



PA-MC-E3 Multi-Channel E3 Port Adapter Installation and Configuration

Product Number: PA-MC-E3(=)

Platforms Supported: Catalyst 5000 Family Switches with Catalyst RSM/VIP2,
Catalyst 6000 Family Switches with Catalyst 6000 Family FlexWAN Module,
Cisco 7200 Series Routers, Cisco uBR7200 Series Routers, Cisco 7200 VXR Routers,
Cisco 7201 Router, Cisco 7301 Router, Cisco 7304 PCI Port Adapter Carrier Card in the
Cisco 7304 Router, VIP in the Cisco 7000 Series and Cisco 7500 Series Routers

Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
<http://www.cisco.com>
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 527-0883

Text Part Number: OL-3528-05

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Preface

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

- [Document Revision History, page vii](#)
- [Objectives, page vii](#)
- [Organization, page viii](#)
- [Related Documentation, page viii](#)
- [Obtaining Documentation, Obtaining Support, and Security Guidelines, page xi](#)

Document Revision History

The Document Revision History table below, beginning with version OL-3528-05, records technical changes to this document.

Document Version	Date	Change Summary
OL-3528-05	April, 2007	Adds Cisco 7201 router information.

Objectives

This document describes how to install and configure the PA-MC-E3 port adapter (PA-MC-E3), hereafter referred to as the PA-MC-E3, which is used in the following platforms:

- Catalyst 5000 family switches with the Route Switch Module (RSM) second-generation Versatile Interface Processor (VIP2)
- Catalyst 6000 family FlexWAN module in the Catalyst 6000 family switches
- Cisco 7200 series routers and Cisco 7200 VXR routers, consisting of the two-slot Cisco 7202, four-slot Cisco 7204 and Cisco 7204VXR, and the six-slot Cisco 7206 and the Cisco 7206VXR
- Cisco uBR7200 series universal broadband routers, consisting of the three-slot Cisco uBR7223 and the six-slot Cisco uBR7246 and Cisco uBR7246VXR
- Cisco 7201 router
- Cisco 7301 router

- Cisco 7304 PCI Port Adapter Carrier Card in the Cisco 7304 router
- VIP in Cisco 7500 series and Cisco 7000 series routers with the 7000 Series Route Switch Processor (RSP7000) and 7000 Series Chassis Interface (RSP7000CI)

Organization

This document contains the following chapters:

Section	Title	Description
Chapter 1	Overview	Describes the PA-MC-E3 and its LED displays, cables, and receptacles.
Chapter 2	Preparing for Installation	Describes safety considerations, tools required, and procedures you should perform before the actual installation.
Chapter 3	Removing and Installing Port Adapters	Describes the procedures for installing and removing PA-MC-E3 port adapters in the supported platforms.
Chapter 4	Configuring the PA-MC-E3	Provides instructions for configuring the PA-MC-E3 on the supported platforms.

Related Documentation

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

- Cisco IOS software:

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



Note

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

- Catalyst 5000 family switches with RSM/VIP2:
 - For an online directory to quickly access documents for Cisco Catalyst 5000 series switches, refer to the *Cisco Catalyst 5000 Series Switches Install and Upgrade Guides* index at the following URL:
http://www.cisco.com/en/US/products/hw/switches/ps679/prod_installation_guides_list.html
 - For hardware installation and maintenance information, refer to the following documents:
 - *Route Switch Module Catalyst VIP2-15 and VIP2-40 Installation and Configuration Note*
 - *Catalyst 5000 Series Route Switch Module Installation and Configuration Note*
 - The installation and configuration guide and quick start for your Cisco Catalyst 5000 series switch
- Catalyst 6000 family switches with FlexWAN module:
 - For an online directory to quickly access documents for Cisco Catalyst 6000 family switches, refer to the *Cisco Catalyst 6500 Series Switches Documentation Roadmaps* index at the following URL:
http://www.cisco.com/en/US/products/hw/switches/ps708/products_documentation_roadmaps_list.html
 - For hardware installation and maintenance information, refer to the following documents:
 - *Catalyst 6000 Family FlexWAN Module Installation and Configuration Note*
 - The hardware and software publications for your Catalyst 6000 family switch
- Cisco 7000 series routers:
 - For an online directory to quickly access documents for Cisco 7000 series routers, refer to the *Cisco 7000 Series Routers Introduction* index at the following URL:
http://www.cisco.com/en/US/products/hw/routers/ps332/tsd_products_support_eol_series_home.html
 - For hardware installation and maintenance information, refer to the following documents:
 - *Cisco 7000 Hardware Installation and Maintenance* for your router.
 - *Second-Generation Versatile Interface Processor (VIP2) Installation and Configuration*
 - *Fourth-Generation Versatile Interface Processor (VIP4) Installation and Configuration*
 - *Versatile Interface Processor (VIP6-80) Installation and Configuration Guide*
- Cisco 7200 series routers:
 - For an online directory to quickly access documents for Cisco 7200 series routers, refer to the *Cisco 7200 Series Routers Documentation Roadmap* at the following URL:
http://www.cisco.com/en/US/products/hw/routers/ps341/products_documentation_roadmap09186a00801c0915.html
 - For hardware installation and configuration information (including the Cisco 7206 or Cisco 7206VXR as a router shelf in a Cisco AS5800 Universal Access Server), refer to the online installation and configuration guide and quick start for your Cisco 7200 series router.
 - For port adapter hardware and memory configuration guidelines, refer to the *Cisco 7200 Series Port Adapter Hardware Configuration Guidelines*.
 - For information on network processing engines or network services engines, refer to the *Network Processing Engine and Network Services Engine Installation and Configuration* document.

- Cisco 7200 VXR routers:
 - For an online directory to quickly access documents for Cisco 7200 VXR routers, refer to the *Cisco 7200 Series Routers Documentation Roadmap* at the following URL:
http://www.cisco.com/en/US/products/hw/routers/ps341/products_documentation_roadmap09186a00801c0915.html
 - For hardware installation and maintenance information, refer to the *Cisco 7200 VXR Installation and Configuration Guide* or the *Cisco 7200 VXR Routers Quick Start Guide*.
- Cisco uBR7200 series routers:
 - For an online directory to quickly access documents for Cisco uBR7200 Universal Broadband routers, refer to the *Cisco uBR7200 Universal Broadband Router Documentation Roadmap* at the following URL:
http://www.cisco.com/en/US/products/hw/cable/ps2217/products_documentation_roadmap09186a00805e0d0c.html
- Cisco 7201 router:
 - For an online directory to quickly access documents for the Cisco 7201 router, refer to the *Cisco 7201 Router Documentation Roadmap* at the following URL:
http://www.cisco.com/en/US/customer/products/hw/routers/ps341/products_documentation_roadmap09186a00807f635a.html
 - For hardware installation and maintenance information, refer to the *Cisco 7201 Installation and Configuration Guide* or the *Cisco 7201 Router Quick Start Guide*.
- Cisco 7301 router:
 - For an online directory to quickly access documents for the Cisco 7301 router, refer to the *Cisco 7301 Internet Router Documentation Roadmap* at the following URL:
http://www.cisco.com/en/US/products/hw/routers/ps352/products_documentation_roadmap09186a00801c0f21.html
 - For hardware installation and maintenance information, refer to the *Cisco 7301 Installation and Configuration Guide* or the *Cisco 7301 Router Quick Start Guide*.
- Cisco 7304 PCI port adapter carrier card in Cisco 7304 router:
 - For an online directory to quickly access documents for the Cisco 7304 PCI Port Adapter Carrier Card in the Cisco 7301 router, refer to the *Cisco 7304 Router Line Card, Carrier Card, Port Adapter, Modular Services Card, and Shared Port Adapter Documentation Roadmap* at the following URL:
http://www.cisco.com/en/US/products/hw/routers/ps352/products_documentation_roadmap09186a00801c0f5e.html
 - For hardware installation and maintenance information, refer to the *Cisco 7304 PCI Port Adapter Carrier Card Installation and Configuration Guide*.

- Cisco 7500 series routers:
 - For an online directory to quickly access documents for the Cisco 7500 series routers, refer to the *Cisco 7500 Series Routers Documentation Roadmap* at the following URL:
http://www.cisco.com/en/US/products/hw/routers/ps359/products_documentation_roadmap09186a00801c0f9b.html
 - For hardware installation and maintenance information, refer to the following documents:
 - *Cisco 7500 Series Installation and Configuration Guide* or the quick start for your Cisco 7500 series router.
 - *Second-Generation Versatile Interface Processor (VIP2) Installation and Configuration*
 - *Fourth-Generation Versatile Interface Processor (VIP4) Installation and Configuration*
 - *Versatile Interface Processor (VIP6-80) Installation and Configuration Guide*
- For international agency compliance, safety, and statutory information for WAN interfaces, refer to the following documents. Use the documentation roadmap for your particular router to link to the appropriate documents for your router:
 - *Regulatory Compliance and Safety Information for the Catalyst 5000 Family Switches*
 - *Regulatory Compliance and Safety Information for the Catalyst 6000 Family Switches*
 - *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 uBR7200 Series Universal Broadband Routers*
 - *Regulatory Compliance and Safety Information for the Cisco 7301 Internet Router*
 - *Regulatory Compliance and Safety Information for the Cisco 7304 Internet Router*
 - *Regulatory Compliance and Safety Information for the Cisco 7500 Series Routers*

Obtaining Documentation, Obtaining Support, and Security Guidelines

For information on obtaining documentation, obtaining support, providing documentation feedback, security guidelines, and also recommended aliases and general Cisco documents, see the monthly What's New in Cisco Product Documentation, which also lists all new and revised technical documentation at:

<http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html>



CHAPTER 1

Overview

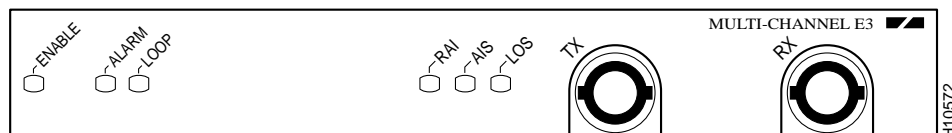
This chapter describes the PA-MC-E3 multi-channel E3 port adapter. This chapter contains the following sections:

- [Port Adapter Overview, page 1-1](#)
- [Configuration Options, page 1-2](#)
- [PA-MC-E3 LEDs, page 1-3](#)
- [Cables, Connectors, and Pinouts, page 1-5](#)
- [Port Adapter Slot Locations on the Supported Platforms, page 1-6](#)
- [Identifying Interface Addresses, page 1-14](#)

Port Adapter Overview

The PA-MC-E3 provides one multi-channel E3, medium-speed serial interface. (See [Figure 1-1](#).)

Figure 1-1 PA-MC-E3 Port Adapter—Faceplate View



The physical E3 link on the PA-MC-E3 port adapter consists of two female BNC connectors, one for receive (RX) and one for transmit (TX). You must use 75-ohm coaxial interface cables with male BNC connectors to connect the PA-MC-E3 interface with external E3 equipment. (For cable information, refer to the [“Cables, Connectors, and Pinouts”](#) section on page 1-5.)

The PA-MC-E3 divides the E3 signal stream into four multi-channel E2 data channels and then into 16 E1 lines. The E3 is designed to comply with the CCITT/ITU G.703 physical layer standard. E3 provides access to services at E3 (34.368 Mbps) data rates, transferring data bidirectionally. (The actual data rate depends on your configuration of the E1 lines.)

The PA-MC-E3 is also designed to comply with CCITT/ITU G.751 for E3, G.742 for E2, and G.704 and G.706 for E1 fault and alarm detection and response actions. Aggregation of multiple E1 lines for higher speed, called inverse multiplexing or bonding, is not supported in hardware, however Cisco IOS software supports features such as CEF and MLPPP that allow users to achieve equivalent functionality.

In addition to fault and alarm detection, the PA-MC-E3 provides SNMP support for status monitoring and statistics reporting. (The SNMP support includes RFC 1406 for E1 and RFC 1407 for E3.) The E3 signal stream uses HDB3 line code. The E3 physical layer alarms are processed and responded to according to CCITT/ITU G.751. (This is also true for E1 lines.) You can configure the source of the transmit clock to be either from an internal oscillator or recovered from the received E1 and E3 signals.

**Caution**

To prevent potential system problems related to setting a clock source, we strongly recommend that you refer to the [“Software and Hardware Requirements” section on page 2-2](#).

Configuration Options

The 16 E1 lines (1–16) have the following four configuration options:

- **Channelized E1**—Any of the 16 E1 lines can be configured as channelized E1 lines, but you are limited to a total of 128 logical channels. You can group the time slots in these E1 lines into several individual logical channel groups, each of which carries data with different data link layer protocol encapsulations. You can configure timeslot 16 as a data channel, although it is typically used for common channel signaling. (Channel associated signaling (CAS) for voice channels and E1 Facilities Data Link [FDL] on timeslot 16 are not supported.)

Each logical channel group can be composed of individual 64-kbps timeslots and/or ranges of timeslots, for example, 1,9,12–14. Each logical channel group can contain from 1–31 timeslots maximum; the same timeslot cannot be used in more than one logical channel group. Any unused timeslots are filled with programmable idle-channel data.

- **PRI ISDN E1**—Any of the E1 lines can be configured to support the PRI ISDN application. You assign a PRI group to the E1 line. Each PRI group can contain from 1–31 timeslots maximum. It is not necessary to allocate all 30 timeslots for the ISDN application. Timeslot 16 is used for common channel signaling. Any unused timeslot are filled with programmable idle-channel data.
- **Fractional E1**—Any of the 16 E1 lines can be configured as fractional E1 lines, each of which can be either E1 frames or E1 cyclic redundancy check (CRC) multiframes, as specified by CCITT/ITU G.704 and G.706. A fractional E1 line is a subset of the full E1 bandwidth, which uses $n \times 64$ kbps; where n is a timeslot in the range of 1–31.

Fractional E1 lines contain only a single logical channel group that can be either a single 64-kbps timeslot or a range of timeslots; for example timeslot 1, or timeslots 15–23. Any unused timeslots are filled with programmable idle-channel data.

**Note**

If you assign only one channel group to an E1 line, it is a fractional E1 line.
If you assign more than one channel group to an E1 line, it is a channelized E1 line.

- **Unframed E1**—Any of the 16 E1 lines can be configured as unframed E1 data lines. Each unframed E1 line contains no framing overhead and is not timeslot divided.

Example configurations would include the following:

1. A maximum of 16 channelized E1 lines.
2. A maximum of 16 PRI ISDN E1 lines. Not all the PRI will support 30 B-channels. See the following note for details.
3. A maximum of 16 fractional E1 lines.

4. A maximum of 16 unframed E1 lines.
5. Combinations of 1 through 4.

**Note**

For PRI ISDN configurations, each timeslot you assign to a PRI group for a configured E1 line, including each timeslot within a range of timeslots, uses one of the 128 available logical channels. For example, if you assign the range of timeslots 1–31 to a PRI group, then 31 logical channels are used (30 B-channels plus the D-channel), whereas if you assign just 1–15 to a PRI group, only 16 timeslots are used.

For channelized, fractional, and unframed configurations each configured channel group, which might contain individual timeslots and/or ranges of timeslots, uses only one of the 128 available logical channels. For example, if you assign the range of timeslots 3–7 to a channel group, only one logical channel is used. Likewise, if you assign just timeslot 3 to a channel group, only one logical channel is used.

The channelized E1 portion of the port adapter contains onboard E1 bit error rate test (BERT) circuitry. With this, the port adapter software can send and detect a programmable pattern that is compliant with CCITT/ITU O.151, O.152, and O.153 pseudo-random and repetitive test patterns. The BER test functionality is configurable to any of the E1 lines. (For specific BER testing configuration information, see the [“Configuring a BERT on an E1 Line”](#) section on page 4-16.)

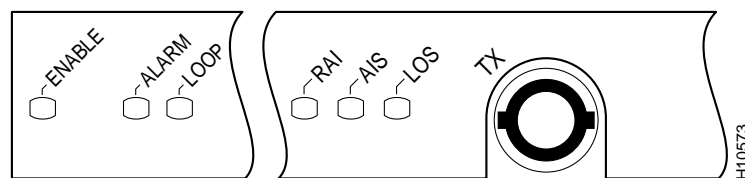
**Note**

Onboard E3 BER testing is not supported.

PA-MC-E3 LEDs

The PA-MC-E3 has five status LEDs and one ENABLED LED. See [Figure 1-2](#).

Figure 1-2 PA-MC-E3 LEDs—Partial Horizontal View



After system initialization, the green enable LED goes on to indicate that the port adapter has been enabled for operation.

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

- The PA-MC-E3 is correctly connected to and receiving power from one of the following:
 - The VIP motherboard in a Cisco 7000 series router or Cisco 7500 series router
 - The Catalyst 6000 family FlexWAN module in a Catalyst 6000 family switch
 - The Catalyst RSM/VIP2 motherboard in a Catalyst 5000 family switch
 - Cisco 7304 PCI Port Adapter Carrier Card in a 7304 router
 - The midplane in a Cisco 7200 series router, Cisco 7200 VXR router, Cisco uBR7200 series router, Cisco 7201 router, or Cisco 7301 router

- The bus recognizes the PA-MC-E3-equipped VIP, Catalyst RSM/VIP2, Catalyst 6000 family FlexWAN module, Cisco 7304 PCI Port Adapter Carrier Card, or the PA-MC-E3 in a Cisco 7200 series router, Cisco 7200 VXR router, Cisco uBR7200 series router, Cisco 7201 router, or Cisco 7301 router.

If either one of the preceding conditions is not met, or if the initialization fails for other reasons, the enable LED does not go on.

Table 1-1 lists LED colors and indications.

Table 1-1 PA-MC-E3 LEDs

LED Label	Color	State	Meaning
ENABLED	Green	On	Port adapter is enabled for operation.
ALARM	Red	On	Alarm condition is received on any configured E1 line or the E3 link. Alarms on unconfigured or unframed E1 lines are not included. The alarms include E1 loss of frame (LOF), E1 alarm indication signal (AIS), E1 remote alarm indication (RAI) signal, E3 loss of signal (LOS), E3 AIS, and an E3 RAI. This LED also blinks momentarily during port adapter initialization. If the blinking continues for an extended time, it indicates a port adapter boot failure
LOOP	Yellow	On	Indicates that an E1 line or the E3 link is in a loopback state and is, therefore, not enabled for normal data traffic.
RAI	Yellow	On	Indicates a remote alarm indication (also called the <i>far end alarm</i> and <i>distant alarm</i> for E3 links) is sent by the remote end of the E3 link to indicate a failure at the remote end of the E3 link. (This LED operates in conjunction with the alarm LED.)
AIS	Red	On	Indicates that an alarm indication signal is received on the E3 link. The AIS is an unframed all-ones (1s) signal. (This LED operates in conjunction with the alarm LED.)
LOS	Red	On	Indicates a loss of signal alarm occurs and is detected by the line interface unit (LIU) on the port adapter. This signal indicates a loss of the received signal on the E3 link. (This LED operates in conjunction with the alarm LED.)



Note

In addition to the interface status information provided by the LEDs, you can also retrieve detailed interface status information through either the router's console port or via Simple Network Management Protocol (SNMP).

Cables, Connectors, and Pinouts

The interface connectors on the PA-MC-E3 are coaxial BNC types, with one connector and cable for transmit (TX) and one for receive (RX). The BNC connectors are transformer coupled to the PA-MC-E3 line interface unit (LIU), which is the analog physical interface on the PA-MC-E3.

The pinout and signal descriptions for the BNC connectors on the PA-MC-E3 are as follows:

- **Transmit (TX)**—Transmitted signals appear on the center contact and the outer shield is ground for the 75-ohm coaxial cable you attach to the TX BNC connector.
- **Receive (RX)**—Received signals appear on the center contact, and the outer shield is ground, for the 75-ohm coaxial cable you attach to the RX BNC connector. The PA-MC-E3 contains an internal strapping option that you can remove if you require isolation between the receive connection outer shield and ground.



Caution

To prevent problems, you *must* check your 75-ohm coaxial cable specifications when long cable lengths are required to connect the PA-MC-E3 to your external E3 equipment. Your coaxial cable's loss must be less than 12 dB at 17.184 MHz, when using maximum cable lengths. Ideally, the maximum cable length for unbalanced, 75-ohm coaxial cable is 1,300 feet (396.2 meters).

You must install a ferrite sleeve (also called a *common-mode choke*) on each 75-ohm coaxial cable to reduce the effects of electromagnetic interference (EMI). (Cisco Systems supplies two ferrite sleeves with the PA-MC-E3; one ferrite sleeve for each of the two 75-ohm coaxial cables you must attach to the PA-MC-E3.)



Note

Attach the ferrite sleeve on the end of each coaxial cable, nearest the PA-MC-E3, as close to the BNC connector as possible. (See [Figure 1-3](#).)



Caution

The ferrite sleeve prevents electromagnetic interference (EMI) from affecting the E3-equipped system and is a required component for proper system operation.

Figure 1-3 Attaching the Ferrite Sleeve around a Coaxial Cable

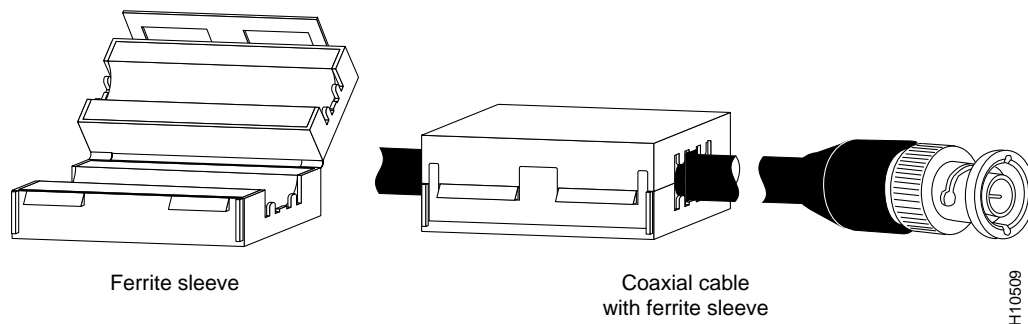
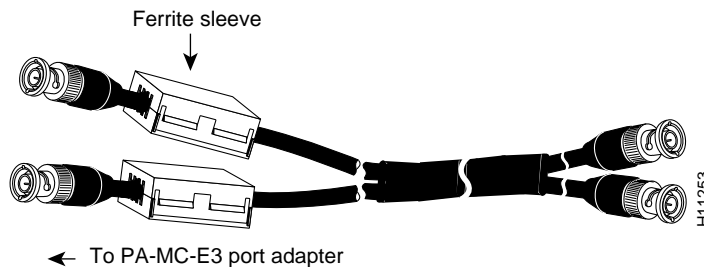


Figure 1-4 shows the typical 75-ohm coaxial cable pair that you supply and should use with the PA-MC-E3. Use only this type of coaxial cable pair for PA-MC-E3 connections. Use one 75-ohm, RG-59 coaxial cable for each PA-MC-E3 connection: RX and TX.

Figure 1-4 75-Ohm, RG-59 Coaxial Cable Pair with Ferrite Sleeves Attached

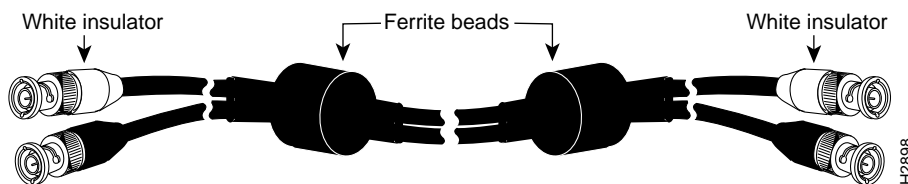


Note

We strongly recommend that you fasten together your transmit and receive cables along their entire length, as shown in Figure 1-4. Doing so reduces the effects of EMI. You can use standard heat-activated shrink tubing or cable ties for this purpose.

You can also order from Cisco Systems a 75-ohm coaxial cable pair with ferrite beads attached (as Cisco Product Number CAB-ATM-DS3/E3—see Figure 1-5). This 75-ohm coaxial cable pair is *not* available from outside commercial cable vendors.

Figure 1-5 CAB-ATM-DS3/E3 Cable—75-Ohm, RG-59 Coaxial Cable with BNC Connectors



Port Adapter Slot Locations on the Supported Platforms

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

- [Catalyst RSM/VIP2 Slot Numbering, page 1-7](#)
- [Catalyst 6000 Family FlexWAN Module Slot Numbering, page 1-7](#)
- [Cisco 7100 Series Routers Slot Numbering, page 1-8](#)
- [Cisco 7200 Series Routers and Cisco 7200 VXR Routers Slot Numbering, page 1-9](#)
- [Cisco uBR7200 Series Router Slot Numbering, page 1-10](#)
- [Cisco 7201 Router Slot Numbering, page 1-11](#)
- [Cisco 7301 Router Slot Numbering, page 1-11](#)
- [Cisco 7304 PCI Port Adapter Carrier Card Slot Numbering, page 1-12](#)
- [Cisco 7000 Series Routers and Cisco 7500 Series Routers VIP Slot Numbering, page 1-13](#)

Catalyst RSM/VIP2 Slot Numbering

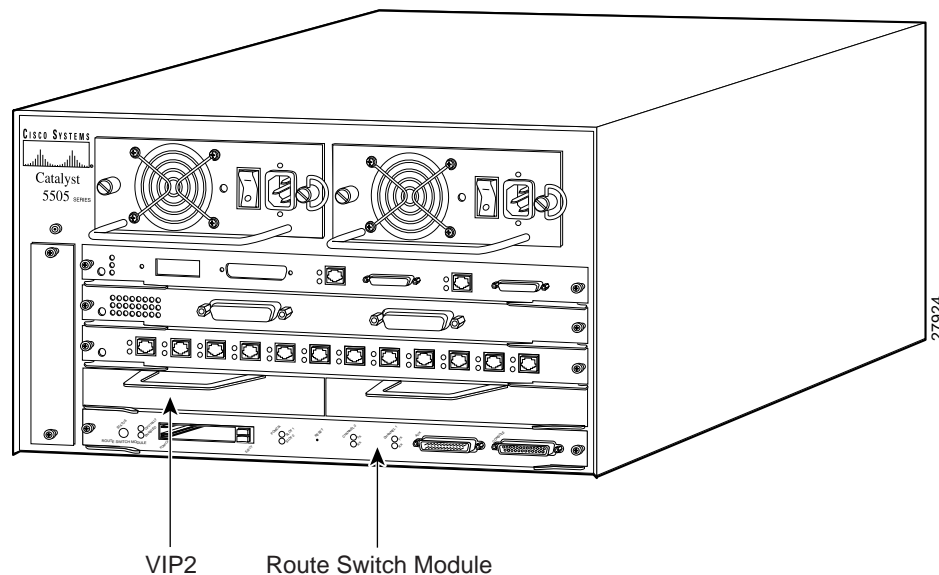
The Catalyst RSM/VIP2 can be installed in any slot in a Catalyst 5000 family switch except the top slots, which contain the supervisor engine modules. The Catalyst RSM/VIP2 does not use interface processor slot numbering; therefore, the slots in which it is installed are not numbered. Port adapters can be installed into either port adapter slot 0 or slot 1 on a Catalyst RSM/VIP2. [Figure 1-6](#) shows a Catalyst RSM/VIP2 with two port adapters installed.



Note

The Catalyst 5500 switch has 13 slots. Slot 1 is reserved for the supervisor engine module. If a redundant supervisor engine module is used, it would go in slot 2; otherwise, slot 2 can be used for other modules. Slot 13 is a dedicated slot, reserved for the ATM Switch Processor module. Refer to the *Catalyst 5000 Series Route Switch Module Installation and Configuration Note* for any additional slot restrictions for the Catalyst RSM/VIP2.

Figure 1-6 Catalyst 5000 Family Switch with Port Adapters Installed on Catalyst RSM/VIP2



Catalyst 6000 Family FlexWAN Module Slot Numbering

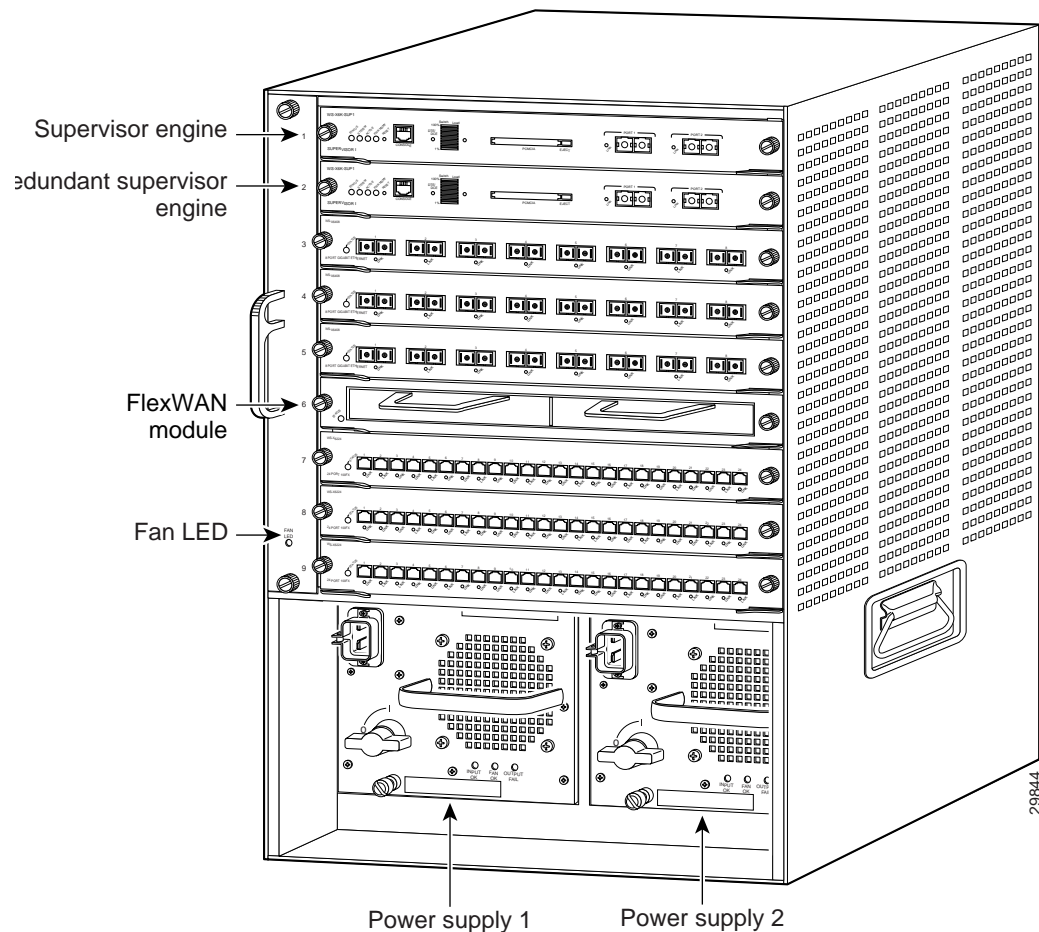
The Catalyst 6000 family FlexWAN module can be installed in any slot in a Catalyst 6000 family switch except slot 1, which is reserved for the supervisor engine. Port adapters can be installed into either port adapter bay 0 or bay 1 on a FlexWAN module. [Figure 1-7](#) shows a FlexWAN module with two blank port adapters installed.



Note

Slot 1 is reserved for the supervisor engine. If a redundant supervisor engine is used, it would go in slot 2; otherwise, slot 2 can be used for other modules.

Figure 1-7 Catalyst 6000 Family Switch with Port Adapters Installed on FlexWAN Module



Cisco 7100 Series Routers Slot Numbering

Port adapters 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 1-8](#) shows the slot numbering on a Cisco 7120 series router.

[Figure 1-9](#) shows the slot numbering on a Cisco 7140 series router.

Figure 1-8 Port Adapter Slots in the Cisco 7120 Series Router

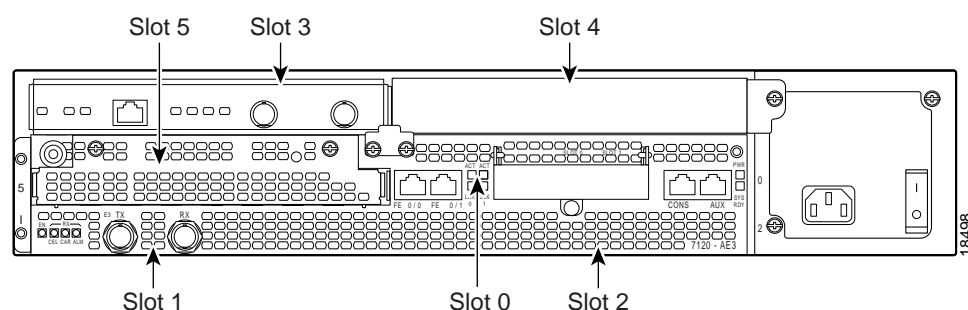
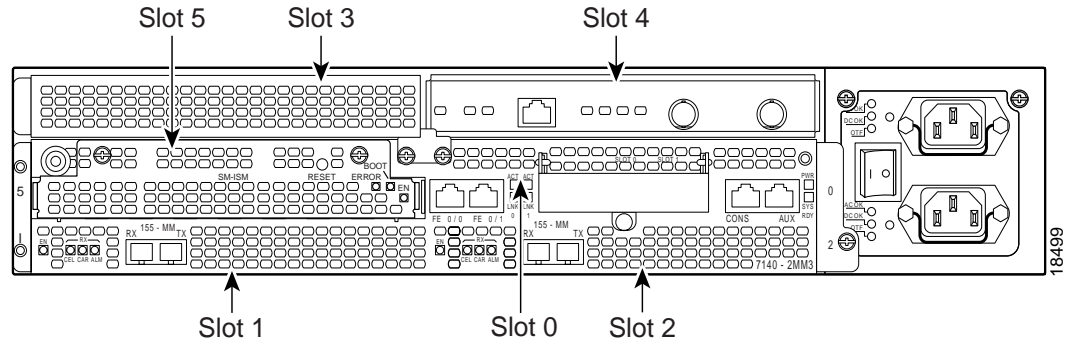


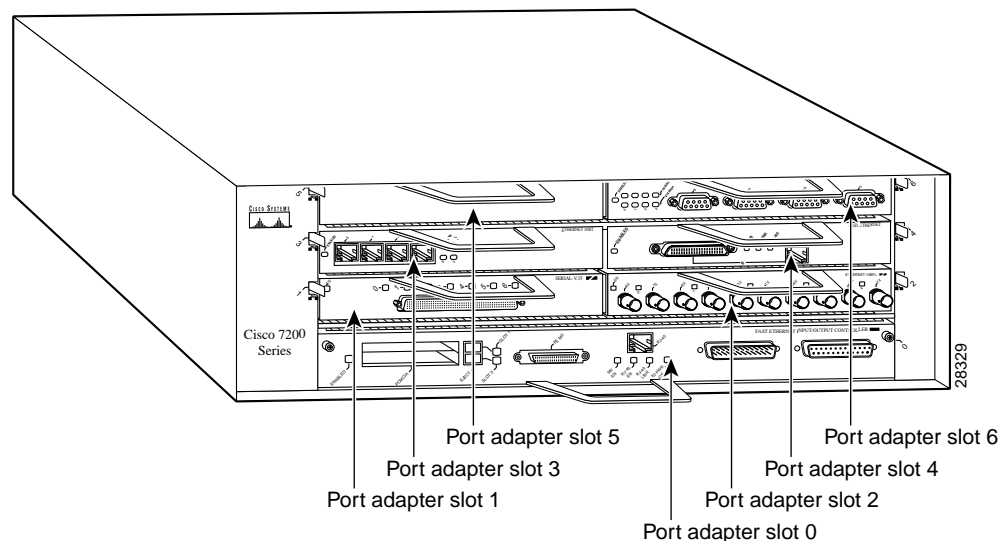
Figure 1-9 Port Adapter Slots in the Cisco 7140 Series Router

Cisco 7200 Series Routers and Cisco 7200 VXR Routers Slot Numbering

Cisco 7202 routers have two port adapter slots. The slots are numbered from left to right. You can place a port adapter in either of the slots (slot 1 or slot 2). The Cisco 7202 router is not shown.

Cisco 7204 routers and Cisco 7204VXR routers have four slots for port adapters, and one slot for an input/output (I/O) controller. The slots are numbered from the lower left to the upper right, beginning with slot 1 and continuing through slot 4. You can place a port adapter in any of the slots (slot 1 through slot 4). Slot 0 is always reserved for the I/O controller. The Cisco 7204 router and Cisco 7204VXR are not shown.

Cisco 7206 routers and Cisco 7206VXR routers (including the Cisco 7206 and Cisco 7206VXR routers as router shelves in a Cisco AS5800 Universal Access Server) have six slots for port adapters, and one slot for an input/output (I/O) controller. The slots are numbered from the lower left to the upper right, beginning with slot 1 and continuing through slot 6. You can place a port adapter in any of the six slots (slot 1 through slot 6). Slot 0 is always reserved for the I/O controller. [Figure 1-10](#) shows the slot numbering on a Cisco 7206 router. The Cisco 7206VXR router is not shown.

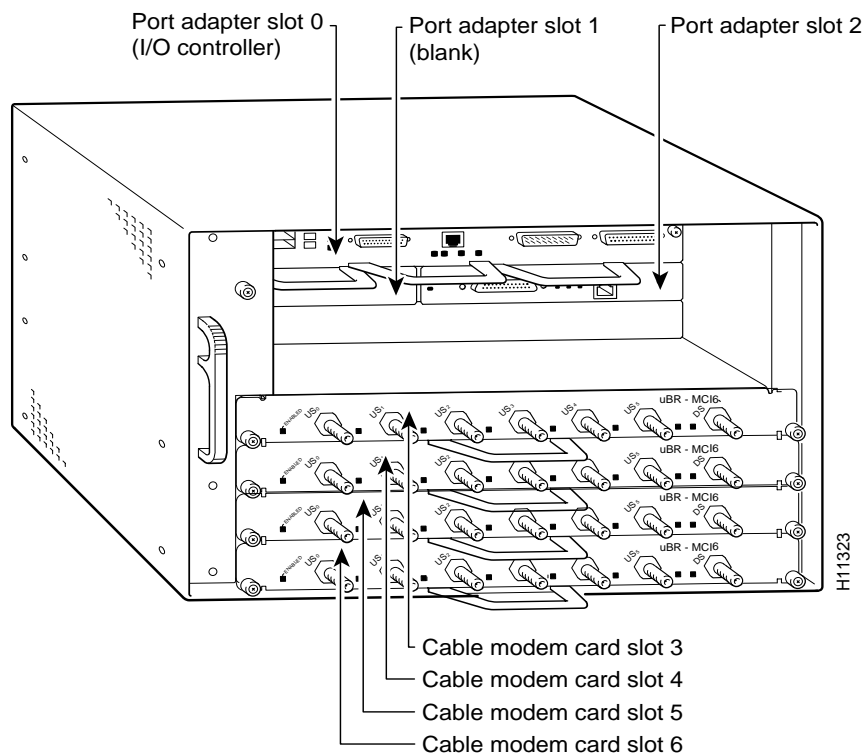
Figure 1-10 Port Adapter Slots in the Cisco 7206 Router

Cisco uBR7200 Series Router Slot Numbering

The Cisco uBR7223 router has one port adapter slot (slot 1). Slot 0 is always reserved for the I/O controller—if present. The Cisco uBR7223 router is not shown.

The Cisco uBR7246 router and Cisco uBR7246VXR router have two port adapter slots (slot 1 and slot 2). Slot 0 is always reserved for the I/O controller—if present. [Figure 1-11](#) shows the slot numbering of port adapters on a Cisco uBR7246 router or Cisco uBR7246VXR router.

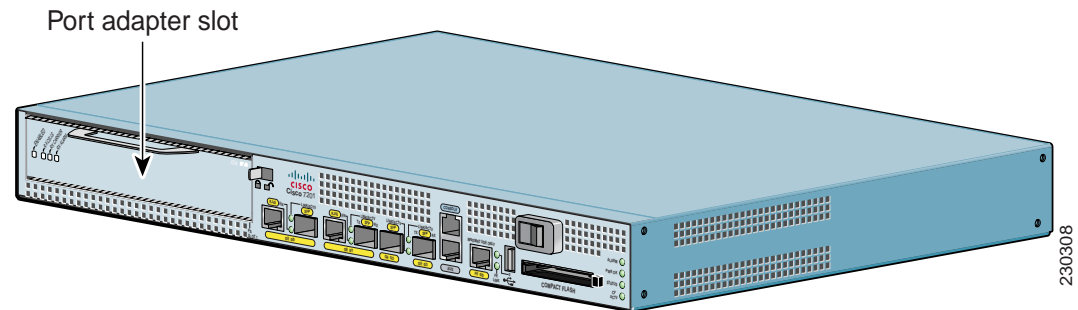
Figure 1-11 Port Adapter Slots in the Cisco uBR7246 and Cisco uBR7246VXR Routers



Cisco 7201 Router Slot Numbering

Figure 1-12 shows the front view of a Cisco 7201 router with a port adapter installed. There is only one port adapter slot (slot 1) in a Cisco 7201 router.

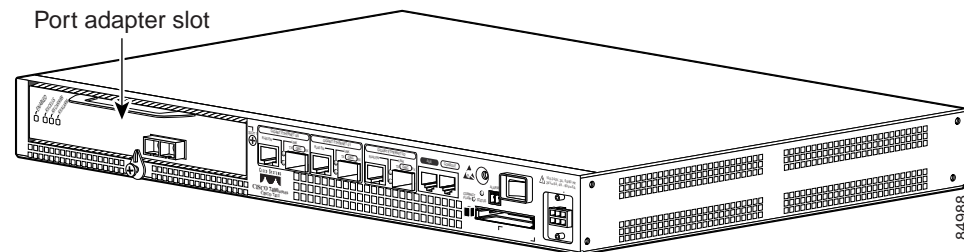
Figure 1-12 Port Adapter Slot in the Cisco 7201 Router



Cisco 7301 Router Slot Numbering

Figure 1-13 shows the front view of a Cisco 7301 router with a port adapter installed. There is only one port adapter slot (slot 1) in a Cisco 7301 router.

Figure 1-13 Port Adapter Slot in the Cisco 7301 Router



Cisco 7304 PCI Port Adapter Carrier Card Slot Numbering

The Cisco 7304 PCI port adapter carrier card installs into Cisco 7304 router module slots 2 through 5. [Figure 1-14](#) shows a Cisco 7304 PCI port adapter carrier card with a port adapter installed. The Cisco 7304 PCI port adapter carrier card accepts one single-width port adapter. [Figure 1-15](#) shows the module slot numbering on a Cisco 7304 router. The port adapter slot number is the same as the module slot number. Slot 0 and slot 1 are reserved for the NPE module or NSE module.

Figure 1-14 Cisco 7304 PCI Port Adapter Carrier Card—Port Adapter Installed

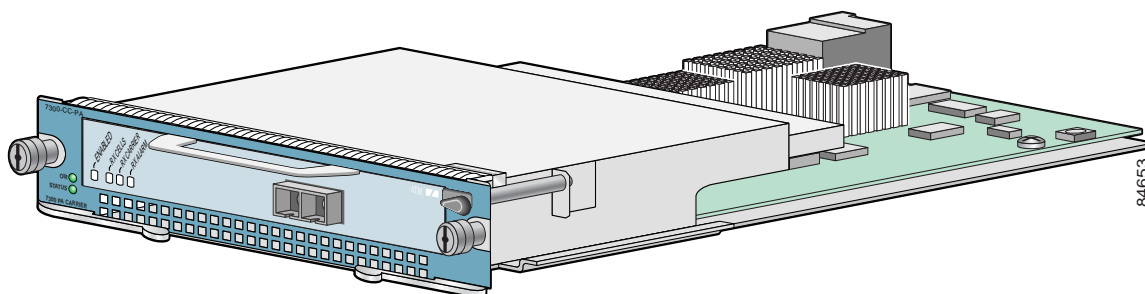
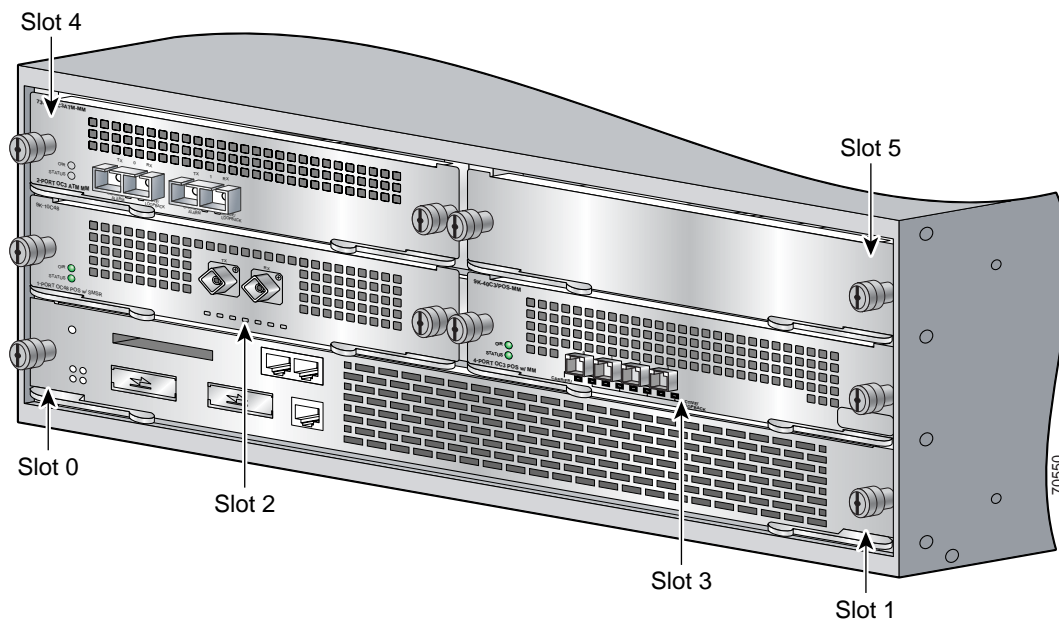


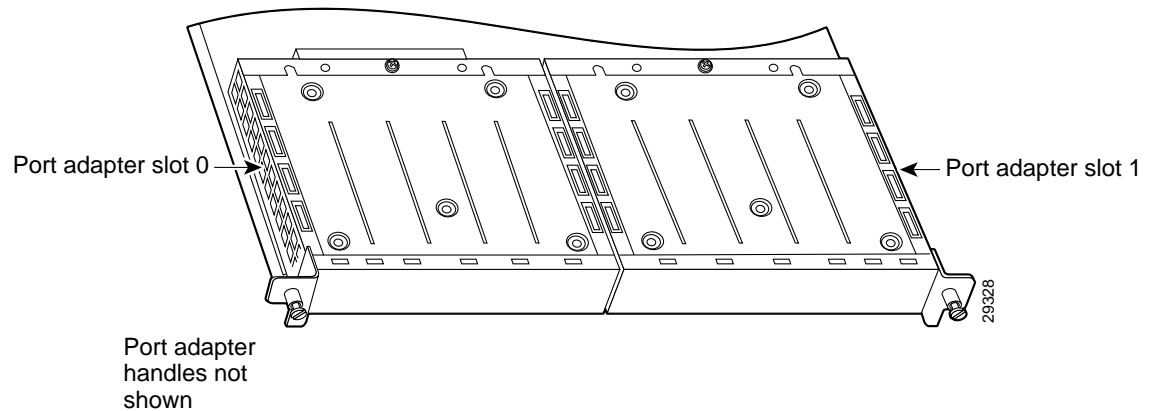
Figure 1-15 Module Slots on the Cisco 7304 Router



Cisco 7000 Series Routers and Cisco 7500 Series Routers VIP Slot Numbering

Port adapters are supported on the VIPs (versatile interface processors) used in Cisco 7000 series and Cisco 7500 series routers. In the Cisco 7010 router and Cisco 7505 router, the VIP motherboard is installed horizontally in the VIP slot. In the Cisco 7507 router and Cisco 7513 router, the VIP motherboard is installed vertically in the VIP slot. The port adapter can be installed in either bay (port adapter slot 0 or 1) on the VIP. The bays are numbered from left to right on the VIP. [Figure 1-16](#) shows the slot numbering on a VIP.

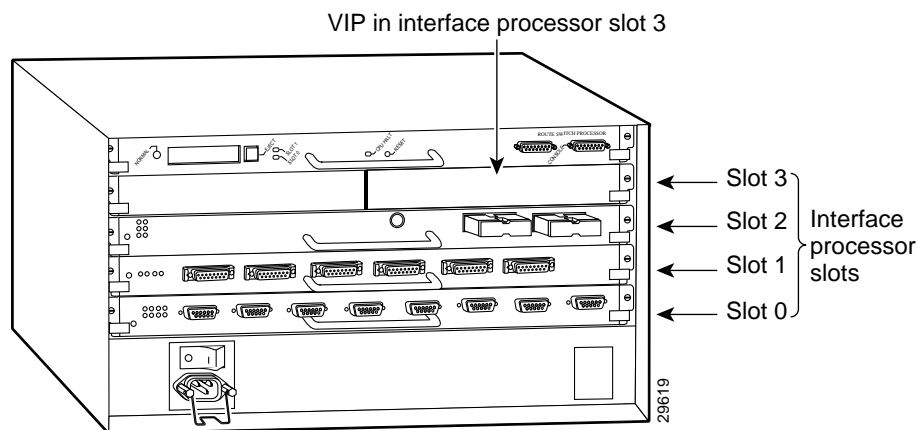
Figure 1-16 VIP Slot Locations



Cisco 7010 routers have three slots for port adapters, and two slots for Route Switch Processors (RSPs). The slots are numbered from bottom to top. You can place the port adapter in any of the VIP interface slots (slot 0 through 2). Slots 3 and 4 are always reserved for RSPs. The Cisco 7010 router is not shown.

Cisco 7505 routers have four slots for port adapters, and one slot for an RSP. The slots are numbered from bottom to top. You can place the port adapter in any of the VIP interface slots (slot 0 through 3). One slot is always reserved for the RSP. [Figure 1-17](#) shows the slot numbering on a Cisco 7505 router.

Figure 1-17 VIP Slots in the Cisco 7505 Router



Cisco 7507 routers have five slots for port adapters, and two slots for RSPs. The slots are numbered from left to right. You can place the port adapters in any of the VIP interface slots (slot 0, 1, 4, 5, or 6). Slots 2 and 3 are always reserved for RSPs. The Cisco 7507 router is not shown.

Cisco 7513 routers have eleven slots for port adapters, and two slots for RSPs. The slots are numbered from left to right. You can place the port adapter in any of the VIP interface slots (slots 0 through 5, or slots 9 through 12). Slots 6 and 7 are always reserved for RSPs. The Cisco 7513 router is not shown.

Identifying Interface Addresses

This section describes how to identify interface addresses for the PA-MC-E3 in supported platforms. Interface addresses specify the actual physical location of each interface on a router or switch.

Interfaces on a PA-MC-E3 installed in a router maintain the same address regardless of whether other port adapters are installed or removed. However, when you move a port adapter to a different slot, the first number in the interface address changes to reflect the new port adapter slot number.

Interfaces on a PA-MC-E3 installed in a VIP or FlexWAN module maintain the same address regardless of whether other interface processors or modules are installed or removed. However, when you move a VIP or FlexWAN module to a different slot, the interface processor or module slot number changes to reflect the new interface processor or module slot.



Note

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

The following subsections describe the interface address formats for the supported platforms:

- [Catalyst RSM/VIP2 Interface Addresses, page 1-15](#)
- [Catalyst 6000 Family FlexWAN Module Interface Addresses, page 1-16](#)
- [Cisco 7200 Series Routers and Cisco 7200 VXR Routers Interface Addresses, page 1-16](#)
- [Cisco uBR7200 Series Routers Interface Addresses, page 1-17](#)
- [Cisco 7201 Router Interface Addresses, page 1-17](#)
- [Cisco 7301 Router Interface Addresses, page 1-17](#)
- [Cisco 7304 PCI Port Adapter Carrier Card Interface Addresses, page 1-17](#)
- [Cisco 7000 Series Routers and Cisco 7500 Series Routers VIP Interface Addresses, page 1-18](#)

[Table 1-2](#) summarizes the interface address formats for the supported platforms.

Table 1-2 **Identifying Interface Addresses**

Platform	Interface Address Format	Numbers	Syntax
Catalyst RSM/VIP2 in Catalyst 5000 family switches	Port-adapter-slot-number/interface-port-number	Port adapter slot—always 0 or 1 Interface port—0	0/0
Catalyst 6000 family FlexWAN module in Catalyst 6000 family switches	Module-slot-number/port-adapter-bay-number/interface-port-number	Module slot—2 ¹ through 13 (depends on the number of slots in the switch) Port adapter bay— 0 or 1 Interface port—0	3/0/0

Table 1-2 *Identifying Interface Addresses (continued)*

Platform	Interface Address Format	Numbers	Syntax
Cisco 7200 series routers and Cisco 7200 VXR routers	Port-adapter-slot-number/interface-port-number	Port adapter slot—1 through 6 (depends on the number of slots in the router) ² Interface port—0	1 / 0
Cisco uBR7223 router	Port-adapter-slot-number/interface-port-number	Port adapter slot—always 1 ² Interface port—0	1 / 0
Cisco uBR7246 and Cisco uBR7246VXR routers	Port-adapter-slot-number/interface-port-number	Port adapter slot—always 1 or 2 ² Interface port—0	1 / 0
Cisco 7201 router	Port-adapter-slot-number/interface-port-number	Port adapter slot—always 1 Interface port—0	1 / 0
Cisco 7301 router	Port-adapter-slot-number/interface-port-number	Port adapter slot—always 1 Interface port—0	1 / 0
Cisco 7304 PCI Port Adapter Carrier Card in Cisco 7304 routers	Module-slot-number/interface-port-number	Module slot— 2 through 5 Interface port—0	3 / 0
VIP in Cisco 7000 series or Cisco 7500 series routers	Interface-processor-slot-number/port-adapter-slot-number/interface-port-number	Interface processor slot—0 through 12 (depends on the number of slots in the router) Port adapter slot— 0 or 1 Interface port—0	3 / 1 / 0

1. Slot 1 is reserved for the supervisor engine. If a redundant supervisor engine is used, it must go in slot 2; otherwise, slot 2 can be used for other modules.
2. Port adapter slot 0 is reserved for the Fast Ethernet port on the I/O controller (if present).

Catalyst RSM/VIP2 Interface Addresses

In Catalyst 5000 family switches, the Catalyst RSM/VIP2 can be installed in any slot except the top slots, which contain the supervisor engine modules. The Catalyst RSM/VIP2 in a Catalyst 5000 family switch does not use interface processor slot numbering; therefore, the slots in which it is installed are not numbered. A port adapter can be installed into either port adapter slot 0 or slot 1 on a Catalyst RSM/VIP2. See [Figure 1-6](#).

The interface address is composed of a two-part number in the format *port-adapter-slot number/interface-port number*. See [Table 1-2](#). For example, if a single-port PA-MC-E3 is installed in port adapter slot 1 of a Catalyst RSM/VIP2 in a Catalyst 5000 family switch, the interface address would be 1/0.

Catalyst 6000 Family FlexWAN Module Interface Addresses

In Catalyst 6000 family switches, the Catalyst 6000 family FlexWAN module can be installed in module slots 2 through 13 (depending on the number of slots in the router). Slot 1 is reserved for the supervisor engine. A port adapter can be installed into either port adapter bay 0 or bay 1 on a FlexWAN module. See [Figure 1-7](#).

The interface address is composed of a three-part number in the format *module-number/port-adapter-bay-number/interface-port-number*. See [Table 1-2](#).

The first number identifies the module slot of the chassis in which the FlexWAN module is installed (slot 2 through slot 3, 6, 9, or 13 depending on the number of slots in the chassis). These module slots are generally numbered from top to bottom, starting with 1.

The second number identifies the bay of the FlexWAN module in which the port adapter is installed (0 or 1). The bays are numbered from left to right on the FlexWAN module.

The third number identifies the physical port number on the port adapter. The PA-MC-E3 port adapter is a single-port port adapter, therefore the port is always 0.

For example, if the FlexWAN module is inserted in module slot 3, then the interface address of the port adapter is 3/0/0 (module slot 3, port adapter bay 0, and interface 0). If the port adapter is in port adapter bay 1 on the FlexWAN module, this same interface address would be numbered 3/1/0. If you remove the FlexWAN module with the port adapter from module slot 3 and install it in module slot 6, the interface address becomes 6/0/0.

**Note**

The FlexWAN module physical port address uses a zero- (0-) based port address, which differs from the conventional Catalyst 6000 family one- (1-) based port address.

Cisco 7200 Series Routers and Cisco 7200 VXR Routers Interface Addresses

In Cisco 7200 series routers and Cisco 7200 VXR routers, port adapter slots are numbered from the lower left to the upper right, beginning with slot 1 and continuing through 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. A port adapter can be installed in any available port adapter slot from 1 through 6 (depending on the number of slots in the router). (Slot 0 is reserved for the I/O controller.) See [Figure 1-10](#).

The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See [Table 1-2](#). For example, if a single-port PA-MC-E3 is installed in slot 1 of a Cisco 7200 series router, the interface address would be 1/0. If a single-port PA-MC-E3 is installed in slot 4, the interface address would be 4/0.

Cisco uBR7200 Series Routers Interface Addresses

In the Cisco uBR7223 router, only one slot accepts port adapters and it is numbered slot 1.

In the Cisco uBR7246 router and Cisco uBR7246VXR router, port adapters can be installed in two port adapter slots (slot1 and slot 2). Slot 0 is always reserved for the I/O controller—if present. See [Figure 1-11](#).

The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See [Table 1-2](#). For example, if a single-port port adapter is installed in slot 1 of a Cisco uBR7223 series router, the interface addresses would be 1/0. If the single-port port adapter were installed in slot 2 of a Cisco uBR7246 or Cisco uBR7248VXR router, the interface addresses would be 2/0.

Cisco 7201 Router Interface Addresses

In the Cisco 7201 router, only one slot accepts port adapters and it is numbered as slot 1. See [Figure 1-12](#).

The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See [Table 1-2](#). For example, if a single-port PA-MC-E3 is installed in a Cisco 7201 router, the interface address would be 1/0.

Cisco 7301 Router Interface Addresses

In the Cisco 7301 router, only one slot accepts port adapters and it is numbered as slot 1. See [Figure 1-13](#).

The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See [Table 1-2](#). For example, if a single-port PA-MC-E3 is installed in a Cisco 7301 router, the interface address would be 1/0.

Cisco 7304 PCI Port Adapter Carrier Card Interface Addresses

In the Cisco 7304 router, port adapters are installed in a Cisco 7304 PCI port adapter carrier card, which installs in Cisco 7304 router module slots 2 through 5. The port adapter slot number is the same as the module slot number. See [Figure 1-15](#).

The interface address is composed of a two-part number in the format *module-slot-number/interface-port-number*. See [Table 1-2](#). For example, if a single-port PA-MC-E3 is installed in the Cisco 7304 PCI port adapter carrier card in Cisco 7304 router module slot 3, the interface address would be 3/0.

Cisco 7000 Series Routers and Cisco 7500 Series Routers VIP Interface Addresses

In Cisco 7000 series routers and Cisco 7500 series routers, port adapters are installed on a versatile interface processor (VIP), which installs in interface processor slots 0 through 12 (depending on the number of slots in the router). The port adapter can be installed in either bay (port adapter slot 0 or 1) on the VIP. See [Figure 1-16](#), and [Figure 1-17](#).

The interface address for the VIP is composed of a three-part number in the format *interface-processor-slot-number/port-adapter-slot-number/interface-port-number*. See [Table 1-2](#).

The first number identifies the slot in which the VIP is installed (slot 0 through 12, depending on the number of slots in the router).

The second number identifies the bay (port adapter slot) on the VIP in which the port adapter is installed (0 or 1). The bays are numbered from left to right on the VIP.

The third number identifies the physical port number (interface port number) on the port adapter. The port numbers always begin at 0 and are numbered from left to right. The number of additional ports depends on the number of ports on the port adapter. The PA-MC-E3 port adapter is a single-port port adapter, therefore the port is always 0.

For example, if a single-port PA-MC-E3 is installed in a VIP in interface processor slot 3, port adapter slot 1, the interface addresses would be 3/1/0. If the PA-MC-E3 is in port adapter slot 0 on the VIP, the same interface address would be 3/0/0.

**Note**

Although the processor slots in the seven-slot Cisco 7507 and the thirteen-slot Cisco 7513 chassis are vertically oriented and those in the five-slot Cisco 7010 and Cisco 7505 chassis are horizontally oriented, all Cisco 7500 series routers use the same method for slot and port numbering.



CHAPTER 2

Preparing for Installation

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

- [Required Tools and Equipment, page 2-1](#)
- [Software and Hardware Requirements, page 2-2](#)
- [Checking Hardware and Software Compatibility, page 2-3](#)
- [Safety Guidelines, page 2-4](#)

Required Tools and Equipment

You need the following tools and parts to install a PA-MC-E3. If you need additional equipment, contact a service representative for ordering information.

- PA-MC-E3
- Catalyst RSM/VIP2 (for installation in Catalyst 5000 family switches). For information about the specific VIP models that support the PA-MC-E3, see the [“Software and Hardware Requirements” section on page 2-2](#).
- Catalyst 6000 family FlexWAN module (for installation in the Catalyst 6000 family switches)
- VIP (for installation in Cisco 7000 series or Cisco 7500 series chassis only) with at least one available interface processor slot or a Cisco 7000 series router with an RSP7000 and RSP7000CI installed. For information about the specific VIP models that support the PA-MC-E3, see the [“Software and Hardware Requirements” section on page 2-2](#).
- Cisco 7304 PCI Port Adapter Carrier Card (for installation in a Cisco 7304 router)
- 75-ohm coaxial cables with BNC connectors, as appropriate for the E3 connections. (For cable information, refer to the [“Cables, Connectors, and Pinouts” section on page 1-5](#).)
- Number 1 Phillips and a 3/16-inch flat-blade screwdriver (for VIP installation only)
- Number 2 Phillips screwdriver
- Your own electrostatic discharge (ESD)-prevention equipment or the disposable grounding wrist strap included with all upgrade kits, field-replaceable units (FRUs), and spares
- Antistatic mat
- Antistatic container

Software and Hardware Requirements

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

Table 2-1 PA-MC-E3 Software Requirements

Router Platforms	Recommended Minimum Cisco IOS Release
Catalyst 5000 family switches	
<ul style="list-style-type: none"> With Catalyst RSM/VIP2-40(=) 	Cisco IOS Release 11.1(18)CC or a later release of Cisco IOS Release 11.1CC
Catalyst 6000 family switches with Catalyst 6000 family FlexWAN module	
<ul style="list-style-type: none"> Catalyst 6000 family MSFC¹ Supervisor engine software 	Cisco IOS Release 12.1(1)E or a later release of Cisco IOS Release 12.1E Catalyst 6000 family supervisor engine software release 5.4(1)CSX or later release
Cisco 7200 series and Cisco 7200 VXR routers	
<ul style="list-style-type: none"> Cisco 7204VXR and Cisco 7206VXR Cisco 7204 and Cisco 7206 Cisco 7202 	Cisco IOS Release 12.0(2)XE2 or a later release of Cisco IOS Release 12.0XE Cisco IOS Release 12.0(3)T or a later release of Cisco IOS Release 12.0T Cisco IOS Release 12.2(4)B or a later release of Cisco IOS Release 12.2B Cisco IOS Release 11.1(22)CC or a later release of Cisco IOS Release 11.1CC Cisco IOS Release 12.2(4)B or a later release of Cisco IOS Release 12.2B Cisco IOS Release 11.1(19)CC1 or a later release of Cisco IOS Release 11.1CC Cisco IOS Release 11.3(4)AA or a later release of Cisco IOS Release 11.3AA Cisco IOS Release 12.2(4)B or a later release of Cisco IOS Release 12.2B
Cisco uBR7200 series routers	
<ul style="list-style-type: none"> Cisco uBR7246 and Cisco uBR7223 	Cisco IOS Release 12.0(3)T or a later release of Cisco IOS Release 12.0T
Cisco 7201 router	
	Cisco IOS Release 12.4(4)XD7 or a later release of Cisco IOS Release 12.4XD Cisco IOS Release 12.2(31)SB4 or a later release of Cisco IOS Release 12.2SB
Cisco 7301 router	
	Cisco IOS Release 12.2(11)YZ or a later release of Cisco IOS Release 12.2YZ
Cisco 7304 router	
<ul style="list-style-type: none"> With Cisco 7304 PCI Port Adapter Carrier Card 	Cisco IOS Release 12.2(14)SZ or a later release of Cisco IOS Release 12.2SZ
Cisco 7000series routers and Cisco 7500 series routers with VIP	
	Cisco IOS Release 11.1(18)CC or a later release of Cisco IOS Release 11.1CC Cisco IOS Release 12.0(10)S or a later release of Cisco IOS Release 12.0S

1. MSFC = Multilayer Switch Feature Card



Note

For specific software features and commands available for the PA-MC-E3 and the Cisco IOS release in which they are supported, refer to the Cisco IOS release note specific to your Cisco IOS release.

Checking Hardware and Software Compatibility

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

**Note**

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

To access Software Advisor, click **Log In** at Cisco.com and go to Support > Tools and Resources. You can also access the tool by pointing your browser directly to http://www.cisco.com/en/US/support/tsd_most_requested_tools.html.

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

**Caution**

The VIP requires that the host Cisco 7000 series router has the RSP7000 and RSP7000CI installed. The VIP will *not* operate properly with the Route Processor (RP), Switch Processor (SP), or Silicon Switch Processor (SSP) installed in the host Cisco 7000 series router.

**Note**

While the VIP, Catalyst RSM/VIP2, and Cisco 7304 PCI Port Adapter Carrier Card support online insertion and removal, individual port adapters installed on a VIP, Catalyst RSM/VIP2, or Cisco 7304 PCI Port Adapter Carrier Card do not. To replace port adapters you must first remove the VIP, Catalyst RSM/VIP2, or Cisco 7304 PCI Port Adapter Carrier Card from the chassis, then replace port adapters as required. Port adapters have a handle attached, but this handle is occasionally not shown in this publication to allow a full view of detail on the port adapter faceplate.

The Cisco 7200 series routers, Cisco 7201 routers, and Cisco 7301 routers support online insertion and removal of the PA-MC-E3.

In the Cisco 7200 series routers or Cisco uBR7200 series routers, the PA-MC-E3 port adapter does not support the NPE-100.

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

http://www.cisco.com/en/US/products/hw/modules/ps2033/products_configuration_guide_book09186a00801056ef.html

**Caution**

It has been observed that an E1 line on the PA-MC-E3 might begin transmitting an invalid E1 framing pattern causing a loss of frame (LOF) at the far end. This behavior occurs after changing the E1 line clock source or after the PAMC-E3 receives an E3 alarm indication signal (AIS). The probability is very low that this will happen after either of these events.

This condition only effects the initially released version of the PA-MC-E3 (Hardware Version 3.1.0) and will be fixed with the release of Hardware Version 3.1.1. To determine the hardware revision of your installed PA-MC-E3, issue the **show controllers e3** command and observe the following line:

```
CE3 H/W Version : 3.1.0
```

The symptom of this condition is the reception by an E1 line of a persistent receive alarm indication (RAI) signal from the far end that cannot be attributed to any other failure in the external network between the PA-MC-E3 and the far end. To recover from this condition, you must manually shut down the affected E1 line, and then immediately bring it back up. Do this by executing the following commands (in succession), which are available in the E3 controller configuration mode:

```
e1 e1-line-number shutdown
no e1 e1-line-number shutdown
```

Following is an example of this shutdown/no-shutdown operation for E1 line 5 of an PA-MC-E3 on a VIP2 in interface processor slot 2:

```
Router# config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# controller e3 2/0/0
Router(config-controller)# e1 5 ?
    bert                Start BERT test
    channel-group        Specify the timeslots to channel-group mapping for an E1
                        interface
    clock                Specify the clock source for an E1
    framing              Specify the type of Framing on an E1 line
    loopback             Put an E1 line into loopback
    national             Specify the National Reserved bits for an E1
    pri-group            Configure the specified timeslots for PRI
    shutdown             Shut down an E1 interface
    unframed             Unframed E1
Router(config-controller)# e1 5 shut
Router(config-controller)# no e1 5 shut
```

If the preceding operation does not resolve the problem, you might need to repeat the operation a second time to recover from this loss-of-frame (LOF) state.



Note

The E1 line **shutdown** command will not be accepted while running BERT or loopbacks; these functions must be stopped first. In addition, a BERT or loopback cannot be started while an E1 line is shut down.

Safety Guidelines

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

**Warning****IMPORTANT SAFETY INSTRUCTIONS**

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 translated safety warnings that accompanied this device.

Note: SAVE THESE INSTRUCTIONS

Note: This documentation is to be used in conjunction with the specific product installation guide that shipped with the product. Please refer to the Installation Guide, Configuration Guide, or other enclosed additional documentation for further details.

Waarschuwing**BELANGRIJKE VEILIGHEIDSinSTRUCTIES**

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 de standaard praktijken om ongelukken te voorkomen. Voor een vertaling van de waarschuwingen die in deze publicatie verschijnen, dient u de vertaalde veiligheidswaarschuwingen te raadplegen die bij dit apparaat worden geleverd.

Opmerking BEWAAR DEZE INSTRUCTIES.

Opmerking Deze documentatie dient gebruikt te worden in combinatie met de installatiehandleiding voor het specifieke product die bij het product wordt geleverd. Raadpleeg de installatiehandleiding, configuratiehandleiding of andere verdere ingesloten documentatie voor meer informatie.

Varoitus**TÄRKEITÄ TURVALLISUUTEEN LIITTYVIÄ OHJEITA**

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 asiakirjassa esitettyjen varoitusten käännökset löydät laitteen mukana toimitetuista ohjeista.

Huomautus SÄILYTÄ NÄMÄ OHJEET

Huomautus Tämä asiakirja on tarkoitettu käytettäväksi yhdessä tuotteen mukana tulleen asennusoppaan kanssa. Katso lisätietoja asennusoppaasta, kokoonpano-oppaasta ja muista mukana toimitetuista asiakirjoista.

Attention IMPORTANTES INFORMATIONS DE SÉCURITÉ

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 les consignes de sécurité traduites qui accompagnent cet appareil.

Remarque CONSERVEZ CES INFORMATIONS

Remarque Cette documentation doit être utilisée avec le guide spécifique d'installation du produit qui accompagne ce dernier. Veuillez vous reporter au Guide d'installation, au Guide de configuration, ou à toute autre documentation jointe pour de plus amples renseignements.

Warnung WICHTIGE SICHERHEITSANWEISUNGEN

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 sind im Lieferumfang des Geräts enthalten.

Hinweis BEWAHREN SIE DIESE SICHERHEITSANWEISUNGEN AUF

Hinweis Dieses Handbuch ist zum Gebrauch in Verbindung mit dem Installationshandbuch für Ihr Gerät bestimmt, das dem Gerät beiliegt. Entnehmen Sie bitte alle weiteren Informationen dem Handbuch (Installations- oder Konfigurationshandbuch o. Ä.) für Ihr spezifisches Gerät.

Figyelem! FONTOS BIZTONSÁGI ELŐÍRÁSOK

Ez a figyelmeztető jel veszélyre utal. Sérülésveszélyt rejtő helyzetben van. Mielőtt bármely berendezésen munkát végezte, legyen figyelemmel az elektromos áramkörök okozta kockázatokra, és ismerkedjen meg a szokásos balesetvédelmi eljárásokkal. A kiadványban szereplő figyelmeztetések fordítása a készülékhez mellékelt biztonsági figyelmeztetések között található.

Megjegyzés ŐRIZZE MEG EZEKET AZ UTASÍTÁSOKAT!

Megjegyzés Ezt a dokumentációt a készülékhez mellékelt üzembe helyezési útmutatóval együtt kell használni. További tudnivalók a mellékelt Üzembe helyezési útmutatóban (Installation Guide), Konfigurációs útmutatóban (Configuration Guide) vagy más dokumentumban találhatók.

Avvertenza IMPORTANTI ISTRUZIONI SULLA SICUREZZA

Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di intervenire su qualsiasi apparecchiatura, occorre essere al corrente dei pericoli relativi ai circuiti elettrici e conoscere le procedure standard per la prevenzione di incidenti. Per le traduzioni delle avvertenze riportate in questo documento, vedere le avvertenze di sicurezza che accompagnano questo dispositivo.

Nota CONSERVARE QUESTE ISTRUZIONI

Nota La presente documentazione va usata congiuntamente alla guida di installazione specifica spedita con il prodotto. Per maggiori informazioni, consultare la Guida all'installazione, la Guida alla configurazione o altra documentazione acclusa.

Advarsel VIKTIGE SIKKERHETSINSTRUKSJONER

Dette varselssymbolet betyr fare. Du befinner deg i en situasjon som kan forårsake personskade. Før du utfører arbeid med utstyret, bør du være oppmerksom på farene som er forbundet med elektriske kretssystemer, og du bør være kjent med vanlig praksis for å unngå ulykker. For å se oversettelser av advarslene i denne publikasjonen, se de oversatte sikkerhetsvarslene som følger med denne enheten.

Merk TA VARE PÅ DISSE INSTRUKSJONENE

Merk Denne dokumentasjonen skal brukes i forbindelse med den spesifikke installasjonsveiledningen som fulgte med produktet. Vennligst se installasjonsveiledningen, konfigureringsveiledningen eller annen vedlagt tilleggsdokumentasjon for detaljer.

Aviso INSTRUÇÕES IMPORTANTES DE SEGURANÇA

Este símbolo de aviso significa perigo. O utilizador encontra-se numa situação que poderá ser causadora de lesões corporais. Antes de iniciar a utilização de qualquer equipamento, tenha em atenção os perigos envolvidos no manuseamento de circuitos eléctricos e familiarize-se com as práticas habituais de prevenção de acidentes. Para ver traduções dos avisos incluídos nesta publicação, consulte os avisos de segurança traduzidos que acompanham este dispositivo.

Nota GUARDE ESTAS INSTRUÇÕES

Nota Esta documentação destina-se a ser utilizada em conjunto com o manual de instalação incluído com o produto específico. Consulte o manual de instalação, o manual de configuração ou outra documentação adicional inclusa, para obter mais informações.

¡Advertencia! INSTRUCCIONES IMPORTANTES DE SEGURIDAD

Este símbolo de aviso indica peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considere los riesgos de la corriente eléctrica y familiarícese con los procedimientos estándar de prevención de accidentes. Vea las traducciones de las advertencias que acompañan a este dispositivo.

Nota GUARDE ESTAS INSTRUCCIONES

Nota Esta documentación está pensada para ser utilizada con la guía de instalación del producto que lo acompaña. Si necesita más detalles, consulte la Guía de instalación, la Guía de configuración o cualquier documentación adicional adjunta.

Varning! VIKTIGA SÄKERHETSANVISNINGAR

Denna varningssignal 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 vanliga förfaranden för att förebygga olyckor. Se översättningarna av de varningsmeddelanden som finns i denna publikation, och se de översatta säkerhetsvarningarna som medföljer denna anordning.

OBS! SPARA DESSA ANVISNINGAR

OBS! Denna dokumentation ska användas i samband med den specifika produktinstallationshandbok som medföljde produkten. Se installationshandboken, konfigurationshandboken eller annan bifogad ytterligare dokumentation för närmare detaljer.

Предупреждение **ВАЖНЫЕ СВЕДЕНИЯ ПО БЕЗОПАСНОСТИ**

Этот символ предупреждает о наличии опасности. При неправильных действиях возможно получение травм. Перед началом работы с любым оборудованием необходимо ознакомиться с ситуациями, в которых возможно поражение электротоком, и со стандартными действиями для предотвращения несчастных случаев. Переведенный текст предупреждений содержится в соответствующем документе, поставляемом вместе с устройством.

Примечание **СОХРАНЯЙТЕ ЭТУ ИНСТРУКЦИЮ**

Примечание Эта инструкция должна использоваться вместе с руководством по установке конкретного изделия, входящим в комплект поставки. Дополнительные сведения см. в руководстве по установке, руководстве по настройке и другой документации, поставляемой с изделием.

警告 **有关安全的重要说明**

这个警告符号指有危险。您所处的环境可能使身体受伤。操作设备前必须意识到电流的危险性，务必熟悉操作标准，以防发生事故。如果需要了解本说明中出现的警告符号的译文，请参阅本装置所附之安全警告译文。

注意 保存这些说明

注意 本文件应与本产品附带的特定安装说明一并阅读。如欲了解详情，请参阅《安装说明》、《配置说明》或所附的其他文件。

警告 **安全上の重要な注意事項**

「危険」の意味です。人身事故を予防するための注意事項が記述されています。装置の取り扱い作業を行うときは、電気回路の危険性に注意し、一般的な事故防止対策に留意してください。このマニュアルに記載されている警告の各国語版は、装置に付属の「Translated Safety Warnings」を参照してください。

注 これらの注意事項を保管しておいてください。

注 この資料は、製品に付属のインストレーション ガイドと併用してください。詳細は、インストレーション ガイド、コンフィギュレーション ガイド、または添付されているその他のマニュアルを参照してください。

Предупреждение **ВАЖНЫЕ СВЕДЕНИЯ ПО БЕЗОПАСНОСТИ**

Этот символ предупреждает о наличии опасности. При неправильных действиях возможно получение травм. Перед началом работы с любым оборудованием необходимо ознакомиться с ситуациями, в которых возможно поражение электротоком, и со стандартными действиями для предотвращения несчастных случаев. Переведенный текст предупреждений содержится в соответствующем документе, поставляемом вместе с устройством.

Примечание **СОХРАНЯЙТЕ ЭТУ ИНСТРУКЦИЮ**

Примечание Эта инструкция должна использоваться вместе с руководством по установке конкретного изделия, входящим в комплект поставки. Дополнительные сведения см. в руководстве по установке, руководстве по настройке и другой документации, поставляемой с изделием.

警告 **有关安全的重要说明**

这个警告符号指有危险。您所处的环境可能使身体受伤。操作设备前必须意识到电流的危险性，务必熟悉操作标准，以防发生事故。如果需要了解本说明中出现的警告符号的译文，请参阅本装置所附之安全警告译文。

注意 保存这些说明

注意 本文件应与本产品附带的具体安装说明一并阅读。如欲了解详情，请参阅《安装说明》、《配置说明》或所附的其他文件。

警告 **安全上の重要な注意事項**

「危険」の意味です。人身事故を予防するための注意事項が記述されています。装置の取り扱い作業を行うときは、電気回路の危険性に注意し、一般的な事故防止対策に留意してください。このマニュアルに記載されている警告の各国語版は、装置に付属の「Translated Safety Warnings」を参照してください。

注 これらの注意事項を保管しておいてください。

注 この資料は、製品に付属のインストラクション ガイドと併用してください。詳細は、インストラクション ガイド、コンフィギュレーション ガイド、または添付されているその他のマニュアルを参照してください。

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.

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 megohm (Mohm).



CHAPTER 3

Removing and Installing Port Adapters

This chapter describes how to remove the PA-MC-E3 port adapter from supported platforms and also how to install a new or replacement port adapter. This chapter contains the following sections:

- [Handling Port Adapters, page 3-1](#)
- [Online Insertion and Removal, page 3-2](#)
- [Warnings and Cautions, page 3-3](#)
- [Port Adapter Removal and Installation, page 3-4](#)
- [Connecting PA-MC-E3 Interface Cables, page 3-15](#)

Handling Port Adapters

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



Note

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



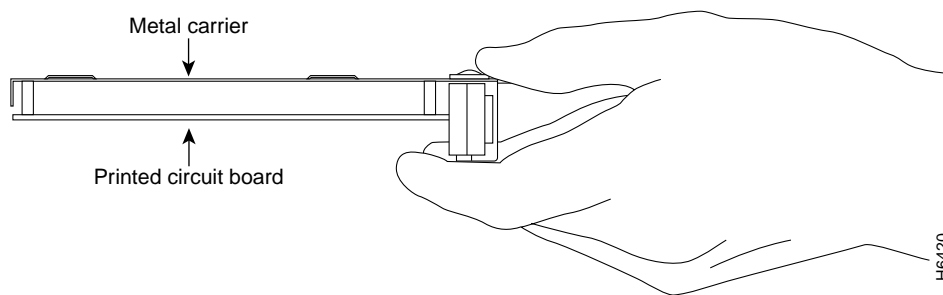
Caution

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



Caution

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

Figure 3-1 Handling a Port Adapter

Online Insertion and Removal

Several platforms support online insertion and removal (OIR) of port adapters; therefore, you do not have to power down routers when removing and replacing a PA-MC-E3 on Cisco 7200 series routers, Cisco 7200 VXR routers, Cisco uBR7200 series routers, Cisco 7201 routers, or Cisco 7301 routers.

Although the Catalyst RSM/VIP2, the Catalyst 6000 family FlexWAN module, the Cisco 7304 PCI port adapter carrier card, and the VIP support OIR, individual port adapters do not. To replace port adapters on the Catalyst 5000 switches, Catalyst 6000 switches, Cisco 7304 router, and Cisco 7000 series and 7500 series routers, you must first remove the Catalyst RSM/VIP2, the Catalyst 6000 family FlexWAN module, the Cisco 7304 PCI port adapter carrier card, or the VIP from the chassis and then install or replace port adapters as required. If a blank port adapter is installed on the Catalyst RSM/VIP2, the Catalyst 6000 family FlexWAN module, the Cisco 7304 PCI port adapter carrier card, or the VIP on which you want to install a new port adapter, you must first remove the Catalyst RSM/VIP2, the Catalyst 6000 family FlexWAN module, the Cisco 7304 PCI port adapter carrier card, or the VIP from the chassis and then remove the blank port adapter.



Caution

To prevent system problems, do not remove port adapters from the Catalyst RSM/VIP2, the Catalyst 6000 family FlexWAN module, the Cisco 7304 PCI port adapter carrier card, and the VIP or attempt to install other port adapters on the motherboard when the system is operating. To install or replace port adapters, first remove the Catalyst RSM/VIP2, the Catalyst 6000 family FlexWAN module, the Cisco 7304 PCI port adapter carrier card, or the VIP from its interface processor slot.

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



Note

As you disengage the port adapter from the router or switch, OIR administratively shuts down all active interfaces in the port adapter.

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

The following is a functional description of OIR for background information only; for specific procedures for installing and replacing a port adapter in a supported platform, refer to the [“Port Adapter Removal and Installation”](#) section on page 3-4.

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

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

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

1. Rapidly scans the system for configuration changes.
2. Initializes newly inserted port adapters or administratively shuts down any vacant interfaces.
3. Brings all previously configured interfaces on the port adapter back to their previously installed state. Any newly inserted interface is put in the administratively shutdown state, as if it was present (but not configured) at boot time. If a similar port adapter type is reinserted into a slot, its ports are configured and brought online up to the port count of the originally installed port adapter of that type.

**Note**

Before you begin installation, read [Chapter 2, “Preparing for Installation,”](#) for a list of parts and tools required for installation.

Warnings and Cautions

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

**Caution**

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

**Note**

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

**Caution**

To prevent jamming the carrier between the upper and the lower edges of the port adapter slot, and to ensure that the edge connector at the rear of the port adapter mates with the connection at the rear of the port adapter slot, make certain that the carrier is positioned correctly, as shown in the cutaway illustrations in the [“Port Adapter Removal and Installation”](#) section on page 3-4.

**Warning**

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

Port Adapter Removal and Installation

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

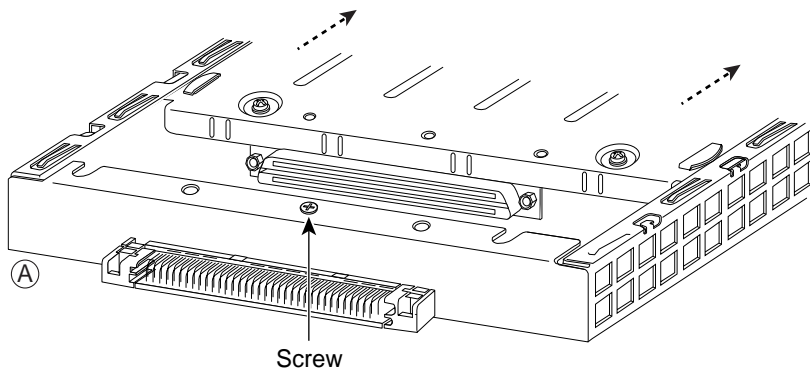
- [Catalyst RSM/VIP2—Removing and Installing a Port Adapter, page 3-5](#)
- [Catalyst 6000 Family FlexWAN Module—Removing and Installing a Port Adapter, page 3-6](#)
- [Cisco 7200 Series Routers and Cisco 7200 VXR Routers—Removing and Installing a Port Adapter, page 3-7](#)
- [Cisco uBR7200 Series—Removing a Port Adapter, page 3-8](#)
- [Cisco uBR7200 Series—Installing a Port Adapter, page 3-9](#)
- [Cisco 7201 Router—Removing and Installing a Port Adapter, page 3-10](#)
- [Cisco 7301 Router—Removing and Installing a Port Adapter, page 3-11](#)
- [Cisco 7304 PCI Port Adapter Carrier Card—Removing and Installing a Port Adapter, page 3-12](#)
- [VIP—Removing and Installing a Port Adapter, page 3-14](#)

Catalyst RSM/VIP2—Removing and Installing a Port Adapter

Note: You must first remove the Catalyst RSM/VIP2 from the chassis before removing a port adapter from the Catalyst RSM/VIP2.

Step 1

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

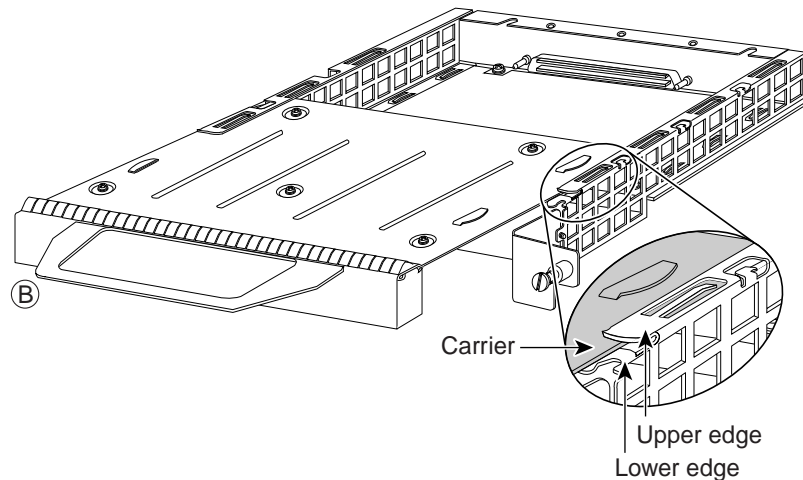


Step 2

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

Step 3

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



Step 4

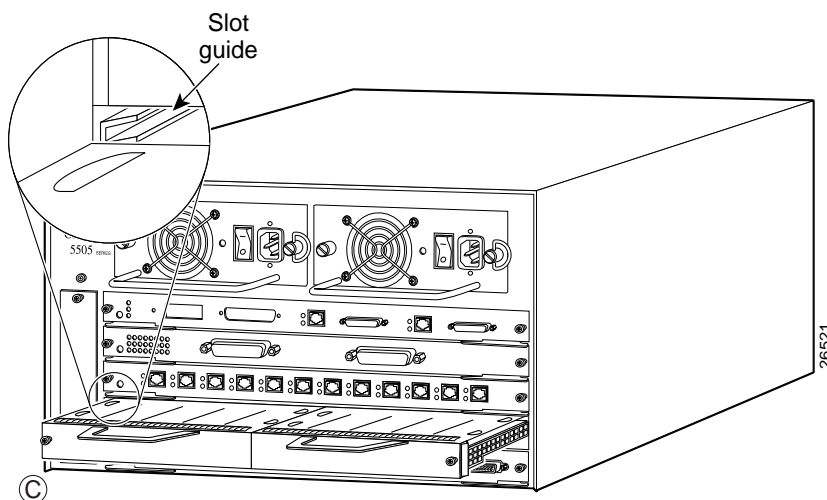
Install the screw in the rear of the port adapter slot. Do not overtighten the screw. (See A.)

Step 5

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

Step 6

Reinstall the Catalyst RSM/VIP2 motherboard in the chassis and tighten the captive installation screw on each side of the Catalyst RSM/VIP2 faceplate. (See C.)

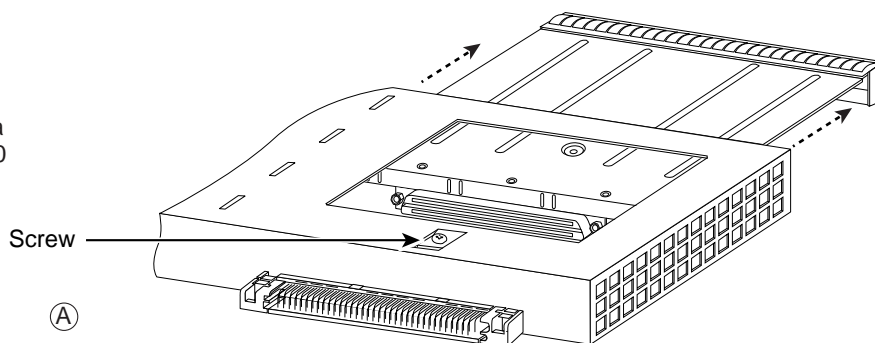


Catalyst 6000 Family FlexWAN Module—Removing and Installing a Port Adapter

Note: You must first remove the Catalyst 6000 FlexWAN module from the chassis before removing a port adapter from the Catalyst 6000 FlexWAN module.

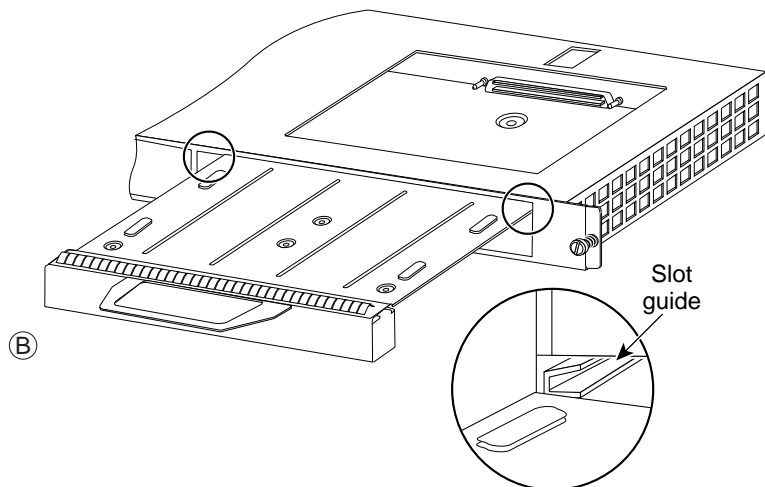
Step 1

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



Step 2

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



Step 3

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

Step 4

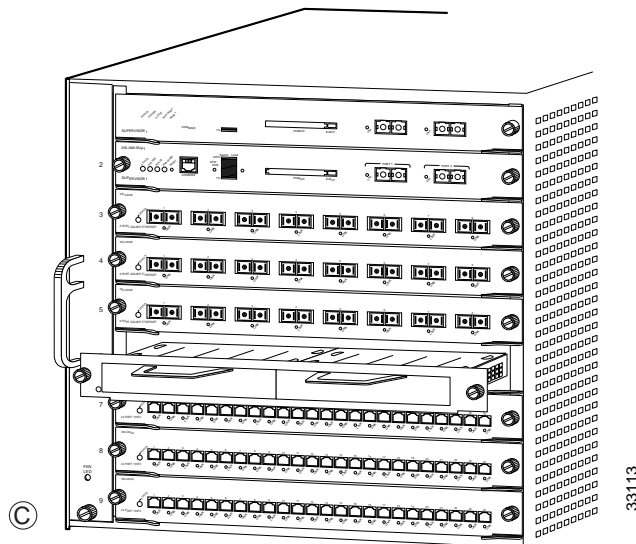
Carefully slide the new port adapter into the port adapter bay until the connector on the port adapter is completely seated in the connector at the rear of the port adapter slot. (See B.)

Step 5

Install the screw in the rear of the port adapter bay. Do not overtighten the screw. (See A.)

Step 6

Reinstall the Catalyst 6000 FlexWAN module in the chassis, and tighten the captive installation screw on each side of the Catalyst 6000 FlexWAN module faceplate. (See C.)



Cisco 7200 Series Routers and Cisco 7200 VXR Routers—Removing and Installing a Port Adapter

Step 1

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

Step 2

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

Step 3

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

Step 4

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

Step 5

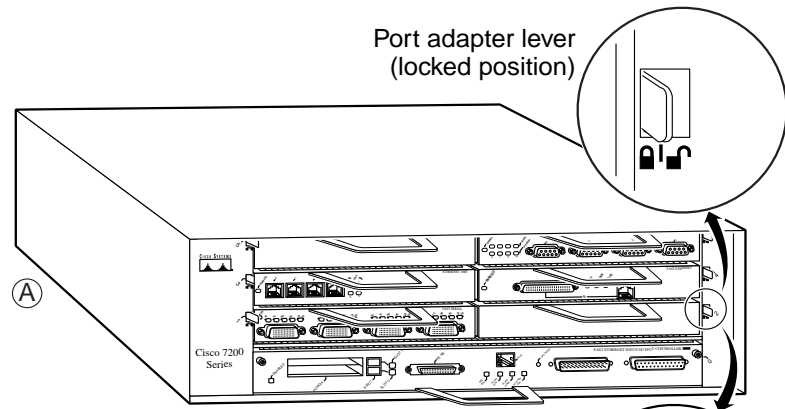
Carefully slide the new port adapter halfway into the port adapter slot. (See B.)

Step 6

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

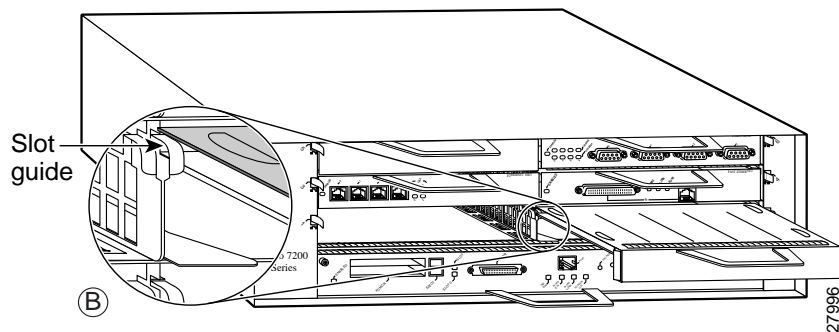
Step 7

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



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

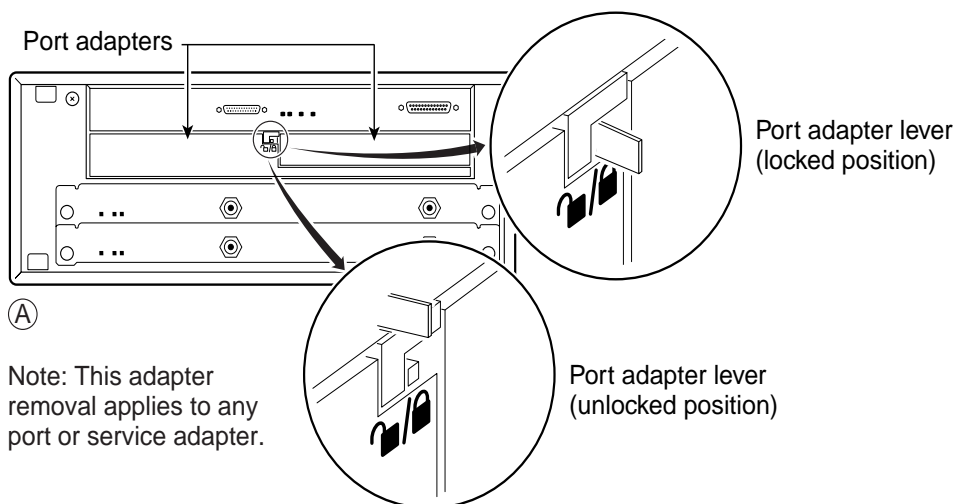
Port adapter lever (unlocked position)



Cisco uBR7200 Series—Removing a Port Adapter

Step 1

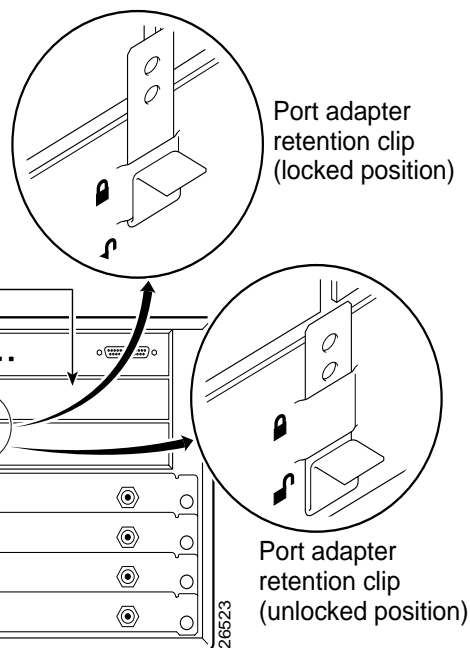
To remove the port adapter, unlock the port adapter retaining mechanism. The port adapter lever remains in the unlocked position.



Place the port adapter lever (Cisco uBR7223, see A), or the port adapter retention clip (Cisco uBR7246 and Cisco uBR7246 VXR, see B) in the unlocked position. Either mechanism remains in the unlocked position.

Step 2

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



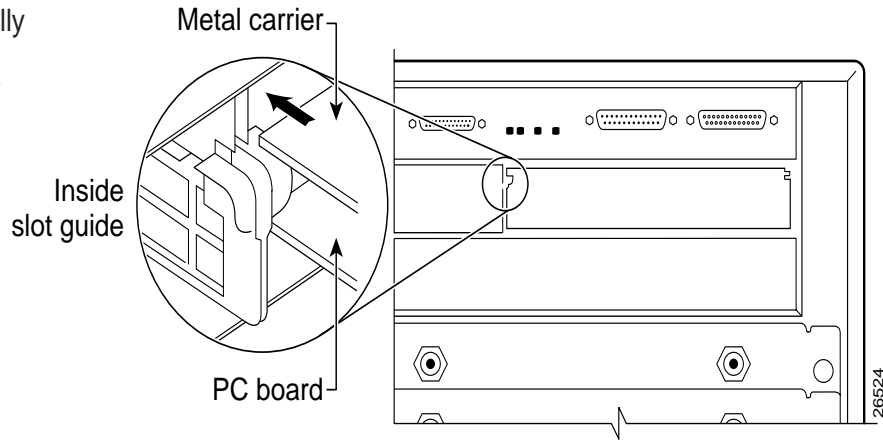
Step 3

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

Cisco uBR7200 Series—Installing a Port Adapter

Step 1

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



Step 2

Carefully slide the new port adapter halfway into the port adapter slot.

Step 3

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

Step 4

After the port adapter is properly seated, lock the port adapter lever or retention clip, depending on your system. (See illustration on preceding page.)

Cisco 7201 Router—Removing and Installing a Port Adapter

Step 1

Use an ESD wrist strap to ground yourself to the router.

Step 2

To remove the port adapter, place the port adapter lever in the unlocked position. The port adapter lever remains in the unlocked position.

Step 3

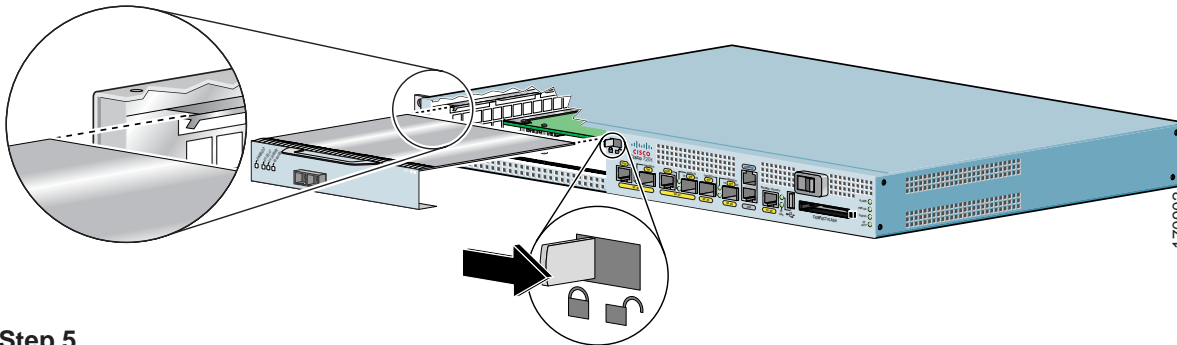
Grasp the handle of the port adapter and pull the port adapter about halfway out of its slot. If you are removing a blank port adapter, pull the blank port adapter completely out of the chassis slot.

Step 4

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

Caution

The port adapter must slide into the slot guides close to the chassis lid. Do not allow the port adapter components to come in contact with the system board or the port adapter could be damaged.



Step 5

To insert the port adapter, carefully align the port adapter carrier in the slot guides. Slide the new port adapter halfway into the chassis.

Step 6

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

Step 7

After the port adapter is properly seated, lock the port adapter lever.

Cisco 7301 Router—Removing and Installing a Port Adapter

Step 1

Use an ESD wrist strap to ground yourself to the router.

Step 2

To remove a port adapter, use a Phillips screwdriver to turn the screw holding the port adapter latch. The screw should be loose enough to allow the latch to rotate to an unlocked position. (See A.) The latch can rotate 360°.

Step 3

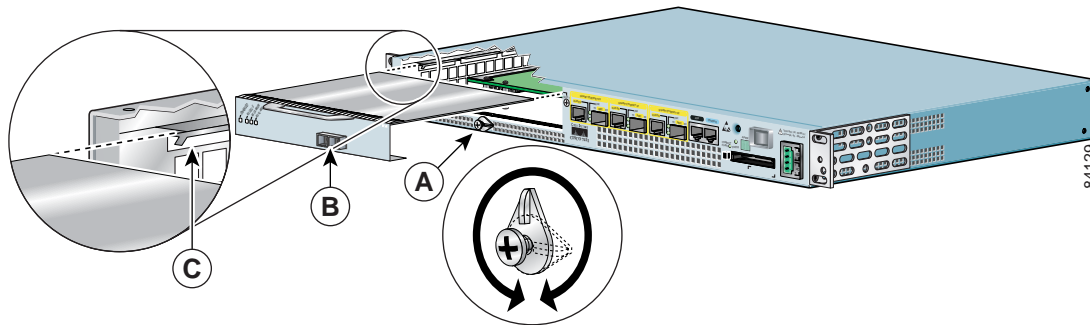
Grasp the handle and pull the port adapter from the router, about halfway out of its slot. (See B.) If you are removing a blank port adapter, pull the blank port adapter completely out of the chassis slot.

Step 4

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

Caution

The port adapter must slide into the slot guides close to the chassis lid. (See C.) Do not allow the port adapter components to come in contact with the system board or the port adapter could be damaged.



Step 5

To insert the port adapter, carefully align the port adapter carrier in the slot guides. (See C.) Slide the new port adapter halfway into the chassis.

Step 6

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

Step 7

After the port adapter is properly seated, turn and secure the port adapter latch in the upright, locked position. (See A.) Tighten the screw to ensure the port adapter remains firmly in place.

Cisco 7304 PCI Port Adapter Carrier Card—Removing and Installing a Port Adapter

You can install one single-width port adapter in a Cisco 7304 PCI Port Adapter Carrier Card. This section provides step-by-step instructions for removing and installing a port adapter in a Cisco 7304 PCI Port Adapter Carrier Card.



Warning

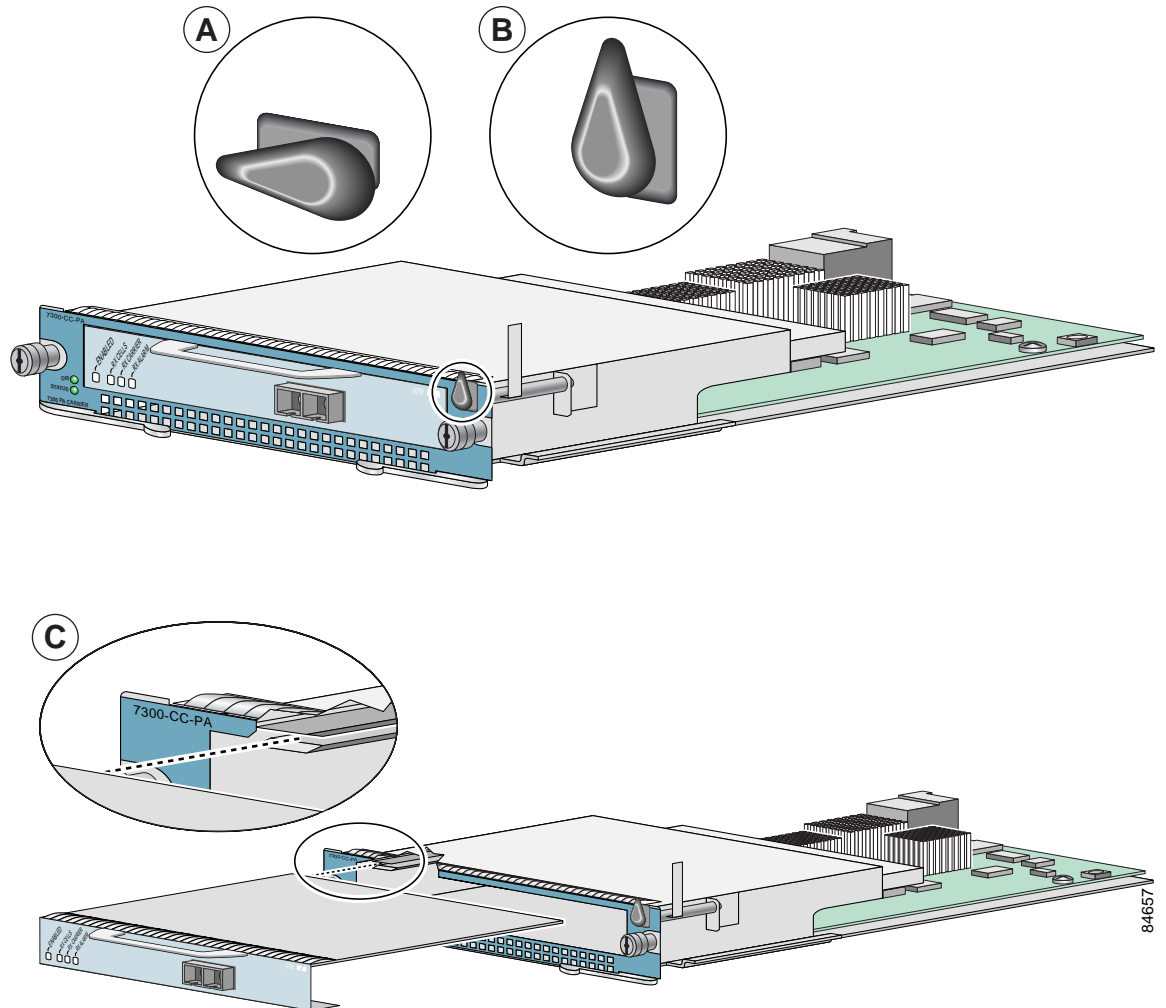
When performing the following procedures, wear a grounding wrist strap to avoid ESD damage to the Cisco 7304 PCI Port Adapter Carrier Card. Some platforms have an ESD connector for attaching the wrist strap. Do not directly touch the midplane or backplane with your hand or any metal tool, or you could shock yourself.

To remove and install a port adapter in a Cisco 7304 PCI Port Adapter Carrier Card, refer to [Figure 3-2](#) and do the following:

-
- Step 1** If the Cisco 7304 PCI Port Adapter Carrier Card is still in the router, you must remove the Cisco 7304 PCI Port Adapter Carrier Card before removing a port adapter.
 - Step 2** To remove the port adapter from the Cisco 7304 PCI Port Adapter Carrier Card, turn the port adapter lock from its locked and horizontal position shown in A of [Figure 3-2](#) to its unlocked and vertical position shown in B of [Figure 3-2](#).
 - Step 3** Grasp the handle of the port adapter and pull the port adapter from the Cisco 7304 PCI Port Adapter Carrier Card. (You have already disconnected the cables from the port adapter when removing the Cisco 7304 PCI Port Adapter Carrier Card).
 - Step 4** To insert the port adapter in the Cisco 7304 PCI Port Adapter Carrier Card, locate the guide rails inside the Cisco 7304 PCI Port Adapter Carrier Card that hold the port adapter in place. They are at the top left and top right of the port adapter slot and are recessed about an inch, as shown in C of [Figure 3-2](#).
 - Step 5** Carefully slide the port adapter in the Cisco 7304 PCI Port Adapter Carrier Card until the port adapter makes contact with the port adapter interface connector. When fully seated, the port adapter front panel should be flush with the face of the Cisco 7304 PCI Port Adapter Carrier Card.
 - Step 6** After the port adapter is properly seated, turn the port adapter lock to its locked and horizontal position, as shown in A of [Figure 3-2](#).
-

Figure 3-2 illustrates how to remove and install a port adapter in a Cisco 7304 PCI Port Adapter Carrier Card.

Figure 3-2 Cisco 7304 PCI Port Adapter Carrier Card—Port Adapter Removal and Installation



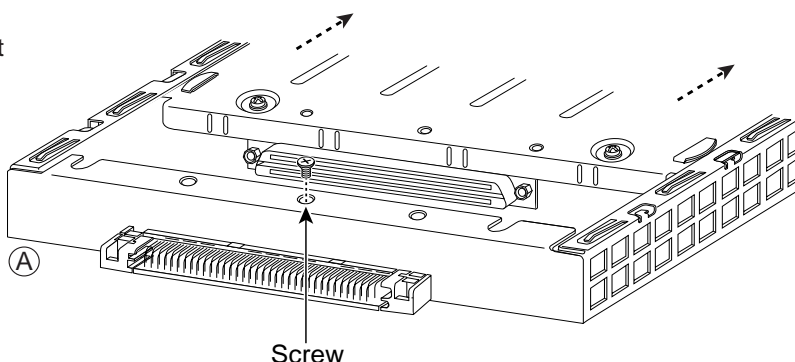
84657

VIP—Removing and Installing a Port Adapter

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

Step 1

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

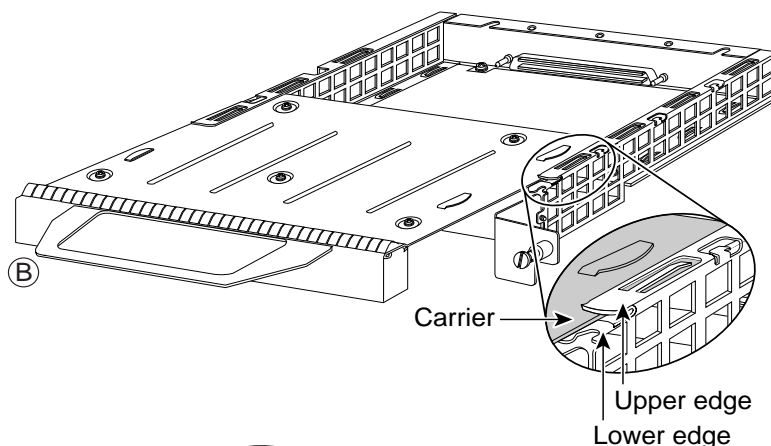


Step 2

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

Step 3

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

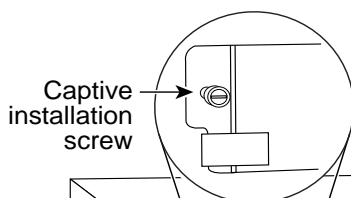


Step 4

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

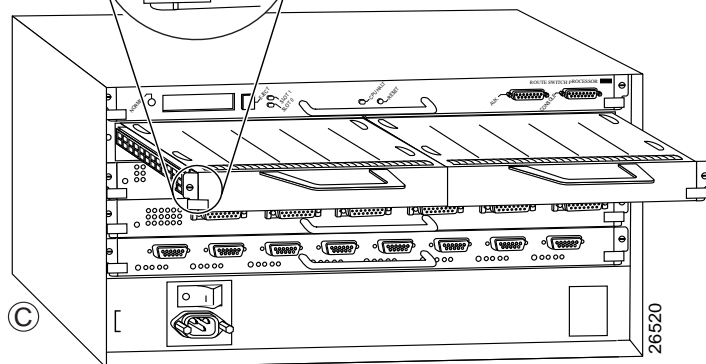
Step 5

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



Step 6

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



Connecting PA-MC-E3 Interface Cables

This section describes the procedures for attaching coaxial cables between the PA-MC-E3 and your external E3 equipment. Use only 75-ohm, RG-59 coaxial cables for all E3 connections. (For specific cable requirements and options, refer to the [“Cables, Connectors, and Pinouts”](#) section on page 1-5.)



Note

You must attach the ferrite sleeves (included with the PA-MC-E3 and shown in the [“Cables, Connectors, and Pinouts”](#) section on page 1-5) to the 75-ohm coaxial cables that you supply and plan to use for your E3 connections. Attach each ferrite sleeve as close as possible to the port adapter end of each 75-ohm coaxial cable. (See [Figure 3-3](#).)

We strongly recommend that you fasten together your transmit and receive cables along their entire length, as shown in the [“Cables, Connectors, and Pinouts”](#) section on page 1-5. Doing so reduces the effects of EMI. You can use standard heat-activated shrink tubing or cable ties for this purpose.

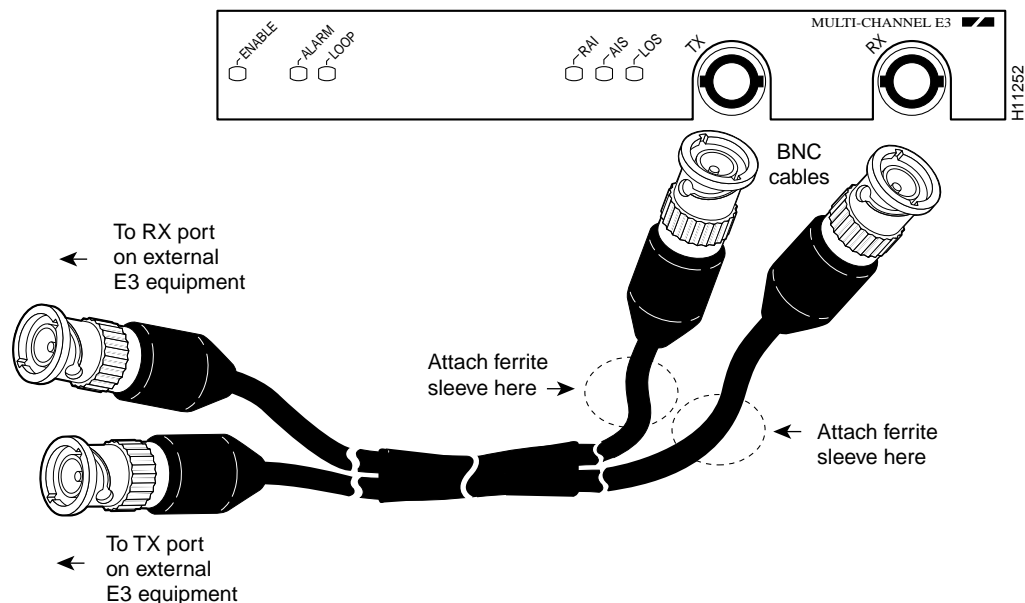
You can also use a 75-ohm coaxial cable pair that has ferrite sleeves already attached; this cable pair is available from Cisco Systems as Product Number CAB-ATM-DS3/E3. (See [Figure 3-3](#).)

Each E3 link requires separate receive and transmit connections to your external E3 equipment.

Connect the 75-ohm coaxial cables to the PA-MC-E3 as follows:

- Step 1** Attach the 75-ohm, RG-59 coaxial cables directly to the BNC ports on the PA-MC-E3. Attach one end of a cable to the port labeled TX and one end of a second cable to the port labeled RX. (See [Figure 3-3](#).)

Figure 3-3 Connecting 75-Ohm Coaxial Cables to an PA-MC-E3



Caution

To prevent system problems and to maintain the proper cable connection sequences, connect the RX and TX ports on the PA-MC-E3 as indicated in Step 2.

**Note**

The MC-E3 port adapter contains an internal strapping option that you can remove if you require isolation between the receive connection's outer shield and ground.

Step 2

Attach the network ends of your two 75-ohm coaxial cables to your external E3 equipment as follows:

- Attach the coaxial cable from the PA-MC-E3 TX port to the RX port on your external E3 equipment.
- Attach the coaxial cable from the PA-MC-E3 RX port to the TX port on your external E3 equipment.

This completes the procedures for PA-MC-E3 installation and 75-ohm coaxial cable attachment. Proceed to [Chapter 4, “Configuring the PA-MC-E3”](#) to configure the interfaces on the PA-MC-E3.



CHAPTER 4

Configuring the PA-MC-E3

To continue your PA-MC-E3 port adapter installation, you must configure the serial interfaces. The instructions that follow apply to all supported platforms. Minor differences between the platforms—with Cisco IOS software commands—are noted.

This chapter contains the following sections:

- [Using the EXEC Command Interpreter, page 4-1](#)
- [Configuring the Interfaces, page 4-2](#)
- [Checking the Configuration, page 4-19](#)

Using the EXEC Command Interpreter

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

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

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

```
Router> enable
```

```
Password:
```

- Step 2** Enter the password (the password is case sensitive). For security purposes, the password is not displayed. When you enter the correct password, the system displays the privileged-level system prompt (#):

```
Router#
```

To configure the new interfaces, proceed to the [“Configuring the Interfaces” section on page 4-2](#).

Configuring the Interfaces

After you verify that the new PA-MC-E3 is installed correctly (the ENABLED LED goes on), use the privileged-level **configure** command to configure the new interfaces. Have the following information available:

- Protocols you plan to route on each new interface
- IP addresses, if you plan to configure the interfaces for IP routing
- Bridging protocols you plan to use
- Clock timing source you plan to use for each new interface and clock speeds for external timing.

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

For a summary of the configuration options available and instructions for configuring interfaces on a PA-MC-E3, refer to the appropriate configuration publications listed in the [“Related Documentation” section on page viii](#).

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

This section contains the following subsections:

- [Shutting Down an Interface, page 4-2](#)
- [Performing a Basic Interface Configuration, page 4-7](#)
- [Configuring the PA-MC-E3, page 4-9](#)
- [Configuring a BERT on an E1 Line, page 4-16](#)
- [Configuring Cyclic Redundancy Checks, page 4-18](#)

Shutting Down an Interface

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

Follow these steps to shut down an interface:

-
- Step 1** Enter the privileged level of the EXEC command interpreter (also called enable mode). (See the [“Using the EXEC Command Interpreter” section on page 4-1](#) for instructions.)
- Step 2** At the privileged-level prompt, enter configuration mode and specify that the console terminal is the source of the configuration subcommands, as follows:

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

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

Table 4-1 shows the **shutdown** command syntax for the supported platforms.

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

Table 4-1 Syntax of the shutdown Command for the Supported Platforms

Platform	Command	Example
Catalyst RSM/VIP2 in Catalyst 5000 family switches	interface , followed by the <i>type (serial)</i> and <i>slot/port</i> (port-adapter-slot-number/interface-port-number) shutdown	The example is for interface 0 on a port adapter in port adapter slot 1. Router(config-if)# interface serial 1/0 Router(config-if)# shutdown Ctrl-Z Router#
Catalyst 6000 family FlexWAN module in Catalyst 6000 family switches	interface , followed by the <i>type (serial)</i> and <i>mod-num/bay/port</i> (module-slot-number/port-adapter-bay-number/interface-port-number) shutdown	The example is for interface 0 on a port adapter in port adapter bay 0 of a FlexWAN module installed in slot 3. Router(config-if)# interface serial 3/0/0 Router(config-if)# shutdown Ctrl-Z Router#
Cisco 7200 series routers and Cisco 7200 VXR routers	interface , followed by the <i>type (serial)</i> and <i>slot/port</i> (port-adapter-slot-number/interface-port-number) shutdown	The example is for interface 0 on a port adapter in port adapter slot 6. Router(config-if)# interface serial 6/0 Router(config-if)# shutdown Ctrl-Z Router#
Cisco uBR7223 router	interface , followed by the <i>type (serial)</i> and <i>slot/port</i> (port-adapter-slot-number/interface-port-number) shutdown	The example is for interface 0 on a port adapter in port adapter slot 1. Router(config-if)# interface serial 1/0 Router(config-if)# shutdown Ctrl-Z Router#
Cisco uBR7246 router	interface , followed by the <i>type (serial)</i> and <i>slot/port</i> (port-adapter-slot-number/interface-port-number) shutdown	The example is for interface 0 on a port adapter in port adapter slot 2. Router(config-if)# interface serial 2/0 Router(config-if)# shutdown Ctrl-Z Router#
Cisco 7201 router	interface , followed by the <i>type (serial)</i> and <i>slot/port</i> (port-adapter-slot-number/interface-port-number) shutdown	The example is for interface 0 on a port adapter in port adapter slot 1. Router(config-if)# interface serial 1/0 Router(config-if)# shutdown Ctrl-Z Router#

Table 4-1 Syntax of the shutdown Command for the Supported Platforms (continued)

Platform	Command	Example
Cisco7301 router	interface , followed by the <i>type (serial)</i> and <i>slot/port</i> (port-adapter-slot-number/interface-port-number) shutdown	The example is for interface 0 on a port adapter in port adapter slot 1. Router(config-if)# interface serial 1/0 Router(config-if)# shutdown Ctrl-Z Router#
Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router	interface , followed by the <i>type (serial)</i> and <i>slot/port</i> (module-slot-number/interface-port-number) shutdown	The example is for interface 0 on a port adapter in a Cisco 7304 PCI Port Adapter Carrier Card in module slot 3 of a Cisco 7304 router. Router(config-if)# interface serial 3/0 Router(config-if)# shutdown Ctrl-Z Router#
VIP in Cisco 7000 series routers or Cisco 7500 series routers	interface , followed by the <i>type (serial)</i> and <i>slot/port adapter/port</i> (interface-processor-slot-number port-adapter-slot-number/interface-port-number) shutdown	The example is for interface 0 on a port adapter in port adapter slot 1 of a VIP installed in interface processor slot 1. Router(config-if)# interface serial 1/1/0 Router(config-if)# shutdown Ctrl-Z Router#



Note If you need to shut down additional interfaces, enter the **interface serial** command (followed by the interface address of the interface) for each of the interfaces on your port adapter. Use the **no shutdown** command to enable the interface.

Step 4 Write the new configuration to NVRAM as follows:

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

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

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

Table 4-2 provides examples of the **show interfaces serial** command for supported platforms.

Table 4-2 Examples of the show interfaces serial Command for the Supported Platforms

Platform	Command	Example
Catalyst RSM/VIP2 in Catalyst 5000 family switches	show interfaces serial , followed by <i>slot/port</i> (port-adapter-slot-number/interface-port-number)	The example is for interface 0 on a port adapter in port adapter slot 1. Router# show interfaces serial 1/0 Serial 1/0 is administratively down, line protocol is down [Additional display text omitted from this example]
Catalyst 6000 family FlexWAN module in Catalyst 6000 family switches	show interfaces serial , followed by <i>mod-num/bay/port</i> (module-slot-number/port-adapter-bay-number/interface-port-number)	The example is for interface 0 on a port adapter in port adapter bay 0 of a FlexWAN module installed in slot 3. Router# show interfaces serial 3/0/0 Serial 3/0/0 is administratively down, line protocol is down [Additional display text omitted from this example]
Cisco 7200 series routers and Cisco 7200 VXR routers	show interfaces serial , followed by <i>slot/port</i> (port-adapter-slot-number/interface-port-number)	The example is for interface 0 on a port adapter in port adapter slot 6. Router# show interfaces serial 6/0 Serial 6/0 is administratively down, line protocol is down [Additional display text omitted from this example]
Cisco 7201 router	show interfaces serial , followed by <i>slot/port</i> (port-adapter-slot-number/interface-port-number)	The example is for interface 0 on a port adapter in port adapter slot 1. Router# show interfaces serial 1/0 Serial 1/0 is administratively down, line protocol is down [Additional display text omitted from this example]
Cisco uBR7223 router	show interfaces serial , followed by <i>slot/port</i> (port-adapter-slot-number/interface-port-number)	The example is for interface 0 on a port adapter in port adapter slot 1. Router# show interfaces serial 1/0 Serial 1/0 is administratively down, line protocol is down [Additional display text omitted from this example]

Table 4-2 Examples of the `show interfaces serial` Command for the Supported Platforms (continued)

Platform	Command	Example
Cisco uBR7246 router	show interfaces serial , followed by <i>slot/port</i> (port-adapter-slot-number/interface-port-number)	The example is for interface 0 on a port adapter in port adapter slot 2. Router# show interfaces serial 2/0 Serial 2/0 is administratively down, line protocol is down [Additional display text omitted from this example]
Cisco 7301 router	show interfaces serial , followed by <i>slot/port</i> (port-adapter-slot-number/interface-port-number)	The example is for interface 0 on a port adapter in port adapter slot 1. Router# show interfaces serial 1/0 Serial 1/0 is administratively down, line protocol is down [Additional display text omitted from this example]
Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router	show interfaces serial , followed by <i>slot/port</i> (module-slot-number/interface-port-number)	The example is for interface 0 on a port adapter in a Cisco 7304 PCI Port Adapter Carrier Card in module slot 3 of a Cisco 7304 router. Router(config-if)# show interfaces serial 3/0 Serial 3/0 is administratively down, line protocol is down [Additional display text omitted from this example]
VIP in Cisco 7000 series routers or Cisco 7500 series routers	show interfaces serial , followed by <i>slot/port adapter/port</i> (interface-processor-slot-number/port-adapter-slot-number/interface-port-number)	The example is for interface 0 on a port adapter in port adapter slot 1 of a VIP in interface processor slot 1. Router# show interfaces serial 1/1/0 Serial 1/1/0 is administratively down, line protocol is down [Additional display text omitted from this example]

Step 6 Re-enable interfaces by doing the following:

- a. Repeat Step 3 to re-enable an interface. Substitute the **no shutdown** command for the **shutdown** command.
- b. Repeat Step 4 to write the new configuration to memory. Use the **copy running-config startup-config** command.

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

For complete descriptions of software configuration commands, refer to the publications listed in the [“Related Documentation” section on page viii](#).

Performing a Basic Interface Configuration

Following are instructions for a basic configuration, which include enabling an interface, specifying IP routing, and setting up external timing on a DCE interface. You might also need to enter other configuration subcommands, depending on the requirements for your system configuration and the protocols you plan to route on the interface. For complete descriptions of configuration subcommands and the configuration options available for serial interfaces, refer to the appropriate software documentation.

In the following procedure, 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 as follows:

```
Router# disable
```

```
Router>
```

- Step 1** Enter configuration mode and specify that the console terminal is the source of the configuration subcommands, as follows:

```
Router# configure terminal
```

```
Enter configuration commands, one per line. End with CNTL/Z.
```

```
Router(config)#
```

- Step 2** Specify the first interface to configure by entering the **interface serial** subcommand, followed by the interface address of the interface you plan to configure.

[Table 4-3](#) provides examples of the **interface serial** subcommand for the supported platforms.

Table 4-3 Examples of the interface serial Subcommand for Supported Platforms

Platform	Command	Example
Catalyst RSM/VIP2 in Catalyst 5000 family switches	interface serial , followed by <i>slot/port</i> (port-adapter-slot-number/interface-port-number)	The example is for interface 0 of a port adapter in port adapter slot 0. Router(config)# interface serial 0/0 Router(config-if)#
Catalyst 6000 family FlexWAN module in Catalyst 6000 family switches	interface serial , followed by <i>mod-num/bay/port</i> (module-slot-number/port-adapter-bay-number/interface-port-number)	The example is for interface 0 of a port adapter in port adapter bay 0 of a FlexWAN module installed in slot 3. Router(config)# interface serial 3/0/0 Router(config-if)#
Cisco 7200 series routers and Cisco 7200 VXR routers	interface serial , followed by <i>slot/port</i> (port-adapter-slot-number/interface-port-number)	The example is for interface 0 of a port adapter in port adapter slot 6. Router(config)# interface serial 6/0 Router(config-if)#

Table 4-3 Examples of the interface serial Subcommand for Supported Platforms (continued)

Platform	Command	Example
Cisco 7201 router	interface serial , followed by <i>slot/port</i> (port-adapter-slot-number/ interface-port-number)	The example is for interface 0 of a port adapter in port adapter slot 1. Router(config)# interface serial 1/0 Router(config-if)#
Cisco uBR7223 router	interface serial , followed by <i>slot/port</i> (port-adapter-slot-number/ interface-port-number)	The example is for interface 0 of a port adapter in port adapter slot 1. Router(config)# interface serial 1/0 Router(config-if)#
Cisco uBR7246 router	interface serial , followed by <i>slot/port</i> (port-adapter-slot-number/ interface-port-number)	The example is for interface 0 of a port adapter in port adapter slot 2. Router(config)# interface serial 2/0 Router(config-if)#
Cisco 7301 router	interface serial , followed by <i>slot/port</i> (port-adapter-slot-number/ interface-port-number)	The example is for interface 0 of a port adapter in port adapter slot 1. Router(config)# interface serial 1/0 Router(config-if)#
Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router	interface serial , followed by <i>slot/port</i> (module-slot-number/ interface-port-number)	The example is for interface 0 on a port adapter in a Cisco 7304 PCI Port Adapter Carrier Card in module slot 3 of a Cisco 7304 router. Router(config-if)# interface serial 3/0 Router(config-if)#
VIP in Cisco 7000 series routers or Cisco 7500 series routers	interface serial , followed by <i>slot/port adapter/port</i> (interface-processor-slot-number/ port-adapter-slot-number/ interface-port-number)	The example is for interface 0 of a port adapter in port adapter slot 1 of a VIP in interface processor slot 1. Router(config)# interface serial 1/1/0 Router(config-if)#

Step 3 Assign an IP address and subnet mask to the interface (if IP routing is enabled on the system) by using the **ip address** subcommand, as in the following example:

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

Step 4 Add any additional configuration subcommands required to enable routing protocols and set the interface characteristics.

Step 5 Re-enable the interfaces using the **no shutdown** command. (See the [“Shutting Down an Interface”](#) section on page 4-2.)

Step 6 Configure all additional port adapter interfaces as required.

Step 7 After including all of the configuration subcommands to complete your configuration, press **Ctrl-Z**—hold down the **Control** key while you press **Z**—or enter **end** or **exit** to exit configuration mode and return to the EXEC command interpreter prompt.

Step 8 Write the new configuration to NVRAM as follows:

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

Configuring the PA-MC-E3

Following are the procedures to configure the E3 controller, E1 lines, and serial interfaces for the PA-MC-E3. Note that all of these procedures are optional except for “Configuring E1 Lines”:

- [Configuring the E3 Controller, page 4-9](#)
- [Configuring E1 Lines, page 4-10](#)
- [Configuring the Serial Interface, page 4-14](#)

These procedures are followed by a sample configuration in the “Configuration Example” section on [page 4-15](#).

Configuring the E3 Controller

If you do not modify the E3 controller configuration of the PA-MC-E3, the configuration defaults in [Table 4-4](#) are used:

Table 4-4 PA-MC-E3 Controller Defaults

Attribute	Default Value
Clock source	line
National reserve bit	1
Idle pattern	0x55

This procedure is optional, however, if you need to change any of the default configuration attributes, follow these steps:

Step 1 Select the E3 controller and enter controller configuration mode:

```
Router(config)# controller E3 0/0 (Catalyst RSM/VIP2)
Router(config)# controller E3 3/0/0 (Catalyst 6000 family FlexWAN module)
Router(config)# controller E3 1/0 (Cisco 7200 series router)
Router(config)# controller E3 1/0 (Cisco uBR7200 series router)
Router(config)# controller E3 1/0 (Cisco 7201, Cisco 7301)
Router(config)# controller E3 3/0 (Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router)
Router(config)# controller E3 1/0/0 (Cisco 7000 and 7500 series routers with VIP)
```



Note The port number for the PA-MC-E3 is always 0.

Step 2 Change the clock source used by the E3 controller:

```
Router(config-controller)# clock source {internal | line}
```

Step 3 Change the national reserve bit.

```
Router(config-controller)# national bit {0 | 1}
```

Step 4 Change the idle pattern.

```
Router(config-controller)# idle pattern hex-number
```

Configuring E1 Lines

You can configure the E1 lines as any of the following four configuration options:

- Channelized
- Fractional
- Unframed
- PRI ISDN

If you assign only one channel group to an E1 line, it is a fractional E1 line. If you assign more than one channel group to an E1 line, it is a channelized E1 line.

For channelized (**e1 channel-group** command), fractional (**e1 channel-group** command), and unframed (**e1 unframed** command) configurations, each configured channel group, which might contain individual timeslots and/or ranges of timeslots, uses only one of the 128 available logical channels. For example, if you assign the range of timeslots 3-7 to a channel group, only one logical channel is used. Likewise, if you assign just timeslot 3 to a channel group, only one logical channel is used.

For PRI ISDN (**e1 pri-group** command) configurations, each timeslot you assign to a PRI group for a configured E1 line, including each timeslot within a range of timeslots, uses one of the 128 available logical channels. For example, if you assign the range of timeslots 3-7 to a PRI group, five logical channels are used (because you assigned timeslots 3, 4, 5, 6, and 7), whereas if you assign just timeslot 3 to a PRI group, only one logical channel is used.

After you configure the E1 lines, they are recognized by the software as a serial interface, and all configuration commands for a serial interface are available. You can configure the serial interface to carry data traffic with the encapsulation of PPP, HDLC, SMDS, and Frame Relay. For information on configuring a serial interface, see the [“Configuring the Serial Interface” section on page 4-14](#).

Changing the E1 Channel Default Settings

If you do not modify the E1 configuration of the PA-MC-E3, the configuration defaults in [Table 4-5](#) are used:

Table 4-5 PA-MC-E3 E1 Channel Defaults

Attribute	Default Value
Clock source	line
National reserve bit pattern	0x1f1
Framing format	crc4

If you need to change any of the default configuration attributes, follow these steps:

Step 1 Select the E3 controller and enter controller configuration mode:

```
Router(config)# controller E3 0/0 (Catalyst RSM/VIP2)
Router(config)# controller E3 3/0/0 (Catalyst 6000 family FlexWAN module)
Router(config)# controller E3 1/0 (Cisco 7200 series router)
Router(config)# controller E3 1/0 (Cisco uBR7200 series router)
Router(config)# controller E3 1/0 (Cisco 7201, Cisco 7301)
Router(config)# controller E3 3/0 (Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router)
Router(config)# controller E3 1/0/0 (Cisco 7000 and 7500 series routers with VIP)
```

**Note**

The port number for the PA-MC-E3 is always 0; the **e1 line** is a value from 1 to 16.

Step 2 Change the clock source used by the E3 controller:

```
Router(config-controller)# e1 line clock source {internal | line}
```

**Caution**

Hardware version 3.1.0 of the PA-MC-E3 port adapter has a limitation on the use of the internal clock. In this hardware, if you change the E1 clock source from line to internal or from internal to line, it is possible, although rare, that the change will cause the E1 line to transmit an invalid E1 framing pattern causing a loss of frame at the far end. To recover from this condition, manually reset the affected E1 line by using the **e1 shutdown** controller configuration command followed by the **no e1 shutdown** controller configuration command. To determine the hardware version on the port adapter, use the **show controllers e3** EXEC command. You cannot use the **e1 shutdown** command while running BERT or loopbacks; you must stop these functions first. In addition, you cannot start a BERT or loopback while an E1 line is shut down.

Step 3 Change the national reserve bit pattern:

```
Router(config-controller)# e1 line national bit hex-number
```

Step 4 Change the framing format:

```
Router(config-controller)# e1 line framing {crc4 | no-crc4 | none}
```

Configuring Channelized E1 Lines

You can configure any of the 16 E1 lines as channelized E1 lines, but you are limited to a total of 128 logical channels. You can group the time slots in these E1 lines into several individual logical channel groups, each of which carries data with different data link layer protocol encapsulations. You can configure timeslot 16 as a data channel, although it is typically used for common channel signaling. Channel associated signaling (CAS) for voice channels and E1 Facilities Data Link (FDL) on timeslot 16 are not supported.

Each logical channel group can be composed of individual 64-kbps timeslots and/or ranges of timeslots, for example, 1, 9, 12-14. Each logical channel group can contain from 1-31 timeslots maximum; the same timeslot cannot be used in more than one logical channel group. Any unused timeslots are filled with programmable idle-channel data.

**Note**

If you assign only one channel group to an E1 line, it is a fractional E1 line. If you assign more than one channel group to an E1 line, it is a channelized E1 line.

To configure a channelized E1 line, following these steps, beginning in global configuration mode:

Step 1 Select the E3 controller and enter controller configuration mode:

```
Router(config)# controller E3 0/0 (Catalyst RSM/VIP2)
Router(config)# controller E3 3/0/0 (Catalyst 6000 family FlexWAN module)
Router(config)# controller E3 1/0 (Cisco 7200 series router)
Router(config)# controller E3 1/0 (Cisco uBR7200 series router)
Router(config)# controller E3 1/0 (Cisco 7201, Cisco 7301)
```

```
Router(config)# controller E3 3/0 (Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router)
Router(config)# controller E3 1/0/0 (Cisco 7000 and 7500 series routers with VIP)
```

- Step 2** Configure the E1 line (values are 1 to 16) in a logical channel group (values are 0 to 30) and specify the timeslots (values are 1 to 31).

```
Router(config-controller)# e1 line channel-group number timeslots range
```

- Step 3** Repeat Step 2 for each logical channel group and exit when done.

```
Router(config-controller)# exit
```

This configuration creates a serial interface. For more information on serial interfaces, see the [“Configuring the Serial Interface” section on page 4-14](#).

Configuring Fractional E1 Lines

You can configure any of the 16 E1 lines as fractional E1 lines, each of which can be either E1 frames or E1 cyclic redundancy check (CRC) multiframes, as specified by CCITT/ITU G.704 and G.706. A fractional E1 line is a subset of the full E1 bandwidth, which uses Nx64 kbps; where N is a timeslot in the range of 1-31.

Fractional E1 lines contain only a single logical channel group that can be either a single 64-kbps timeslot or a range of timeslots; for example timeslot 1, or timeslots 15-23. Any unused timeslots are filled with programmable idle-channel data (**idle pattern** controller configuration command).



Note

If you assign only one channel group to an E1 line, it is a fractional E1 line. If you assign more than one channel group to an E1 line, it is a channelized E1 line.

To configure a fractional E1 line, follow these steps, beginning in global configuration mode:

- Step 1** Select the E3 controller and enter controller configuration mode:

```
Router(config)# controller E3 0/0 (Catalyst RSM/VIP2)
Router(config)# controller E3 3/0/0 (Catalyst 6000 family FlexWAN module)
Router(config)# controller E3 1/0 (Cisco 7200 series router)
Router(config)# controller E3 1/0 (Cisco uBR7200 series router)
Router(config)# controller E3 1/0 (Cisco 7201, Cisco 7301)
Router(config)# controller E3 3/0 (Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router)
Router(config)# controller E3 1/0/0 (Cisco 7000 and 7500 series routers with VIP)
```

- Step 2** Configure the E1 line (values are 1 to 16) in a logical channel group (values are 0 to 30) and specify the timeslots (values are 1 to 31).

```
Router(config-controller)# e1 line channel-group number timeslots range
```

This configuration creates a serial interface. For more information on serial interfaces, see the [“Configuring the Serial Interface” section on page 4-14](#).

Configuring Unframed E1 Lines

You can configure any of the 16 E1 lines as unframed E1 data lines. Each unframed E1 line contains no framing overhead and is not divided into timeslots.

To configure an unframed E1 line, follow these steps, beginning in global configuration mode:

- Step 1** Select the E3 controller and enter controller configuration mode:

```
Router(config)# controller E3 0/0 (Catalyst RSM/VIP2)
Router(config)# controller E3 3/0/0 (Catalyst 6000 family FlexWAN module)
Router(config)# controller E3 1/0 (Cisco 7200 series router)
Router(config)# controller E3 1/0 (Cisco uBR7200 series router)
Router(config)# controller E3 1/0 (Cisco 7201, Cisco 7301)
Router(config)# controller E3 3/0 (Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router)
Router(config)# controller E3 1/0/0 (Cisco 7000 and 7500 series routers with VIP)
```

- Step 2** Configure an unframed E1 line (values are 1 to 16).

```
Router(config-controller)# e1 line unframed
```

This configuration creates a serial interface. For more information on serial interfaces, see the [“Configuring the Serial Interface” section on page 4-14](#).

Configuring PRI ISDN E1 Lines

You can configure any of the E1 lines to support the PRI ISDN application. You assign a PRI group to the E1 line. Each PRI group can contain from 1-31 timeslots maximum. It is not necessary to allocate all 30 timeslots for the ISDN application. Timeslot 16 is used for common channel signaling. Any unused timeslot are filled with programmable idle-channel data (**idle pattern** controller configuration command).

To configure an E1 line to support the PRI ISDN, follow these steps, beginning in global configuration mode:

- Step 1** Select the E3 controller and enter controller configuration mode:

```
Router(config)# controller E3 0/0 (Catalyst RSM/VIP2)
Router(config)# controller E3 3/0/0 (Catalyst 6000 family FlexWAN module)
Router(config)# controller E3 1/0 (Cisco 7200 series router)
Router(config)# controller E3 1/0 (Cisco uBR7200 series router)
Router(config)# controller E3 1/0 (Cisco 7201, Cisco 7301)
Router(config)# controller E3 3/0 (Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router)
Router(config)# controller E3 1/0/0 (Cisco 7000 and 7500 series routers with VIP)
```

- Step 2** Configure the E1 line (values are 1 to 16) as a PRI group and specify the timeslots (values are 1 to 31 the default is all timeslots):

```
Router(config-controller)# e1 line pri-group [timeslots range]
```

This configuration creates a serial interface. For more information on serial interfaces, see the [“Configuring the Serial Interface” section on page 4-14](#).

Configuring the Serial Interface

After you configure the E1 lines on the PA-MC-E3, you can continue configuring it as you would a normal serial interface. All serial interface commands might not be applicable to the E1 channel. You can configure the serial interface to carry data traffic with the encapsulation of PPP, HDLC, SMDS, and Frame Relay.

For more information on other commands available for serial interfaces, refer to the “Configure a Synchronous Serial Interface” subsection in the “Configuring Interfaces” chapter of the *Configuration Fundamentals Configuration Guide*.

To enter interface configuration mode and configure the serial interface that corresponds to an E1 line, enter the **interfaces serial** command in global configuration mode.



Note

When configuring the serial interface, you must specify the e1 line number and channel in addition to the standard slot and port information for each router. For unframed E1 lines, the channel is always zero (for example, interface serial 3/0/0/1:0). For channelized and fractional E1 lines, the channel is the number specified as the channel group number (for example, interface serial 3/0/0/3:20, where 20 is the channel group number). For PRI E1 lines, the channel is always 15 (for example, interface serial 3/0/0/3:15).

Table 4-6 provides examples of the **interface serial** subcommand for an E1 line for the supported platforms.

Table 4-6 Examples of the interface serial Subcommand for an E1 Line for Supported Platforms

Platform	Command	Example
Catalyst RSM/VIP2 in Catalyst 5000 family switches	interface serial , followed by <i>slot/port/e1-line:channel</i> (port-adapter-slot-number/interface-port-number/e1-line-number:channel-group-number)	The example is for interface 0 of a port adapter in port adapter slot 0. Router(config)# interface serial 0/0/1:0 Router(config-if)#
Catalyst 6000 family FlexWAN module in Catalyst 6000 family switches	interface serial , followed by <i>mod-num/bay/port/e1-line:channel</i> (module-slot-number/port-adapter-bay-number/interface-port-number/e1-line-number:channel-group-number)	The example is for interface 0 of a port adapter in port adapter bay 0 of a FlexWAN module installed in slot 3. Router(config)# interface serial 3/0/0/1:0 Router(config-if)#
Cisco 7200 series routers and Cisco 7200 VXR routers	interface serial , followed by <i>slot/port/e1-line:channel</i> (port-adapter-slot-number/interface-port-number/e1-line-number:channel-group-number)	The example is for interface 0 of a port adapter in port adapter slot 6. Router(config)# interface serial 6/0/1:0 Router(config-if)#
Cisco 7201 router	interface serial , followed by <i>slot/port/e1-line:channel</i> (port-adapter-slot-number/interface-port-number/e1-line-number:channel-group-number)	The example is for interface 0 of a port adapter in port adapter slot 1. Router(config)# interface serial 1/0/1:0 Router(config-if)#

Table 4-6 Examples of the interface serial Subcommand for an E1 Line for Supported Platforms (continued)

Platform	Command	Example
Cisco uBR7223 router	interface serial , followed by <i>slot/port/e1-line:channel</i> (port-adapter-slot-number/interface-port-number/e1-line-number:channel-group-number)	The example is for interface 0 of a port adapter in port adapter slot 1. Router(config)# interface serial 1/0/1:0 Router(config-if)#
Cisco uBR7246 router	interface serial , followed by <i>slot/port/e1-line:channel</i> (port-adapter-slot-number/interface-port-number/e1-line-number:channel-group-number)	The example is for interface 0 of a port adapter in port adapter slot 2. Router(config)# interface serial 2/0/1:0 Router(config-if)#
Cisco 7301 router	interface serial , followed by <i>slot/port/e1-line:channel</i> (port-adapter-slot-number/interface-port-number/e1-line-number:channel-group-number)	The example is for interface 0 of a port adapter in port adapter slot 1. Router(config)# interface serial 1/0/1:0 Router(config-if)#
Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router	interface serial , followed by <i>slot/port/e1-line:channel</i> (module-slot-number/interface-port-number/e1-line-number:channel-group-number)	The example is for interface 0 on a port adapter in a Cisco 7304 PCI Port Adapter Carrier Card in module slot 3 of a Cisco 7304 router. Router(config-if)# interface serial 3/0/1:0 Router(config-if)#
VIP in Cisco 7000 series routers or Cisco 7500 series routers	interface serial , followed by <i>slot/port adapter/port/e1-line:channel</i> (interface-processor-slot-number/port-adapter-slot-number/interface-port-number/e1-line-number:channel-group-number)	The example is for interface 0 of a port adapter in port adapter slot 1 of a VIP in interface processor slot 1. Router(config)# interface serial 1/1/0/1:0 Router(config-if)#

Configuration Example

The following example shows a condensed PA-MC-E3 configuration example in which multiple E1 lines at remote sites are aggregated onto a single E3 line at the edge router. This example concentrates the E1 lines to the router without an E123 multiplexer or E1 CSU/DSU.

In the following example, the PA-MC-E3 in slot 4 is configured as follows:

- E1 line 2 is assigned to channel group 0 and is using all timeslots (full E1 bandwidth)
- E1 line 3 is assigned to channel group 0 and is using timeslots 1 through 15
- E1 line 3 is also assigned to channel group 1 and is using timeslots 16 through 31
- For the E3, the default clock source, national, bit, and idle pattern are used
- For each E1 line, the default framing, national bits, and clock source are used
- Each E1 channel is assigned an IP address

Note that the example below is only a partial example; other interface configuration commands can be assigned to the E1 channel.

For more information, refer to the “Configuring the E3 Controller” section on page 4-9 and the “Configuring E1 Lines” section on page 4-10.

```
Router# configure terminal

Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# controller e3 4/0/0

Router(config-controller)# e1 2 channel-group 0 timeslot 1-31

Router(config-controller)# e1 3 channel-group 0 timeslot 1-15

Router(config-controller)# e1 3 channel-group 1 timeslot 16-31

...
Router(config)# interface serial 4/0/0/2:0

Router(config-if)# ip address 10.20.30.1 255.255.255.0

Router(config)# interface serial 4/0/0/3:0

Router(config-if)# ip address 10.20.40.1 255.255.255.0

Router(config)# interface serial 4/0/0/3:1

Router(config-if)# ip address 10.20.50.1 255.255.255.0

...
Router(config-if)# end
```

Configuring a BERT on an E1 Line

Bit error rate test (BERT) circuitry is built into the PA-MC-E3. Using BERTs you can test cables and signal problems in the field. You can configure any E1 line to connect to the onboard BERT circuitry.

There are two categories of test patterns that can be generated by the onboard BERT circuitry: pseudorandom and repetitive. The former test patterns are exponential numbers and conform to CCITT/ITU O.151 and O.153; the latter test patterns are zeroes or ones, or alternating zeroes and ones.

A description of each type of test pattern follows:

- Pseudorandom patterns:
 - 2¹¹ (per CCITT/ITU O.151)
 - 2¹⁵ (per CCITT/ITU O.151)
 - 2²⁰ (per CCITT/ITU O.153)
 - 2²⁰ QRSS (per CCITT/ITU O.151)
 - 2²³ (per CCITT/ITU O.151)
- Repetitive patterns:
 - All zeros (0s)
 - All ones (1s)
 - Alternating zeros (0s) and ones (1s)

Both the total number of error bits received and the total number of bits received are available for analysis. You can select the testing period from 1 minute to 24 hours, and you can also retrieve the error statistics anytime during the BERT. (Note that BER testing for the E3 link is not supported.) When running a BERT, your system expects to receive the same pattern that it is transmitting. To help ensure this, two common options are available:

- Use a loopback somewhere in the link or network.
- Configure remote testing equipment to transmit the same BER test pattern at the same time.

Sending a BERT Pattern on an E1 Line

You can send a BERT pattern on an E1 line with the following controller command:

e1 *e1-line-number* **bert pattern** *pattern* **interval** *time*.

where:

- *e1-line-number* is 1–16
- *time* is 1–1440 minutes
- *pattern* is:
 - 0s, repetitive test pattern of all zeros (as 00000...)
 - 1s, repetitive test pattern of all ones (as 11111...)
 - 2¹¹, pseudo-random test pattern (2,048 bits long)
 - 2¹⁵, pseudo-random O.151 test pattern (32,768 bits long)
 - 2²⁰-O153, pseudo-random O.153 test pattern (1,048,575 bits long)
 - 2²⁰-QRSS, pseudo-random QRSS O.151 test pattern (1,048,575 bits long)
 - 2²³, pseudo-random O.151 test pattern (8,388,607 bits long)
 - alt-0-1, repetitive alternating test pattern of zeros (0s) and ones (1s), as 01010101...



Note

To terminate a BER test during the specified test period, use the **no e1 line bert** command.

The following examples show how to configure a BER test to send a BERT pseudorandom pattern of 2²⁰ through E1 line 10 for 5 minutes for various supported routers:

For a Cisco 7200 series or a Cisco uBR7200 series router:

```
Router(config)# controller e3 1/0
Router(config-controller)# e1 10 bert pattern 2^20 interval 5
```

For a VIP2:

```
Router(config)# controller e3 1/0/0
Router(config-controller)# e1 10 bert pattern 2^20 interval 5
```

For a Catalyst RSM/VIP2:

```
Router(config)# controller e3 1/0
Router(config-controller)# e1 10 bert pattern 2^20 interval 5
```

Viewing BERT Results

To view the BERT results for the above examples, you would enter the following **show controllers** commands:

For the Cisco 7200 series or a Cisco uBR7200 series router:

```
Router(config)# show controllers e3 1/0/10
```

For a VIP2:

```
Router(config)# show controllers e3 1/0/0/10
```

For a Catalyst RSM/VIP2:

```
Router(config)# show controllers e3 1/0/10
```

Configuring Cyclic Redundancy Checks

Cyclic redundancy check (CRC) is an error-checking technique that uses a calculated numeric value to detect errors in transmitted data. All interfaces use a 16-bit CRC (CRC-CITT) by default but also support a 32-bit CRC. The sender of a data frame calculates the frame check sequence (FCS). Before it sends a frame, the sender appends the FCS value to the message. The receiver recalculates the FCS and compares its calculation to the FCS from the sender. If there is a difference between the two calculations, the receiver assumes that a transmission error occurred and sends a request to the sender to resend the frame.

[Table 4-7](#) summarizes the CRC commands.

Table 4-7 **CRC Commands**

Command	Function	Example
crc size	Enable 32-bit CRC.	The following example enables 32-bit CRD on a serial interface: Router(config)# interface serial 3/0 Router(config-if)# crc 32
no crc size	Return to default 16-bit CRC.	The following example disables 32-bit CRD on a serial interface and returns to the default 16-bit CRC: Router(config)# interface serial 3/0 Router(config-if)# no crc 32

You enable 32-bit CRC using the **crc 32** command. Before you can enable 32-bit CRC, you must use the **interface serial** command (followed by the interface address of the interface) to select the interface on which you want to enable 32-bit CRC. This command functions in the same way on all supported platforms.

In the example that follows, 32-bit CRC is specified:

```
Router(config-if)# crc 32
```

The preceding command example applies to all systems in which the PA-MC-E3 is supported. Use the **no crc 32** command to disable CRC-32 and return the interface to the default CRC-16 (CRC-CITT) setting.

When you have finished, press **Ctrl-Z**—hold down the **Control** key while you press **Z**—or enter **end** or **exit** to exit configuration mode and return to the EXEC command interpreter prompt. Then write the new configuration to NVRAM using the **copy running-config startup-config** command.

For command descriptions, refer to the *Configuration Fundamentals Configuration Guide* on Cisco.com.

Checking the Configuration

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

- [Using show Commands to Verify the New Interface Status, page 4-19](#)
- [Using the ping Command to Verify Network Connectivity, page 4-33](#)
- [Using loopback Commands, page 4-33](#)

Using show Commands to Verify the New Interface Status

[Table 4-8](#) demonstrates how you can use the **show** commands to verify that new interfaces are configured and operating correctly and that the PA-MC-E3 appears in them correctly. Sample displays of the output of selected **show** commands appear in the sections that follow. For complete command descriptions and examples, refer to the publications listed in the “[Related Documentation](#)” section on [page viii](#).

**Note**

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

Table 4-8 *Using show Commands*

Command	Function	Example
show version or show hardware	Displays system hardware configuration, the number of each interface type installed, Cisco IOS software version, names and sources of configuration files, and boot images	Router# show version
show controllers	Displays all the current interface processors and their interfaces	Router# show controllers

Table 4-8 Using show Commands (continued)

Command	Function	Example
show controllers e3 [<i>slot/port/e1-line</i>] [brief tabular]	Displays the status of the E3 controller on the Catalyst RSM/VIP2, Cisco7200 series routers, Cisco 7200 uBR series routers, Cisco 7200 VXR routers, Cisco 7201 router, Cisco 7301 router, and Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router	Router# show controllers e3 1/0/1 brief
show controllers e3 [<i>module-slot-number/port-adapter-bay-number/interface-port-number/e1-line</i>] [brief tabular]	Displays the status of the E3 controller on a Catalyst 6000 family FlexWAN module	Router# show controllers e3 3/0/0/1 brief
show controllers e3 [<i>interface-processor-slot-number/port-adapter-slot-number/interface-port-number/e1-line</i>] [brief tabular]	Displays the status of the E3 controller on a VIP in a Cisco 7000 series router or Cisco 7500 series router	Router# show controllers e3 3/1/0/1 tabular
show diag slot Note The <i>slot</i> argument is not required with Catalyst 5000 family switches.	Displays types of port adapters installed in your system and information about a specific port adapter slot, interface processor slot, or chassis slot	Router# show diag 2
show interfaces type 0 or 1/ <i>interface-port-number</i>	Displays status information about a specific type of interface (for example, serial) on a Catalyst RSM/VIP2	Router# show interfaces serial 1/0
show interfaces type <i>module-slot-number/port-adapter-bay-number/interface-port-number</i>	Displays status information about a specific type of interface (for example, serial) on a Catalyst 6000 family FlexWAN module	Router# show interfaces serial 3/0/0
show interfaces type <i>port-adapter-slot-number/interface-port-number</i>	Displays status information about a specific type of interface (for example, serial) in a Cisco 7200 series router, Cisco 7200 VXR router, Cisco 7201 router, or Cisco 7301 router	Router# show interfaces serial 1/0
show interfaces type 1/ <i>interface-port-number</i>	Displays status information about a specific type of interface (for example, serial) in a Cisco uBR7223 router	Router# show interfaces serial 1/1

Table 4-8 Using show Commands (continued)

Command	Function	Example
show interfaces <i>type 1 or 2/</i> <i>interface-port-number</i>	Displays status information about a specific type of interface (for example, serial) in a Cisco uBR7246 router	Router# show interfaces serial 2/0
show interfaces <i>type module-slot-number/</i> <i>interface-port-number</i>	Displays status information about a specific type of interface (for example, serial) on a Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router	Router# show interfaces serial 3/0
show interfaces <i>type interface-processor-</i> <i>slot-number/port-adapter-slot-number/</i> <i>interface-port-number</i>	Displays status information about a specific type of interface (for example, serial) on a VIP in a Cisco 7000 series router or Cisco 7500 series router	Router# show interfaces serial 3/1/0
show interfaces serial <i>slot/port/e1-line:channel-group</i>	Display statistics about the serial information for a specific E1 line (values are 1 to 16) and channel group (values are 0 to 30) on the Catalyst RSM/VIP2, Cisco7200 series routers, Cisco 7200 uBR series routers, Cisco 7200 VXR routers, Cisco 7201 router, Cisco 7301 router, and Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router	Router# show interfaces serial 1/0/1:0
show interfaces serial <i>module-slot-</i> <i>number/port-adapter-bay-number/</i> <i>interface-port-number/e1-line:channel-</i> <i>group</i>	Display statistics about the serial information for a specific E1 line (values are 1 to 16) and channel group (values are 0 to 30) on a Catalyst 6000 family FlexWAN module	Router# show interfaces serial 3/0/1:0
show interfaces serial <i>interface-processor-</i> <i>slot-number/port-adapter-slot-number</i> <i>/e1-line:channel-group</i>	Display statistics about the serial information for a specific E1 line (values are 1 to 16) and channel group (values are 0 to 30) on a VIP in a Cisco 7000 series router or Cisco 7500 series router	Router# show interfaces serial 3/0/1:0
show protocols	Displays protocols configured for the entire system and for specific interfaces	Router# show protocols
show running-config	Displays the running configuration file	Router# show running-config
show startup-config	Displays the configuration stored in NVRAM	Router# show startup-config

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

- [Using the show version or show hardware Commands, page 4-22](#)
- [Using the show diag Command, page 4-26](#)
- [Using the show interfaces Command, page 4-29](#)

Choose the subsection appropriate for your system. Proceed to [“Using the ping Command to Verify Network Connectivity” section on page 4-33](#) when you have finished using the **show** commands.

Using the show version or show hardware Commands

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



Note

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

The following sections provide platform-specific output examples using the **show version** command:

- [Catalyst RSM/VIP2 in Catalyst 5000 Family Switches—Example Output of the show version Command, page 4-22](#)
- [Catalyst 6000 Family FlexWAN Module—Example Output of the show version Command, page 4-23](#)
- [Cisco 7200 Series Routers, Cisco 7200 VXR Routers, and Cisco uBR7200 Series Routers—Example Output of the show version Command, page 4-24](#)
- [Cisco 7201 Router—Example Output of the show version Command, page 4-24](#)
- [VIP in Cisco 7000 Series Routers and Cisco 7500 Series Routers—Example Output of the show version Command, page 4-25](#)

Catalyst RSM/VIP2 in Catalyst 5000 Family Switches—Example Output of the show version Command

Following is an example of the **show version** command from a Catalyst 5000 family switch with the PA-MC-E3:

```
Router# show version

Cisco Internetwork Operating System Software
IOS (tm) C5RSM Software (C5RSM-JSV-M), Version 11.2(9)P
Copyright (c) 1986-1997 by cisco Systems, Inc.
Compiled Tue 24-Jun-97 17:09 by biff
Image text-base: 0x600108E0, data-base: 0x6095E000

ROM: System Bootstrap, Version 11.2(15707)
BOOTFLASH: C5RSM Software (C5RSM-JSV-M), Version 11.2

Router uptime is 17 hours, 17 minutes
System restarted by reload
System image file is "c5rsm-jsv-mz.7P", booted via tftp

cisco RSP2 (R4700) processor with 32768K bytes of memory.
```



```

R4700 processor, Implementation 33, Revision 1.0
Last reset from power-on
G.703/E1 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.
1 C5IP controller (15 Vlan).
2 MIP controllers (4 E1).
1 VIP2 controller (2 E1)(4 Token Ring).
6 Channelized E1/PRI ports.
123K bytes of non-volatile configuration memory.

16384K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
8192K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x100

```

Catalyst 6000 Family FlexWAN Module—Example Output of the show version Command

Following is an example of the **show version** command from a Catalyst 6000 family switch with the PA-MC-E3:

```

Router# show version

Cisco Internetwork Operating System Software
IOS (tm) MSFC Software (C6MSFC-JSV-M), Experimental Version 12.1(20000209:134547)
[amcrae-cosmos_e_nightly 163]
Copyright (c) 1986-2000 by cisco Systems, Inc.
Compiled Wed 09-Feb-00 07:10 by
Image text-base: 0x60008900, data-base: 0x6140E000

ROM: System Bootstrap, Version 12.0(3)XE, RELEASE SOFTWARE

const-uut uptime is 5 minutes
System returned to ROM by reload
System image file is "bootflash:c6msfc-jsv-mz.Feb9"

cisco Cat6k-MSFC (R5000) processor with 122880K/8192K bytes of memory.
Processor board ID SAD03457061
R5000 CPU at 200Mhz, Implementation 35, Rev 2.1, 512KB L2 Cache
Last reset from power-on
Channelized E1, Version 1.0.
Bridging software.
X.25 software, Version 3.0.0.
SuperLAT software (copyright 1990 by Meridian Technology Corp).
TN3270 Emulation software.
Primary Rate ISDN software, Version 1.1.
6 FlexWAN controllers (13 Serial)(8 E1)(8 T1)(2 HSSI)(2 ATM)(1 Channelized T3)(1
Channelized E3)(2 POS).
1 Virtual Ethernet/IEEE 802.3 interface(s)
17 Serial network interface(s)
2 HSSI network interface(s)
2 ATM network interface(s)
2 Packet over SONET network interface(s)
1 Channelized T3 port(s)
1 Channelized E3 port(s)
123K bytes of non-volatile configuration memory.
4096K bytes of packet SRAM memory.

16384K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x1

```

Cisco 7200 Series Routers, Cisco 7200 VXR Routers, and Cisco uBR7200 Series Routers—Example Output of the show version Command

Following is an example of the **show version** command from a Cisco 7200 series router with the PA-MC-E3:

```
Router# show version
```

```
Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-J-M), Version 11.1(7)CA [biff 105]
Copyright (c) 1986-1996 by cisco Systems, Inc.
Compiled Sun 04-Aug-96 06:00 by biff
Image text-base: 0x600088A0, data-base: 0x605A4000
```

```
ROM: System Bootstrap, Version 11.1(7)CA RELEASED SOFTWARE
```

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

```
cisco 7206 (NP150) processor with 12288K/4096K bytes of memory.
R4700 processor, Implementation 33, Revision 1.0 (Level 2 Cache)
Last reset from power-on
Bridging software.
SuperLAT software (copyright 1990 by Meridian Technology Corp).
X.25 software, Version 2.0, NET2, BFE and GOSIP compliant.
TN3270 Emulation software (copyright 1994 by TGV INC).
Chassis Interface.
4 Ethernet/IEEE 802.3 interfaces.
2 FastEthernet/IEEE 802.3 interfaces.
4 Token Ring /IEEE802.5 interfaces.
12 Serial network interfaces.
1 Compression port adapter.
125K bytes of non-volatile configuration memory.
1024K bytes of packet SRAM memory.

20480K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
8192K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x2
```

Cisco 7201 Router—Example Output of the show version Command

Following is an example of the **show version** command from a Cisco 7201 router:

```
Router# show version
```

```
Cisco IOS Software, 7200 Software (C7200P-ADVENTERPRISEK9-M), Version
12.4(biffDEV.061001), INTERIM SOFTWARE Copyright (c) 1986-2006 by Cisco Systems, Inc.
Compiled Sun 01-Oct-06 23:42 by biff
ROM: System Bootstrap, Version 12.4(4r)XD5, RELEASE SOFTWARE (fc1)
BOOTLDR: Cisco IOS Software, 7200 Software (C7200P-KBOOT-M), Version 12.4(TAZ3DEV.060927),
INTERIM SOFTWARE
c7201alphal uptime is 5 days, 18 hours, 32 minutes System returned to ROM by power-on
System image file is "disk0:c7200p-adventerprisek9-mz.2006-10-01.biffdev"
This product contains cryptographic features and is subject to United States and local
country laws governing import, export, transfer and use. Delivery of Cisco cryptographic
products does not imply third-party authority to import, export, distribute or use
encryption.
Importers, exporters, distributors and users are responsible for compliance with U.S. and
local country laws. By using this product you agree to comply with applicable laws and
regulations. If you are unable to comply with U.S. and local laws, return this product
immediately.
```

```

A summary of U.S. laws governing Cisco cryptographic products may be found at:
http://www.cisco.com/wwl/export/crypto/tool/stqrg.html
If you require further assistance please contact us by sending email to export@cisco.com.
Cisco 7201 (c7201) processor (revision A) with 917504K/65536K bytes of memory.
Processor board ID 222222222222
MPC7448 CPU at 1666Mhz, Implementation 0, Rev 2.2
1 slot midplane, Version 2.255
Last reset from power-on
1 FastEthernet interface
4 Gigabit Ethernet interfaces
2045K bytes of NVRAM.
62443K bytes of USB Flash usbflash0 (Read/Write)
250880K bytes of ATA PCMCIA card at slot 0 (Sector size 512 bytes).
65536K bytes of Flash internal SIMM (Sector size 512K).
Configuration register is 0x2

```

VIP in Cisco 7000 Series Routers and Cisco 7500 Series Routers—Example Output of the show version Command

Following is an example of the **show version** command from a Cisco 7500 series router with the PA-MC-E3:

```
Router# show version
```

```

Cisco Internetwork Operating System Software
IOS (tm) GS Software (RSP-A), Version 11.1(7)CA [biff 125]
Copyright (c) 1986-1996 by cisco Systems, Inc.
Compiled Sat 10-Aug-96 17:56 by biff
Image text-base: 0x600108A0, data-base: 0x60952000

ROM: System Bootstrap, Version 5.3(16645) [biff 571], RELEASE SOFTWARE
ROM: GS Software (RSP-BOOT-M), Version 11.1(7)CA, RELEASE SOFTWARE (fc1)

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

cisco RSP2 (R4600) processor with 16384K bytes of memory.
R4600 processor, Implementation 32, Revision 2.0
Last reset from power-on
G.703/E1 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.
1 EIP controller (6 Ethernet).
1 VIP2 controller (8 Ethernet)(1 HSSI).
14 Ethernet/IEEE 802.3 interfaces.
1 HSSI network interface.
125K bytes of non-volatile configuration memory.

8192K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
8192K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x0

```

Using the show diag Command

Display the types of port adapters installed in your system (and specific information about each) using the **show diag slot** command, where *slot* is the *port adapter slot* in a Catalyst 5000 family switch, Cisco 7200 series router, Cisco 7200 VXR router, Cisco uBR7200 series router, Cisco 7201 router, Cisco 7301 router, or Cisco 7401ASR router, the *module slot* in a Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router, and the *interface processor slot* in a Cisco 7000 series router or Cisco 7500 series router with a VIP. In the FlexWAN module, the **show diag** command is used without the *slot* designation.



Note

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



Note

The *slot* argument is not required for Catalyst 5000 family switches.

The following sections provide platform-specific output examples using the **show diag** command:

- [Catalyst RSM/VIP2 in Catalyst 5000 Family Switches—Example Output of the show diag Command, page 4-26](#)
- [Cisco 6000 Family FlexWAN Module—Example Output of the show diag Command, page 4-27](#)
- [Cisco 7200 Series Routers, Cisco 7200 VXR Routers, and Cisco uBR7200 Series Routers—Example Output of the show diag Command, page 4-27](#)
- [Cisco 7201 Router —Example Output of the show diag Command, page 4-27](#)
- [VIP in Cisco 7000 Series Routers and Cisco 7500 Series Routers—Example Output of the show diag Command, page 4-28](#)

Catalyst RSM/VIP2 in Catalyst 5000 Family Switches—Example Output of the show diag Command

Following is an example of the **show diag** command that shows a PA-MC-E3 on a Catalyst RSM/VIP2:

```
Router# show diag
Slot 0:
  Physical slot 0, ~physical slot 0xF, logical slot 0, CBus 1
  Microcode Status 0x4
  Master Enable, LED, WCS Loaded
  Board is analyzed
  Pending I/O Status: Console I/O, Debug I/O
  EEPROM format version 1
  C5IP controller, HW rev 1.0, board revision A0
  Serial number: 00000001  Part number: 00-0000-01
  Test history: 0x00      RMA number: 00-00-00
  Flags: cisco 7000 board; 7500 compatible
EEPROM contents (hex):
  0x20: 01 1C 01 00 00 00 00 01 00 00 00 01 00 00 00 00
  0x30: 50 00 00 00 00 00 00 00 00 00 00 00 78 00 00 00
[Additional display text omitted]
```

Cisco 6000 Family FlexWAN Module—Example Output of the show diag Command

Following is an example of the **show diag** command that shows a PA-MC-E3 on a Catalyst 6000 family FlexWAN module:

```
Router# show diag

(Additional displayed text omitted from this example.)

Slot 5: Logical_index 11
Board is analyzed ipc ready FlexWAN controller

Slot database information:
Flags: 0x2004Insertion time: unknown

CWAN Controller Memory Size: Unknown
PA Bay 1 Information:
    CE3 PA, 1 port
EEPROM format version 0
HW rev 0.00, Board revision UNKNOWN
Serial number: 00000000 Part number: 00-0000-00
```

Cisco 7200 Series Routers, Cisco 7200 VXR Routers, and Cisco uBR7200 Series Routers—Example Output of the show diag Command

Following is an example of the **show diag** command that shows a PA-MC-E3 in port adapter slot 1 of a Cisco 7200 series router:

```
Router# show diag 1
Slot 1:
CE3 Port adapter, 1 port
Port adapter is analyzed
Port adapter insertion time 00:18:56 ago
EEPROM contents at hardware discovery:
Hardware revision 1.0          Board revision A0
Serial number    9007030       Part number    73-2410-02
Test history     0x0           RMA number     00-00-00
EEPROM format version 1
EEPROM contents (hex):
0x20:01 61 01 00 00 89 6F B6 49 09 6A 02 00 00 00 00
0x30:50 00 00 00 98 05 26 00 FF FF FF FF FF FF FF FF
```

Cisco 7201 Router —Example Output of the show diag Command

Following is an example of the **show diag** command on a Cisco 7201 router:

```
Router# show diag 1
Slot 1:
Dual OC3 POS Port adapter, 2 ports
Port adapter is analyzed
Port adapter insertion time 00:02:19 ago
EEPROM contents at hardware discovery:
Hardware Revision : 1.0
PCB Serial Number : JAE07520DYL
Part Number : 73-8220-02
Board Revision : A0
RMA Test History : 00
RMA Number : 0-0-0-0
RMA History : 00
Deviation Number : 0
Product (FRU) Number : PA-POS-2OC3
```

```

Top Assy. Part Number : 800-21857-02
EEPROM format version 4
EEPROM contents (hex):
0x00: 04 FF 40 03 E3 41 01 00 C1 8B 4A 41 45 30 37 35
0x10: 32 30 44 59 4C 82 49 20 1C 02 42 41 30 03 00 81
0x20: 00 00 00 00 04 00 88 00 00 00 00 CB 94 50 41 2D
0x30: 50 4F 53 2D 32 4F 43 33 20 20 20 20 20 20 20 20
0x40: 20 C0 46 03 20 00 55 61 02 FF FF FF FF FF FF FF
0x50: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x60: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x70: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF

```

VIP in Cisco 7000 Series Routers and Cisco 7500 Series Routers—Example Output of the show diag Command

Following is an example of the **show diag** command that shows a PA-MC-E3 in port adapter slot 0 on a VIP2 in interface processor slot 1:

```

Router# show diag 1
Slot 1:
Mueslix serial (RS232) port adapter, 8 ports
Port adapter is analyzed
Port adapter insertion time 2d09h ago
Hardware revision 1.4          Board revision UNKNOWN
Serial number 4294967295      Part number 255-65535-255
Test history 0xFF            RMA number 255-255-255
EEPROM format version 1
EEPROM contents (hex):
0x20:01 0F 01 04 FF FF FF FF FF FF FF FF FF FF FF
0x30:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
Slot database information:
Flags: 0x4          Insertion time: 0x12A0 (08:56:58 ago)

Controller Memory Size: 8 MBytes

PA Bay 0 Information:
Mueslix Serial PA, 8 ports
EEPROM format version 1
HW rev 1.0, Board revision A0
Serial number: 4294967295 Part number: 255-65535-255

PA Bay 1 Information:
Fast-Serial PA, 4 ports
EEPROM format version 1
HW rev 1.0, Board revision A0
Serial number: 02024473 Part number: 73-1389-05

```

Using the show interfaces Command

Display status information (including the physical slot and interface address) for the interfaces you specify using the **show interfaces** command.

For complete descriptions of interface subcommands and the configuration options available for the individual platforms and VIP interfaces, refer to the publications listed in the [“Related Documentation” section on page viii](#).



Note

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

The following sections provide platform-specific output examples using the **show interfaces** command:

- [Catalyst RSM/VIP2 in Catalyst 5000 Family Switches—Example Output of the show interfaces Command, page 4-29](#)
- [Catalyst 6000 Family FlexWAN Module—Example Output of the show interfaces Command, page 4-30](#)
- [Cisco 7200 Series Routers, Cisco 7200 VXR Routers, and Cisco uBR7200 Series Routers—Example Output of the show interfaces Command, page 4-30](#)
- [Cisco 7201 Router—Example Output of the show interfaces Command, page 4-31](#)
- [VIP in Cisco 7000 Series Routers or Cisco 7500 Series Routers—Example Output of the show interfaces Command, page 4-32](#)

Catalyst RSM/VIP2 in Catalyst 5000 Family Switches—Example Output of the show interfaces Command

Following are examples of the **show interfaces serial** command from a Catalyst RSM/VIP2. In these examples, the eight serial interfaces (0 to 7) are on a port adapter in port adapter slot 1 of a Catalyst RSM/VIP2; also, most of the status information for each interface is omitted. (Interfaces are administratively shut down until you enable them.)

```
Router# show interfaces serial 1/0
Serial1/0 is up, line protocol is up
  Hardware is cyBus Serial
  Internet address is 10.0.0.1
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
[Additional display text omitted from this example]
```

```
Router# show interfaces serial 1/1
Serial1/1 is up, line protocol is up
  Hardware is cyBus Serial
  Internet address is 10.0.0.1
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
[Additional display text omitted from this example]
```

```
Router# show interfaces serial 1/2
Serial1/2 is up, line protocol is up
  Hardware is cyBus Serial
  Internet address is 10.0.0.2
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
[Additional display text for remaining interfaces omitted]
```

Catalyst 6000 Family FlexWAN Module—Example Output of the show interfaces Command

Following is an example of the **show interfaces serial** command from a Catalyst 6000 family FlexWAN module. In this example, the Catalyst 6000 family FlexWAN module is in slot 5, and the MC-E3 port adapter is in port adapter bay 1:

```
Router(config)# show interface serial 5/1/0/1:0
Serial5/1/0/1:0 is down, line protocol is down
  Hardware is E3
  MTU 1500 bytes, BW 1984 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, crc 16, loopback not set
  Keepalive not set
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    0 packets input, 0 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    0 packets output, 0 bytes, 0 underruns
    0 output errors, 0 collisions, 2 interface resets
    0 output buffer failures, 0 output buffers swapped out
    0 carrier transitions alarm present
  Timeslot(s) Used:1-31, Transmitter delay is 0 flags, transmit queue length 999
```

Cisco 7200 Series Routers, Cisco 7200 VXR Routers, and Cisco uBR7200 Series Routers—Example Output of the show interfaces Command

Following are examples of the **show interfaces serial** command from a Cisco 7200 series router. In these examples, the eight serial interfaces (0 to 7) are on a port adapter in port adapter slot 1; also, most of the status information for each interface is omitted. (Interfaces are administratively shut down until you enable them.)

```
Router# show interfaces serial 1/0
Serial1/0 is up, line protocol is up
  Hardware is M8T-RS232
  Internet address is 10.0.0.0
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
[Additional display text omitted from this example]
```

```
Router# show interfaces serial 1/1
Serial1/1 is up, line protocol is up
  Hardware is M8T-RS232
  Internet address is 10.0.0.1
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
[Additional display text omitted from this example]
```

```
Router# show interfaces serial 1/2
Serial1/2 is up, line protocol is up
  Hardware is M8T-RS232
  Internet address is 10.0.0.2
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
[Additional display text for remaining interfaces omitted]
```


Following is an example of the **show interfaces serial** command, which shows all of the information specific to interface port 0 on a PA-MC-E3 installed in port adapter slot 1:

```
Router# show interfaces serial 1/0
Serial1/0 is up, line protocol is up
  Hardware is M8T-RS232
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
  Last input never, output 1d17h, output hang never
  Last clearing of "show interface" counters never
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    0 packets input, 0 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    24 packets output, 5137 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 output buffer failures, 0 output buffers swapped out
    0 carrier transitions      DCD=down  DSR=down  DTR=down  RTS=down  CTS=down
```

Cisco 7201 Router—Example Output of the show interfaces Command

Following is an example of the **show interfaces** command from a Cisco 7201 router:

```
Router# show interfaces
GigabitEthernet0/0 is up, line protocol is up
  Hardware is MV64460 Internal MAC, address is 0019.56c5.2adb (bia
0019.56c5.2adb)
  Internet address is 209.165.200.225
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
    reliability 255/255, txload 1/255, rxload 45/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex, 1000Mb/s, media type is RJ45
  output flow-control is XON, input flow-control is XON
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:07:03, output 00:00:07, output hang never
  Last clearing of "show interface" counters 00:00:04
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 180240000 bits/sec, 430965 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    2222975 packets input, 133378500 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
    0 watchdog, 0 multicast, 0 pause input
    0 input packets with dribble condition detected
    0 packets output, 0 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 babbles, 0 late collision, 0 deferred
    0 lost carrier, 0 no carrier, 0 pause output
    0 output buffer failures, 0 output buffers swapped out
```

VIP in Cisco 7000 Series Routers or Cisco 7500 Series Routers—Example Output of the show interfaces Command

Following are examples of the **show interfaces serial** command used with the VIP. In these examples, the eight serial interfaces (0 to 7) are on a port adapter in port adapter slot 1 of a VIP in interface processor slot 3; also, most of the status information for each interface is omitted. (Interfaces are administratively shut down until you enable them.)

```
Router# show interfaces serial 3/1/0
Serial3/1/0 is up, line protocol is up
  Hardware is cyBus Serial
  Internet address is 10.0.0.0
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
[Additional display text omitted from this example]
```

```
Router# show interfaces serial 3/1/1
Serial3/1/1 is up, line protocol is up
  Hardware is cyBus Serial
  Internet address is 10.0.0.1
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
[Additional display text omitted from this example]
```

```
Router# show interfaces serial 3/1/2
Serial3/1/2 is up, line protocol is up
  Hardware is cyBus Serial
  Internet address is 10.0.0.2
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
[Additional display text for remaining interfaces omitted]
```

Following is an example of the **show interfaces serial** command, which shows all of the information specific to interface 0 on a port adapter in port adapter slot 1 of a VIP in interface processor slot 3:

```
Router# show interfaces serial 3/1/0
Serial3/1/0 is up, line protocol is up
  Hardware is cyBus Serial
  Internet address is 10.0.0.0
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
  Last input 2d18h, output 00:00:54, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/64/0 (size/threshold/drops)
    Conversations 0/1 (active/max active)
    Reserved Conversations 0/0 (allocated/max allocated)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    16 packets input, 1620 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants
    0 input errors, 0 CRC, 0 frame, 0 overrun, 1 ignored, 0 abort
    3995 packets output, 1147800 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 output buffer failures, 0 output buffers swapped out
    1 carrier transitions
  RTS up, CTS up, DTR up, DCD up, DSR up
```

Proceed to the next section, “[Using the ping Command to Verify Network Connectivity](#),” to check network connectivity of the PA-MC-E3 and switch or router.

Using the ping Command to Verify Network Connectivity

Using the **ping** command you can verify that an interface port is functioning properly. This section provides a brief description of this command. Refer to the publications listed in the [“Related Documentation” section on page viii](#) for detailed command descriptions and examples.

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

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

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

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

Proceed to the next section, [“Using loopback Commands,”](#) to finish checking network connectivity.

Using loopback Commands

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 that 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:

The **loopback dte** command places an interface into loopback data terminal equipment (DTE) mode, which loops the router output data back toward the router (after the line interface unit).

```
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
```

The **loopback local** command places an interface into local loopback mode, which loops the router output data back toward the router at the framer.

```
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
```

The **loopback network line** command places an interface into network line loopback mode, which loops the data back toward the network (before the framer).

```
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
```

The **loopback network payload** command places the interface into network payload loopback mode, which loops just the payload data back toward the network at the E3 framer.

```
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
```

In addition to using loopback commands at the physical interface level, you can also use the **loopback local** command to diagnose problems with cables between the E3 controller and the central switching office at the E3 link level, or to diagnose problems with cables between the port adapter and the central switching office at the E1 line level.

An E3 local loopback simultaneously loops all channels toward the router and loops the E3 link back toward the network.

An E1 local loopback sets both local and line (remote) loopback modes simultaneously and loops data toward the router. An E1 remote line loopback loops the E1 line to the remote end. You can also use this loopback mode with bit error rate (BER) tests.

To set a loopback on the E3 or E1 lines, follow these steps, beginning in global configuration mode:

Step 1 Select the E3 controller and enter controller configuration mode:

```
Router(config)# controller E3 0/0 (Catalyst RSM/VIP2)
Router(config)# controller E3 3/0/0 (Catalyst 6000 family FlexWAN module)
Router(config)# controller E3 1/0 (Cisco 7200 series router)
Router(config)# controller E3 1/0 (Cisco uBR7200 series router)
Router(config)# controller E3 1/0 (Cisco 7201, Cisco 7301)
Router(config)# controller E3 3/0 (Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router)
Router(config)# controller E3 1/0/0 (Cisco 7000 and 7500 series routers with VIP)
```

Step 2 Set a local loopback on the E3 controller:

```
Router(config-controller)# loopback local
```

Step 3 Set a local loopback on the E1 line:

```
Router(config-controller)# e1 line loopback local
```
