 6 for the Cisco 7206 and Cisco 7206VXR. Port adapter slot 0 is reserved for the optional Fast Ethernet port on the I/O controller if present. Figure 8-1 shows the port adapter slots and interface ports of a Cisco 7206. The individual interface port numbers always begin with 0. The number of additional ports depends on the number of ports on a port adapter.

Note The I/O controller is available with or without a Fast Ethernet port. You can install both I/O controller types in all Cisco 7200 series routers; however, when you install an I/O controller with a Fast Ethernet port in a Cisco 7202, the system software automatically disables the port.

For example, the serial port on a one-port PA-E3 in port adapter slot 3 has the address 3/0. (See Figure 8-1.) If the PA-E3 is in port adapter slot 1, this same interface port is numbered 1/0. The serial ports on a two-port PA-2E3 in port adapter slot 3 have the addresses 3/0 and 3/1.

Note The PA-E3 is considered a high-bandwidth port adapter; you must observe specific configuration guidelines. Refer to the publication *Cisco 7200 Series Port Adapter Hardware Configuration Guidelines*, which shipped with your Cisco 7200 series chassis and is also available on the Cisco Connection Documentation, Enterprise Series CD-ROM.

Figure 8-1   **Cisco 7206 Serial Port Number Example**

PA-E3 port adapter
(port number 3/0)
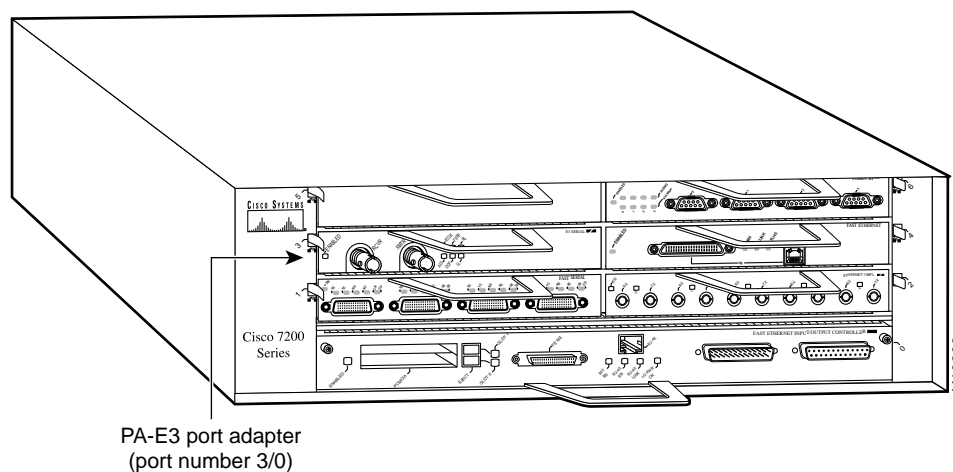
Figure 8-2 shows the interface ports of a PA-E3 in slot 2 of a Cisco uBR7200 series router. The port adapter slots are numbered slot 1 and slot 2 for the Cisco uBR7246 and slot 1 for the Cisco uBR7223 (slot 0 is always reserved for the Fast Ethernet port on the I/O controller if present). The individual interface port numbers always begin with 0. The number of additional ports depends on the number of ports on a port adapter. Port adapters can occupy any port adapter slot; there are no restrictions.

For example, the serial port on a one-port PA-E3 in port adapter slot 1 has the address 1/0. (See Figure 8-2.) If the PA-E3 is in port adapter slot 2, this same interface port is numbered 2/0. The serial ports on a two-port PA-2E3 in port adapter slot 2 have the addresses 2/0 and 2/1.

Figure 8-2 **PA-E3 Interface Port Address Example—Cisco uBR7246 Shown**
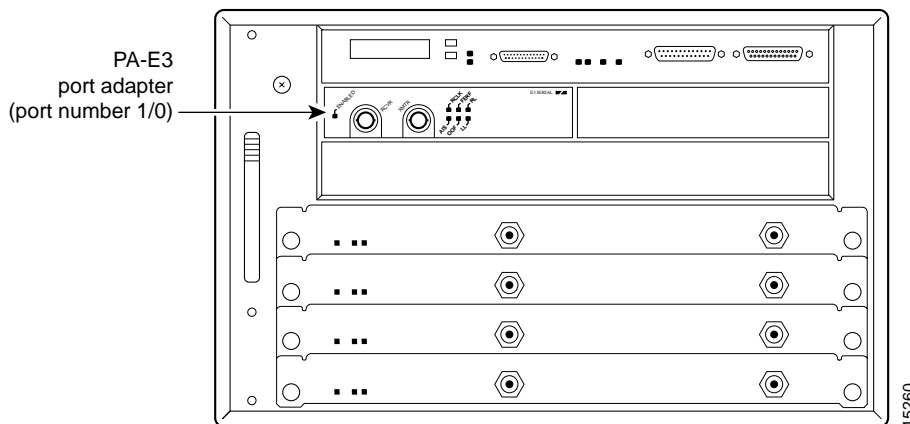
You can identify interface ports by physically checking the port adapter/interface port location on the back of the router or by using software commands to display information about a specific interface or all interfaces in the router.

VIP2 Ports

In the router, physical port addresses specify the actual physical location of each interface port on the router interface processor end. (See Figure 8-3.) Each address is composed of a three-part number in the format *interface processor slot number/port adapter number/interface port number*, as follows:

- The first number identifies the chassis slot in which the VIP2 is installed (as shown in the sample system in Figure 8-3).

- The second number identifies the physical port adapter slot on the VIP2, and is either 0 or 1.

- The third number identifies the interface port on each E3 serial port adapter, which is always numbered as interface 0 for the one-port PA-E3 and 0 or 1 for the two-port PA-2E3.

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

Interface ports on the 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 first number in the address changes to reflect the new chassis slot number.

Figure 8-3 shows the port adapter slots and interface ports of a sample Cisco 7505 system. On the VIP2, the first port adapter slot number is always 0. The second port adapter slot number is always 1. The individual interface port numbers always begin with 0. The number of additional ports depends on the number of ports on a port adapter.

For example, the serial port on a one-port PA-E3 in the first port adapter slot in chassis slot 3 is numbered 3/0/0. (See Figure 8-3.) If the PA-E3 is in port adapter slot 1, this same port is numbered 3/1/0. The serial ports on a two-port PA-2E3 in the first port adapter slot in chassis slot 3 are numbered 3/0/0 and 3/0/1.

Port adapters can occupy either port adapter slot; there are no restrictions.

Figure 8-3   Cisco 7505 Serial Port Number Example
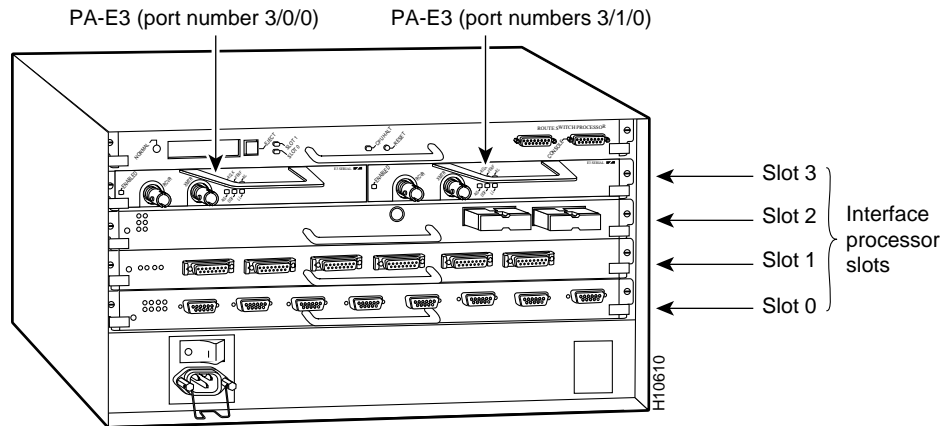
You can identify interface ports by physically checking the slot/port-adapter/interface port location on the back of the router or by using **show** commands to display information about a specific interface or all interfaces in the router.

Catalyst RSM/VIP2 Ports

In the Catalyst RSM/VIP2, each port adapter address is composed of a two-part number in the format *port adapter number/interface port number*, as follows:

- The first number identifies the physical port adapter slot on the Catalyst RSM/VIP2, and is either 0 or 1.

- The second number identifies the interface port on each E3 serial port adapter, which is always numbered as interface 0 for the one-port PA-E3 and 0 or 1 for the two-port PA-2E3.

Figure 8-4 shows the port adapters on a Catalyst RSM/VIP2 installed in a Catalyst 5509 switch. The first port adapter slot number is always 0. The second port adapter slot number is always 1. The individual interface port numbers always begin with 0. The number of additional ports depends on the number of ports on a port adapter.

For example, the serial port on a one-port PA-E3 in the first port adapter slot is numbered 0/0. (See Figure 8-4.) If the PA-E3 is in port adapter slot 1, this same port is numbered 1/0. The serial ports on a two-port PA-2E3 in the first port adapter slot are numbered 0/0 and 0/1.

Port adapters can occupy either port adapter slot; there are no restrictions.

Figure 8-4   Serial Port Adapters in the Catalyst 5509
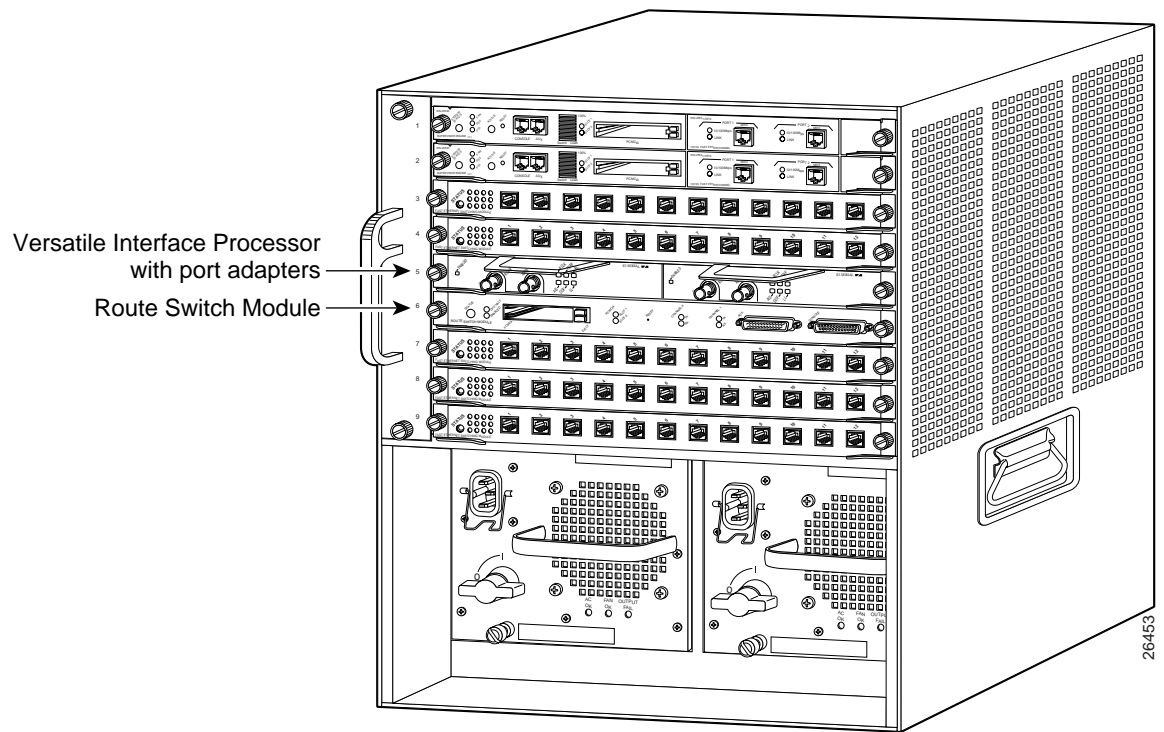
You can identify interface ports by physically checking the port-adapter/interface port location on the back of the router or by using **show** commands to display information about a specific interface or all interfaces in the router.

Cisco 7100 Series Ports

In the Cisco 7100 series routers, the *slot number* is the location in the chassis where the interface resides and the *port number* is the physical port. Interfaces in the Cisco IOS software are identified by a type, slot number, and port number. For example, serial 3/1 indicates port 1 on the serial port adapter in slot 3.

Slots in the Cisco 7120 series routers are numbered as shown in Figure 8-5. The fixed LAN interface is slot 0, the fixed WAN interface is slot 1, and the modular port adapter interface is slot 3. Slots 2 and 4 are not used on the Cisco 7120 series routers. Slot 5 is the service module.

Figure 8-5   Port Adapter Slot Numbering—Cisco 7120 Series
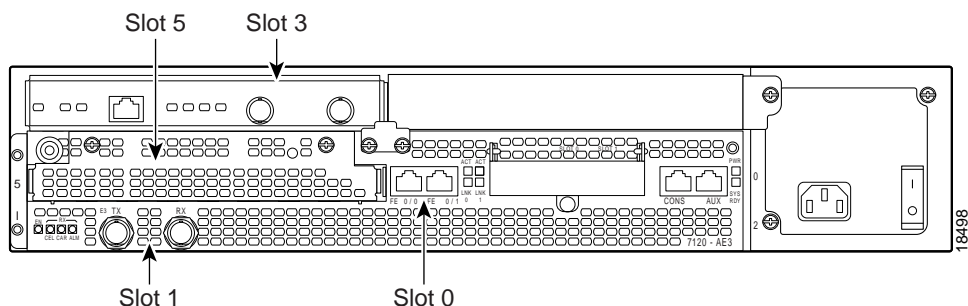
Slots in the Cisco 7140 series routers are numbered as shown Figure 8-6. The fixed LAN interface is slot 0, the fixed WAN interfaces are slots 1 and 2, and the modular port adapter interface is slot 4. Slot 3 is not used. Slot 5 is the service module.

Figure 8-6   Port Adapter Slot Numbering—Cisco 7140 Series
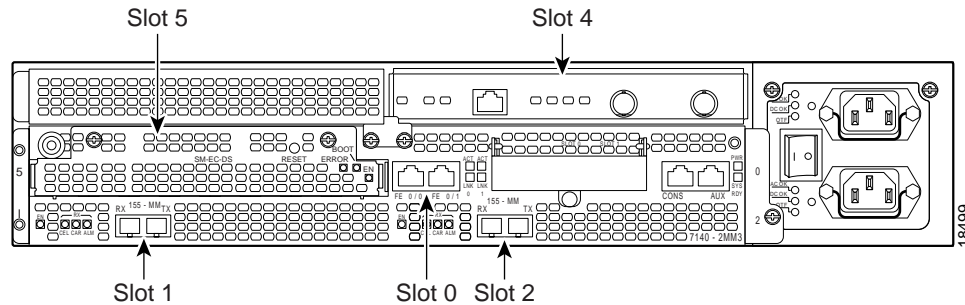
Performing a Basic Configuration

The following steps are for a basic interface configuration for the PA-E3. Press the **Return** key after each step unless otherwise noted. At any time you can exit the privileged level and return to the user level by entering **disable** at the prompt:

```
router# disable

router>
```

Step 1   At the privileged-level prompt, enter configuration mode and specify that the console terminal is the source of the configuration subcommands:

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

Step 2   Specify the interface to configure:

- For Cisco 7100 series, Cisco 7200 series, or Cisco uBR7200 series routers, specify the interface to configure by entering the subcommand **interface serial** followed by the *slot/port* (port adapter slot number and interface port number). The example that follows is for the interface of the port adapter in slot 3:

  ```
  router(config)# interface serial 3/0
  ```

- For a VIP2, specify the interface to configure by entering the subcommand **interface serial**, followed by the *slot/port-adapter/port* (interface processor slot number, port adapter slot number, and interface port number). The example that follows is for the interface of the first port adapter on a VIP2 in interface processor slot 1:

  ```
  router(config)# interface serial 1/0/0
  ```

- For a Catalyst RSM/VIP2, specify the interface to configure by entering the subcommand **interface serial**, followed by the *port-adapter/port* (port adapter slot number and interface port number). The example that follows is for the interface of the first port adapter on a Catalyst RSM/VIP2:

  ```
  router(config)# interface serial 0/0
  ```

Step 3   If IP routing is enabled on the system, change to interface configuration mode and use the **ip address** configuration subcommand to assign an IP address and subnet mask to the interface, as in the following example:

```
router(config-if)# ip address 10.0.0.0 10.255.255.255
```

Step 4   In interface configuration mode, choose the internal clock source by entering the **clock source** configuration subcommand, as in the following example:

```
router(config-if)# clock source internal
```

Use the **no** form of this command to restore the default clock source, which is line.

Step 5   In interface configuration mode, change the shutdown state to up and enable the interface as follows:

```
router(config-if)# no shutdown
```

Step 6   Configure additional interfaces as required.

Step 7   When you have included all of the configuration subcommands to complete the configuration, press **Ctrl-Z** to exit configuration mode.

Step 8   Write the new configuration to nonvolatile memory as follows:

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

To check the interface configuration using **show** commands, proceed to the "Using show Commands to Display Interface and System Information" section on page 8-12.

Configuration Example

The following example shows a typical configuration for the PA-E3 on a Cisco 7500 series router:

```
router> enable
router# configure terminal
router(config)# interface serial
router(config)# interface serial 1/0/0
router(config)# ip address 1.1.1.10 255.255.255.0
router(config-if)# clock source internal
router(config-if)# no shutdown
router(config-if)# ^Z
```

Customizing the PA-E3

You can customize the PA-E3. The features you can customize have default values that will probably suit your environment and need not be changed. However, you might need to enter configuration commands, depending on the requirements for your system configuration and the protocols you plan to route on the interface. Perform the tasks in the following sections if you need to customize the PA-E3.

Setting the Bandwidth

In interface configuration mode, reduce effective bandwidth (range of 22 to 34010 kilobits per second) by entering the **dsu bandwidth** configuration subcommand, as in the following example:

```
router(config-if)# dsu bandwidth 16000
```

Use the **no** form of this command to return to the default, 34010.

Note The local port configuration must match the remote port configuration. For example, if you reduce the effective bandwidth to 16000 on the local port, you must do the same on the remote port.

Defining the DSU Mode

In interface configuration mode, define the DSU interoperability mode by entering the **dsu mode** [**0** | **1**] configuration subcommand, as in the following example:

```
router(config-if)# dsu mode 1
```

Use the **no** form of this command to return to the default, 0.

Note The local port configuration must match the remote port configuration. For example, if you define the DSU interoperability mode as 1 on the local port, you must do the same on the remote port. You need to know what type of DSU is at the remote port to find out if it interoperates with the PA-E3. For E3 serial interfaces, specify mode 0 for connection from a PA-E3 to another PA-E3 or a Digital Link DSU (DL3100). Specify mode 1 for connection from a PA-E3 to a Kentrox DSU.

Also refer to the "Interoperability Guidelines for PA-E3 DSUs" section on page 15 for information regarding DSU feature compatibilities.

Defining Set Bit (National)

In interface configuration mode, define set bit in G751 frame (national bit) by entering the **national bit** [**0** | **1**] configuration subcommand, as in the following example:

```
router(config-if)# national bit 1
```

Use the **no** form of this command to return to the default, which is 0.

Enabling E3 Scrambling

In interface configuration mode, enable E3 scrambling by entering the **scramble** configuration subcommand, as in the following example:

```
router(config-if)# scramble
```

Use the **no** form of this command to restore the default value, which is disabled.

Note The local port configuration must match the remote port configuration. For example, if you enable scrambling on the local port, you must do the same on the remote port.

Also refer to the "Interoperability Guidelines for PA-E3 DSUs" section on page 15 for information regarding DSU feature compatibilities.

Specifying E3 Framing

In interface configuration mode, specify E3 framing by entering the **framing {g751 | bypass}** configuration subcommand, as in the following example:

```
router(config-if)# framing g751
```

Use the **no** form of this command to return to the default, which is G.751 framing.

Note If you use the **bypass** option, scrambling must be set to the default, disabled; the DSU mode must be set to the default, 0; and the DSU bandwidth must be set to the default, 34010.

Setting the Cable Length

In interface configuration mode, set the cable length (0 to 450 feet), as in the following example:

```
router(config-if)# cablelength 250
```

Use the **no** form of this command to return to the default, which is 10 feet.

Configuring Cyclic Redundancy Checks

The PA-E3 uses a 16-bit cyclic redundancy check (CRC) by default; it also supports a 32-bit CRC.

The CRC is an error-checking technique that uses a calculated numeric value to detect errors in transmitted data. The sender of a data frame divides the bits in the frame message by a predetermined number to calculate a remainder or *frame check sequence* (FCS). Before sending the frame, the sender appends the FCS value to the message so that the frame contents are exactly divisible by the predetermined number. The receiver divides the frame contents by the same predetermined number that the sender used to calculate the FCS. If the result is not 0, the receiver assumes that a transmission error occurred and sends a request to the sender to resend the frame.

Note To enable a 32-bit CRC on an interface, follow Step 1 and Step 2 of the preceding procedure (enter configuration mode and specify the slot and port address of the PA-E3, and the interface port number for a VIP2), and then enter the command **crc 32**. Enter **Ctrl-Z** to exit from configuration mode.

For a Cisco 7100 series, Cisco 7200 series, or Cisco uBR7200 series router, use the following example:

```
router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
router(config)#
router(config)# interface serial 3/0
router(config-int)# crc 32
Ctrl-z
```

For a VIP2, use the following example:

```
router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
router(config)#
router(config)# interface serial 1/0/0
router(config-if)# crc 32
Ctrl-z
```

For a Catalyst RSM/VIP2, use the following example:

```
router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
router(config)#
router(config)# interface serial 0/0
router(config-if)# crc 32
Ctrl-z
```

To disable CRC-32 and return to the default CRC-16 setting, specify the slot and port address (and the interface port number for a VIP2) and use the **no crc 32** command. For complete command descriptions and instructions, refer to the related software documentation.

Note When enabling a 32-bit CRC on an interface, ensure that the remote device is also configured for a 32-bit CRC. Both the sender and the receiver must use the same CRC setting.

To check the interface configuration using **show** commands, proceed to the following section, "Checking the Configuration."

Checking the Configuration

After configuring the new interface, use the **show** commands to display the status of the new interface or all interfaces, the **ping** command to check connectivity, and the **loopback** command to verify the physical interface.

Using show Commands to Verify Status

Use **show** commands to verify that the new interfaces are configured and operating correctly:

Step 1   Use the **show version** command to display the system hardware configuration. Ensure that the list includes the new interfaces.

Step 2   Display all of the current port adapters and their interfaces with the **show controllers** command. Verify that the new PA-E3 appears in the correct slot.

Step 3   Specify one of the new interfaces as follows:

- **show interfaces** *type slot/port* command on Cisco 7100 series, Cisco 7200 series, and Cisco uBR7200 series routers

- **show interfaces** *type slot/port-adapter/port* on the VIP2

- **show interfaces** *port-adapter/port* on the Catalyst RSM/VIP2

Verify that the first line of the display specifies the interface with the correct slot number and that the interface and line protocol are in the correct state: up or down.

Step 4   Specify one of the new interfaces as follows:

- **show interfaces** *port adapter type slot/port* on Cisco 7100 series, Cisco 7200 series, and Cisco uBR7200 series routers

- **show interfaces** *type slot/port adapter/interface* command on the VIP2

- **show interfaces** *port adapter/interface* command on the Catalyst RSM/VIP2

Verify that the first line of the display specifies the interface with the correct slot number and that the interface and line protocol are in the correct state: up or down.

Step 5   View the information that is specific to the serial interface hardware:

- For Cisco 7100, Cisco 7200 series and Cisco uBR7200 series routers, specify the new serial interface with the **show controllers serial** [*port adapter slot number/interface port number*] command, and verify that the first line of the display specifies the interface with the correct slot number.

- For a VIP2, specify information that is specific to the new serial interface with the **show controllers serial** [*type slot/port adapter/interface*] command, and verify that the first line of the display specifies the interface with the correct slot number.

- For a Catalyst RSM/VIP2, specify information that is specific to the new serial interface with the **show controllers serial** [*port adapter/interface*] command, and verify that the first line of the display specifies the interface with the correct slot number.

Step 6   Display the protocols configured for the entire system and for the specific interfaces with the **show protocols** command. If necessary, return to configuration mode to add or remove protocol routing on the system or on specific interfaces.

Step 7   Display the running configuration file with the **show running-config** command. Display the configuration stored in NVRAM using the **show startup-config** command. Verify that the configuration is accurate for the system and each interface.

If the interface is down and you configured it as up, or if the displays indicate that the hardware is not functioning properly, ensure that the network interface is properly connected and terminated. If you still have problems bringing the interface up, ask a service representative for assistance.

Using show Commands to Display Interface and System Information

For Cisco 7100, Cisco 7200, or Cisco uBR7200 series routers, to display information about a specific interface, use the **show interfaces** command with the interface type and port address in the format **show interfaces** *type slot/port*.

The following example of the **show interfaces** *type slot/port* command shows all of the information specific to the serial E3 port (interface port 0) in port adapter slot 2:

```
router# show interfaces serial 2/0

Serial2/0 is up, line protocol is up
  Hardware is M1T-E3 pa
  Internet address is 172.16.0.0/8
  MTU 4470 bytes, BW 34010 Kbit, DLY 200 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
  Last input 00:00:05, output 00:00:46, 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
     22 packets input, 7128 bytes, 0 no buffer
     Received 22 broadcasts, 0 runts, 0 giants
              0 parity
     6 input errors, 3 CRC, 0 frame, 0 overrun, 0 ignored, 3 abort
     22 packets output, 7348 bytes, 0 underruns
     0 output errors, 0 applique, 6 interface resets
     0 output buffer failures, 0 output buffers swapped out
     1 carrier transitions
   rxLOS inactive  rxLOF inactive  rxAIS inactive
   txAIS inactive  txRAI inactive
```

For a VIP2, the **show interfaces** *type slot/port-adapter/port* command displays status information (including the physical slot and port address) for the interfaces you specify. In this example, a one-port E3 serial port adapter-configured VIP2 is in chassis slot 1, in port adapter slot 0.

```
router# show interfaces serial 1/0/0
Serial1/0/0 is up, line protocol is up
  Hardware is cyBus Serial
  Internet address is 10.0.0.0/24
  MTU 4470 bytes, BW 45045 Kbit, DLY 200 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
  Last input 2d22h, output 00:00:19, output hang never
  Last clearing of "show interface" counters 2d20h
  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 parity
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     4084 packets output, 1298712 bytes, 0 underruns
     0 output errors, 0 applique, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions
```

For a Catalyst RSM/VIP2, the **show interfaces** *port-adapter/port* command displays status information for the interfaces you specify. In this example, a one-port E3 serial port adapter-configured Catalyst RSM/VIP2 in port adapter slot 0.

```
router# show interfaces serial 0/0
Serial0/0 is up, line protocol is up
  Hardware is cyBus Serial
  Internet address is 10.0.0.0/24
  MTU 4470 bytes, BW 45045 Kbit, DLY 200 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
  Last input 2d22h, output 00:00:19, output hang never
  Last clearing of "show interface" counters 2d20h
  Queueing strategy: fifo
```

Configuring the PA-E3 Interfaces **8-13**

```
    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 parity
        0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
        4084 packets output, 1298712 bytes, 0 underruns
        0 output errors, 0 applique, 0 interface resets
        0 output buffer failures, 0 output buffers swapped out
        0 carrier transitions
```

For Cisco 7100, Cisco 7200, and Cisco uBR7200 series routers, use the **show controllers serial** command, using arguments such as the slot and port number (slot/port), to display information that is specific to the serial interface hardware. Following is an example of the **show controllers serial** *slot/port* command that shows the serial port adapter installed on a Cisco 7200 series router in chassis slot 3:

```
router# show controllers serial 3/0

M1T-Serial: show controller:
PAS unit 0, subunit 0, f/w version 1-23, rev ID 0x1, version 2
idb = 0x608E3340, ds = 0x608E50C0, ssb=0x608E5A84
Clock mux=0x35, ucmd_ctrl=0x8, port_status=0x25
maxdgram=4474, bufpool=64Kb, 128 particles
     TM=down  CA=up  LC=down
line state: up
Serial DTE cable
(Display text omitted.)
```

For a VIP2, use the **show controllers serial** command, using arguments such as those that specify the slot, port adapter, and port numbers (slot/port-adapter/port), to display information that is specific to the serial interface hardware. Following is an example of the **show controllers serial** *slot/port adapter/interface* command that shows serial port 2/0/1 on a one-port PA-E3 installed on a VIP2 in chassis slot 1:

```
router# show controllers serial 2/0/1
Serial2/0/1
   Mx E3(2) HW Revision 0x2, FW Revision 2.42
   Framing is g751, Clock Source is Line, Bandwidth limit is 34010.
   National Bit is 0, International Bits are: 0 0
   DSU mode 0
Data in current interval (421 seconds elapsed):
    0 Line Code Violations, 0 P-bit Coding Violation
    0 C-bit Coding Violation
    0 P-bit Err Secs, 0 P-bit Severely Err Secs
    0 Severely Err Framing Secs, 0 Unavailable Secs
    0 Line Errored Secs, 0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
  Total Data (last 1 15 minute intervals):
    4 Line Code Violations, 0 P-bit Coding Violation,
    0 C-bit Coding Violation,
    0 P-bit Err Secs, 0 P-bit Severely Err Secs,
    0 Severely Err Framing Secs, 0 Unavailable Secs,
    3 Line Errored Secs, 0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
  No alarms detected.
(Display text omitted.)
```

For a Catalyst RSM/VIP2, use the **show controllers serial** command, using arguments such as those that specify the port adapter and port numbers (port-adapter/port), to display information that is specific to the serial interface hardware. Following is an example of the **show controllers serial** *port-adapter/interface* command that shows serial port 0/1 on a one-port PA-E3 installed on a Catalyst RSM/VIP2:

```
router# show controllers serial 0/1
Serial0/1
   Mx E3(2) HW Revision 0x2, FW Revision 2.42
   Framing is g751, Clock Source is Line, Bandwidth limit is 34010.
   National Bit is 0, International Bits are: 0 0
   DSU mode 0
Data in current interval (421 seconds elapsed):
     0 Line Code Violations, 0 P-bit Coding Violation
     0 C-bit Coding Violation
     0 P-bit Err Secs, 0 P-bit Severely Err Secs
     0 Severely Err Framing Secs, 0 Unavailable Secs
     0 Line Errored Secs, 0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
   Total Data (last 1 15 minute intervals):
     4 Line Code Violations, 0 P-bit Coding Violation,
     0 C-bit Coding Violation,
     0 P-bit Err Secs, 0 P-bit Severely Err Secs,
     0 Severely Err Framing Secs, 0 Unavailable Secs,
     3 Line Errored Secs, 0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
   No alarms detected.
(Display text omitted.)
```

The **show version** (or **show hardware**) command displays the configuration of the system hardware (the number of each port adapter type installed), the software version, the names and sources of configuration files, and the boot images. Following is an example of the output from the **show version** command on a Cisco 7200 series router:

```
router# show version

Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-P-M), Version 11.1(16)CA
Synced to mainline version: 11.1(10.5)
Copyright (c) 1986-1997 by cisco Systems, Inc.
Compiled Thu 22-May-97 14:40
Image text-base: 0x600088F0, data-base: 0x604B6000

ROM: System Bootstrap, Version 11.1(5) [mkamson 5], RELEASE SOFTWARE (fc1)
ROM: 7200 Software (C7200-BOOT-M), Version 11.1(6), RELEASE SOFTWARE (fc1)

byron uptime is 22 minutes
System restarted by reload
System image file is "paking/poet/c7200-p-mz", booted via tftp from 172.16.0.0

cisco 7206 (NPE150) processor with 12288K/4096K bytes of memory.
R4700 processor, Implementation 33, Revision 1.0 (512KB Level 2 Cache)
Last reset from power-on
X.25 software, Version 2.0, NET2, BFE and GOSIP compliant.
4 Ethernet/IEEE 802.3 interfaces.
1 Serial network interface.
1 FDDI network interface.
125K bytes of non-volatile configuration memory.
1024K bytes of packet SRAM memory.

4096K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x2
```

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

```
router# show version

Cisco Internetwork Operating System Software
IOS (tm) GS Software, Version 11.1(16)CA
Synced to mainline version: 11.1(10.5)
Copyright (c) 1986-1997 by cisco Systems, Inc.
Compiled Thu 22-May-97 14:32
Image text-base: 0x600108E0, data-base: 0x60A00000

ROM: System Bootstrap, Version 5.3.2(3.2) [kmac 3.2], MAINTENANCE INTERIM SOFTWARE
ROM: GS Software, Version 11.1(8)CA, EARLY DEPLOYMENT RELEASE SOFTWARE (fc1)

keats uptime is 22 minutes
System restarted by reload
System image file booted via tftp from 172.16.0.0

Last reset from power-on
G.703/E1 software, Version 1.0.
G.703/JT2 software, 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).
Chassis Interface.
3 VIP2 controllers (1 FastEthernet)(4 Ethernet)(1 Fddi)(2 E3).
4 Ethernet/IEEE 802.3 interfaces.
1 FastEthernet/IEEE 802.3 interface.
2 Serial network interfaces.
1 FDDI network interface.
125K bytes of non-volatile configuration memory.

8192K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x2
```

To determine which type of port adapter is installed in your system, use the **show diag** *slot* command. Specific port adapter information is displayed, as shown in the following example of a one-port PA-E3 in chassis slot 3 on a Cisco 7200 series router:

```
router# show diag 3

Slot 3:
        E3 PA port adapter, 1 ports
        Port adapter is analyzed
        Port adapter insertion time 01:04:31 ago
        Hardware revision 1.0          Board revision UNKNOWN
        Serial number     3710903      Part number    73-1801-03
        Test history      0x0          RMA number     00-00-00
        EEPROM format version 1
        EEPROM contents (hex):
          0x20: 01 71 01 00 00 38 9F B7 49 07 09 03 00 00 00 00
          0x30: 06 00 00 00 FF FF FF 00 FF FF FF FF FF FF FF FF
```

To determine which type of port adapter is installed on a VIP2 in your system, use the **show diag** *slot* command. Specific port adapter information is displayed, as shown in the following example of a one-port PA-E3 in chassis slot 2:

```
router# show diag 2

Slot 2:
        Physical slot 2, ~physical slot 0xD, logical slot 2, CBus 0
        Microcode Status 0x4
        Master Enable, LED, WCS Loaded
        Board is analyzed
        Pending I/O Status: None
        EEPROM format version 1
        VIP2 controller, HW rev 2.4, board revision D0
        Serial number: 04371939  Part number: 73-1684-03
        Test history: 0x00        RMA number: 00-00-00
        Flags: cisco 7500

        EEPROM contents (hex):
          0x20: 01 15 02 04 00 42 B5 E3 49 06 94 03 00 00 00 00
          0x30: 68 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

        Slot database information:
        Flags: 0x4      Insertion time: 0x14A4 (00:23:00 ago)

        Controller Memory Size: 32 MBytes DRAM, 2048 KBytes SRAM

        PA Bay 0 Information:
                E3 Serial PA, 1 port
                EEPROM format version 1
                HW rev 1.00, Board revision AO
                Serial number: 3549502 Part number: 73-2620-02
```

To determine which type of port adapter is installed on a Catalyst RSM/VIP2 in your system, use the **show diag** command. Specific port adapter information is displayed, as shown in the following example of a one-port PA-E3:

```
router# show diag 1

Slot 1:
        Physical slot 1, ~physical slot 0xD, logical slot 1, CBus 0
        Microcode Status 0x4
        Master Enable, LED, WCS Loaded
        Board is analyzed
        Pending I/O Status: None
        EEPROM format version 1
        VIP2 controller, HW rev 2.4, board revision D0
        Serial number: 04371939  Part number: 73-1684-03
        Test history: 0x00        RMA number: 00-00-00
        Flags: cisco 7500

        EEPROM contents (hex):
          0x20: 01 15 02 04 00 42 B5 E3 49 06 94 03 00 00 00 00
          0x30: 68 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

        Slot database information:
        Flags: 0x4      Insertion time: 0x14A4 (00:23:00 ago)
```

Note The slot values displayed by some commands (such as **show diag** and **show controllers cbus**) are not relevant to any physical connection; disregard these slot values for the Catalyst RSM/VIP2.

Configuring the PA-E3 Interfaces **8-17**

For a VIP2, use the **show controllers cbus** command to display all of the current interface processors and their interfaces. Following is an example of the **show controllers cbus** command that shows serial port 1/0/0 on a one-port PA-E3 installed on a VIP2 in chassis slot 1:

```
router# show controllers cbus

MEMD at 40000000, 2097152 bytes (unused 4288, recarves 1, lost 0)
  RawQ 48000100, ReturnQ 48000108, EventQ 48000110
  BufhdrQ 48000138 (2810 items), LovltrQ 48000150 (20 items, 2016 bytes)
  IpcbufQ 48000160 (32 items, 4096 bytes)
  IpcbufQ_classic 48000158 (8 items, 4096 bytes)
  3570 buffer headers (48002000 - 4800FF10)
  pool0: 9 buffers, 256 bytes, queue 48000140
  pool1: 458 buffers, 1536 bytes, queue 48000148
  pool2: 229 buffers, 4512 bytes, queue 48000168
  pool3: 4 buffers, 4544 bytes, queue 48000170
  slot0: VIP2, hw 2.4, sw 21.40, ccb 5800FF20, cmdq 48000080, vps 8192
    software loaded from system
    IOS (tm) VIP Software (SVIP-DW-M), Version 11.1(16)CA
    ROM Monitor version 17.0
    Ethernet0/0/0, addr 00e0.f7d7.cb00 (bia 00e0.f7d7.cb00)
      gfreeq 48000148, lfreeq 48000178 (1536 bytes), throttled 0
      rxlo 4, rxhi 273, rxcurr 2, maxrxcurr 4
      txq 48001A00, txacc 48001A02 (value 152), txlimit 152
    Ethernet0/0/1, addr 00e0.f7d7.cb01 (bia 00e0.f7d7.cb01)
      gfreeq 48000148, lfreeq 48000180 (1536 bytes), throttled 0
      rxlo 4, rxhi 273, rxcurr 0, maxrxcurr 0
      txq 48001A08, txacc 48001A0A (value 0), txlimit 152
    Ethernet0/0/2, addr 00e0.f7d7.cb02 (bia 00e0.f7d7.cb02)
      gfreeq 48000148, lfreeq 48000188 (1536 bytes), throttled 0
      rxlo 4, rxhi 273, rxcurr 0, maxrxcurr 0
      txq 48001A10, txacc 48001A12 (value 0), txlimit 152
    Ethernet0/0/3, addr 00e0.f7d7.cb03 (bia 00e0.f7d7.cb03)
      gfreeq 48000148, lfreeq 48000190 (1536 bytes), throttled 0
      rxlo 4, rxhi 273, rxcurr 0, maxrxcurr 0
      txq 48001A18, txacc 48001A1A (value 0), txlimit 152
(Display text omitted.)
```

For a Catalyst RSM/VIP2, use the **show controllers cbus** command to display all of the current interfaces. Following is an example of the **show controllers cbus** command that shows serial port 0/0 on a one-port PA-E3 installed on a Catalyst RSM/VIP2:

```
router# show controllers cbus

MEMD at 40000000, 2097152 bytes (unused 4288, recarves 1, lost 0)
  RawQ 48000100, ReturnQ 48000108, EventQ 48000110
  BufhdrQ 48000138 (2810 items), LovltrQ 48000150 (20 items, 2016 bytes)
  IpcbufQ 48000160 (32 items, 4096 bytes)
  IpcbufQ_classic 48000158 (8 items, 4096 bytes)
  3570 buffer headers (48002000 - 4800FF10)
  pool0: 9 buffers, 256 bytes, queue 48000140
  pool1: 458 buffers, 1536 bytes, queue 48000148
  pool2: 229 buffers, 4512 bytes, queue 48000168
  pool3: 4 buffers, 4544 bytes, queue 48000170
  slot0: VIP2, hw 2.4, sw 21.40, ccb 5800FF20, cmdq 48000080, vps 8192
    software loaded from system
    IOS (tm) VIP Software (SVIP-DW-M), Version 11.1(16)CA
    ROM Monitor version 17.0
    Ethernet0/0, addr 00e0.f7d7.cb00 (bia 00e0.f7d7.cb00)
      gfreeq 48000148, lfreeq 48000178 (1536 bytes), throttled 0
      rxlo 4, rxhi 273, rxcurr 2, maxrxcurr 4
      txq 48001A00, txacc 48001A02 (value 152), txlimit 152
    Ethernet0/1, addr 00e0.f7d7.cb01 (bia 00e0.f7d7.cb01)
      gfreeq 48000148, lfreeq 48000180 (1536 bytes), throttled 0
      rxlo 4, rxhi 273, rxcurr 0, maxrxcurr 0
      txq 48001A08, txacc 48001A0A (value 0), txlimit 152
    Ethernet0/2, addr 00e0.f7d7.cb02 (bia 00e0.f7d7.cb02)
      gfreeq 48000148, lfreeq 48000188 (1536 bytes), throttled 0
      rxlo 4, rxhi 273, rxcurr 0, maxrxcurr 0
      txq 48001A10, txacc 48001A12 (value 0), txlimit 152
    Ethernet0/3, addr 00e0.f7d7.cb03 (bia 00e0.f7d7.cb03)
      gfreeq 48000148, lfreeq 48000190 (1536 bytes), throttled 0
      rxlo 4, rxhi 273, rxcurr 0, maxrxcurr 0
      txq 48001A18, txacc 48001A1A (value 0), txlimit 152
(Display text omitted.)
```

Note   The slot values displayed by some commands (such as **show diag** and **show controllers cbus**) are not relevant to any physical connection; please disregard these slot values for the Catalyst RSM/VIP2.

For complete command descriptions and examples for the Cisco 7100 series routers, Cisco 7200 series routers, Cisco uBR7200 series routers, the VIP2, and the Catalyst RSM/VIP2, refer to the publications listed in the "Related Documentation" section on page vi.

Using the ping Command to Verify Network Connection

The **ping** command allows you to verify that an interface port is functioning properly and to check the path between a specific port and connected devices at various locations on the network. For example, after you verify that the system and VIP2 have booted successfully and are operational, you can use the **ping** command to verify the status of interface ports. Refer to the publications listed in the "Related Documentation" section on page vi for detailed command descriptions and examples.

The **ping** command sends an echo request out to a remote device at an IP address that you specify. After sending a series of signals, the command waits a specified time for the remote device to echo the signals. Each returned signal is displayed as an exclamation point (!) on the console terminal;

each signal 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 message [timed out] or [failed] indicates that the connection failed.

Following is an example of a successful **ping** command to a remote server with the address 10.0.0.0:

```
router# ping 10.0.0.0 <Return>
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 1.1.1.10, 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 server and that the server is active (powered on), and repeat the **ping** command. Refer to the publications listed in the "Related Documentation" section on page vi for complete descriptions of interface subcommands and the configuration options available for VIP2-related interfaces, and to determine which subcommands and configuration options support VIP2 functionality.

Using the loopback Command to Verify the Physical Interface

Use the **loopback** {**dte** | **local** | **network** {**line** | **payload**} command to troubleshoot the E3 serial port adapter at the physical interface level. The command loops all packets from the E3 interface either back to the interface or from the network back out toward the network. Use the **no** form of the command to remove the loop.

The following examples of the **loopback** {**dte** | **local** | **network** {**line** | **payload**} command configure loopback modes on the single interface (interface 0) of a one-port E3 serial port adapter in port adapter slot 0 of a VIP2 in chassis slot 10 of a Cisco 7500 series router:

- Set the interface into loopback data terminal equipment (DTE) mode as follows:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
router(config)# interface serial 10/0/0
router(config-if)# loopback dte
```

Loopback DTE loops the router output data back toward the router (after the line interface unit).

- Set the interface into local loopback mode as follows:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
router(config)# interface serial 10/0/0
router(config-if)# loopback local
```

Local loopback loops the router output data back toward the router at the framer.

- Set the interface into network line loopback mode as follows:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
router(config)# interface serial 10/0/0
router(config-if)# loopback network line
```

Network line loopback loops the data back toward the network (before the framer).

- Set the interface into network payload loopback mode as follows:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
router(config)# interface serial 10/0/0
router(config-if)# loopback network payload
```

Network payload loopback loops just the payload data back toward the network at the E3 framer.

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