



## **PA-POS-10C3 Single-Port Port Adapter Installation and Configuration Guide**

Platforms: Cisco 7200 VXR Routers, Cisco 7201 Router, Cisco 7301 Router,  
Cisco 7304 Router, Cisco 7401 Router, VIP in Cisco 7500 Series Routers,  
FlexWAN Module in Cisco 7600 Series Routers

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## Preface

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

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

## Document Version History

The version history of this document is provided below beginning with version OL-6514-03.

Version	Date	Notes
OL-6514-04	April 2007	Added Cisco 7201 router support.
OL-6514-03	Feb. 26, 2006	Added Cisco 7600 series routers and Cisco 7401ASR router support.
OL-6514-02	November 22, 2006	Added Cisco 7304 router support.

## Objectives

This document describes how to install and configure the PA-POS-1OC3 single-port Packet-over-SONET (POS) port adapter, hereafter referred to as the PA-POS-1OC3, which is used in the following platforms:

- Cisco 7200 VXR routers, which consist of the 4-slot Cisco 7204VXR router and the 6-slot Cisco 7206VXR router
- Cisco 7201 router
- Cisco 7301 router
- Cisco 7304 PCI port adapter carrier card in the Cisco 7304 router
- Cisco 7401ASR router

- Cisco 7500 series routers, which consist of the 5-slot Cisco 7505, the 7-slot Cisco 7507, and the 13-slot Cisco 7513 routers.
- Cisco 7600 series routers, which consist of the 3-slot Cisco 7603, the 6-slot Cisco 7606, the 9-slot Cisco 7609, and the 13-slot Cisco 7613 routers, using FlexWAN and Enhanced FlexWAN modules.

## Organization

This document contains the following chapters:

Section	Title	Description
Chapter 1	<a href="#">PA-POS-1OC3 Overview</a>	Describes the PA-POS-1OC3 and its LEDs and cables. Provides supporting information about addressing, networks, and SONET.
Chapter 2	<a href="#">Preparing for Installation</a>	Describes safety considerations, tools required, and procedures you should perform before the actual installation.
Chapter 3	<a href="#">Removing and Installing the PA-POS-1OC3</a>	Provides instructions for removing and installing the PA-POS-1OC3 port adapter
Chapter 4	<a href="#">Configuring the PA-POS-1OC3</a>	Provides instructions for configuring the PA-POS-1OC3 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>. Translated documentation is available at the following URL: [http://www.cisco.com/public/countries\\_languages.shtm](http://www.cisco.com/public/countries_languages.shtm)

- 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](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*.
  - For port adapter hardware installation and memory configuration information, 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.
- For more information about the Cisco 7206 or the Cisco 7206VXR as a router shelf, see the Cisco AS5800 Series Universal Gateways documents at the following URL:  
[http://www.cisco.com/en/US/products/hw/univgate/ps509/tsd\\_products\\_support\\_series\\_home.html](http://www.cisco.com/en/US/products/hw/univgate/ps509/tsd_products_support_series_home.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](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](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 the 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](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 7401ASR router:
  - For an online directory to quickly access documents for the Cisco 7401ASR router, refer to the *Cisco 7401ASR Router Documentation Roadmap* at the following URL:  
[http://www.cisco.com/en/US/products/hw/routers/ps354/products\\_documentation\\_roadmap09186a00801c0fd5.html](http://www.cisco.com/en/US/products/hw/routers/ps354/products_documentation_roadmap09186a00801c0fd5.html)
  - For hardware installation and maintenance information, refer to the *Cisco 7401ASR Installation and Configuration Guide* or the *Cisco 7401ASR Router Quick Start 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](http://www.cisco.com/en/US/products/hw/routers/ps359/products_documentation_roadmap09186a00801c0f9b.html)
  - For hardware installation and maintenance information, refer to the *Cisco 7500 Series Installation and Configuration Guide* or the online quick start for your Cisco 7500 series router.

- Cisco 7600 series routers with the FlexWAN module:
  - For an online directory to quickly access documents for the Cisco 7600 series routers, refer to the *Cisco 7600 Series Routers Documentation Roadmap* at the following URL:  
[http://www.cisco.com/en/US/products/hw/routers/ps368/products\\_documentation\\_roadmap09186a00801ebed9.html](http://www.cisco.com/en/US/products/hw/routers/ps368/products_documentation_roadmap09186a00801ebed9.html)
  - For hardware installation and maintenance information, refer to the online installation and configuration guide for your Cisco 7600 series router.
- For automatic protection switching (APS) configuration information, refer to the APS documentation at the following URL:  
[http://www.cisco.com/en/US/products/sw/iosswrel/ps1824/products\\_feature\\_guide09186a0080087ad9.html](http://www.cisco.com/en/US/products/sw/iosswrel/ps1824/products_feature_guide09186a0080087ad9.html)
- 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:
  - *Cisco AS5800 Universal Access Server Regulatory Compliance and Safety Information*
  - *Regulatory Compliance and Safety Information for Cisco 7200 Series 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*
  - *Regulatory Compliance and Safety Information for the Cisco 7600 Series Routers*
- For fiber-optic cleaning information, see *Inspection and Cleaning Procedures for Fiber-Optic Connections* at the following URL:  
[http://www.cisco.com/en/US/tech/tk482/tk876/technologies\\_white\\_paper09186a0080254eba.shtml](http://www.cisco.com/en/US/tech/tk482/tk876/technologies_white_paper09186a0080254eba.shtml)

## 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

## PA-POS-10C3 Overview

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This chapter describes the PA-POS-10C3 and contains the following sections:

- [PA-POS-10C3 Overview, page 1-1](#)
- [SONET/SDH Overview, page 1-2](#)
- [Features, page 1-3](#)
- [Interface Specifications, page 1-4](#)
- [OC-3 Optical Fiber Specifications, page 1-4](#)
- [Using Statistics to Estimate Link Loss and Power Budget, page 1-6](#)
- [LEDs, page 1-6](#)
- [Cables and Connectors, page 1-7](#)
- [Port Adapter Slot Locations on the Supported Platforms, page 1-8](#)
- [Identifying Interface Addresses, page 1-20](#)

## PA-POS-10C3 Overview

The PA-POS-10C3 provides a single Packet-over-SONET (POS) port in a single port adapter slot. The port functions as a single independent OC-3c/STM1 port. The PA-POS-10C3 is used as a direct connection between the supported router or switch platform and an external network.

The PA-POS-10C3 fits into a single port adapter slot on the Cisco 7201 router, Cisco 7204VXR router, Cisco 7206VXR router, Cisco 7301 router, Cisco 7304 PCI port adapter carrier card in Cisco 7304 router, the 7401ASR router, Cisco 7500 series routers (Cisco 7505, Cisco 7507, Cisco 7513), and Cisco 7600 series routers (Cisco 7603, Cisco 7606, Cisco 7609, Cisco 7613) with FlexWAN or Enhanced FlexWAN.



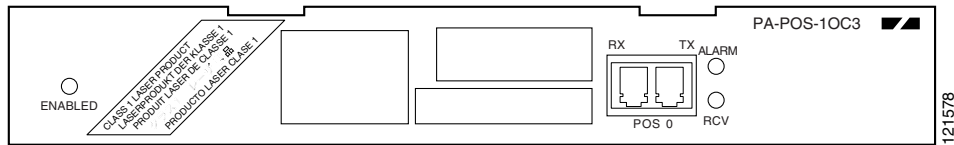
### Note

The Cisco 7206VXR router can be used as a router shelf in a Cisco AS5800 universal access server. Refer to the Cisco AS5800 documentation at the following URL:

[http://www.cisco.com/en/US/products/hw/univgate/ps509/tsd\\_products\\_support\\_series\\_home.html](http://www.cisco.com/en/US/products/hw/univgate/ps509/tsd_products_support_series_home.html)

Figure 1-1 shows the PA-POS-10C3 faceplate.

Figure 1-1 PA-POS-10C3 Faceplate



## SONET/SDH Overview

The POS specification addresses the use of PPP encapsulation over SONET/Synchronous Digital Hierarchy (SDH) links. SONET is an American National Standards Institute (ANSI) standard (T1.105-1988) for optical digital transmission at hierarchical rates from 51.840 Mbps (STS-1) to 2.5 Gbps (STS-48) and greater. SDH is the international standard for optical digital transmission at hierarchical rates from 155.520 Mbps (STM-1) to 2.5 Gbps (STM-16) and greater.

Because SONET/SDH is by definition a point-to-point circuit, PPP is well suited for use over these links. PPP was designed as a standard method of communicating over point-to-point links.

SONET is an octet-synchronous multiplex scheme that defines a family of standard rates and formats. The basic rate for POS is that of STS-3c/STM-1, which is 155.520 Mbps. The available information bandwidth is 149.760 Mbps, which is the STS-3c/STM-1 Synchronous Payload Envelope (SPE), the payload portion of the SONET frame into which the octet-oriented user data is mapped. (Octet boundaries are aligned with the SPE octet boundaries.) For the SPE with the PA-POS-10C3, section, line, and path overhead are removed.

The International Telecommunications Union Telecommunication Sector (ITU-T) defines a series of SDH transmission rates beginning at 155.520 Mbps, as follows:

SONET <sup>1</sup>	SDH Equivalent
STS-3c <sup>2</sup>	STM-1 <sup>2</sup>
STS-12c	STM-4c
STS-48c	STM-16c

1. ANSI-defined SONET specifications.
2. Supported by the PA-POS-10C3.

Despite the name, SONET is not limited to optical links. Electrical specifications have been defined for single-mode fiber, multimode fiber, and CATV 75-ohm coaxial cable. The PA-POS-10C3 allows transmission over single-mode and multimode optical fiber. Transmission rates are integral multiples of 51.840 Mbps, which can be used to carry T3/E3 bit-synchronous signals.

The following transmission multiples are currently specified and commonly used:

- STS-3c—155.520 Mbps (the PA-POS-10C3 conforms to STS-3c)
- STS-12c—622.080 Mbps
- STS-48c—2,488.320 Mbps

The following references discuss concepts and specifications of POS and PPP:

- Simpson, W, Editor, *The Point-to-Point Protocol (PPP)*, RFC 1548, Daydreamer, December 1993.
  - Simpson, W, Editor, *PPP in HDLC -like Framing*, RFC 1662, Daydreamer, July 1994.
  - Simpson, W, Editor, *PPP over SONET/SDH*, RFC 1619, May 1995.
  - *American National Standard for Telecommunications - Digital Hierarchy - Optical Interface Rates and Formats Specification*, ANSI T1.105-1991.
  - *American National Standard for Telecommunications - Synchronous Optical Network (SONET) Payload Mappings*, ANSI T1.105.02-1993 draft.
- ITU-T Recommendation G.707, *Synchronous Digital Hierarchy Bit Rates*, June 1992.

## Features

The PA-POS-10C3 features include:

- Single-port Packet-over-SONET capabilities with a single-width port adapter
- Single product ID (PA-POS-10C3), with configuration options for small form-factor pluggable (SFP) optic modules:
  - POM-OC3-MM (short range, multimode fiber)
  - POM-OC3-SMIR (intermediate range, single-mode fiber)
  - POM-OC3-SMLR (long range, single-mode fiber)
- Field-replaceable SFP optic modules
- Automatic protection switching (APS)
- Supports network processing and switching engines—NPE-400, NPE-G1, NSE-1 on the Cisco 7200 VXR platform
- Online insertion and removal (OIR) allowing you to remove, add, or replace a PA-POS-10C3 when the system is online
- Standards-compliant SONET/SDH interface; SONET/STS-3c and SDH/STM-1 framing and signaling overhead
- Full-duplex operation at 155 Mbps (half-duplex operation is not supported)
- Self-synchronous x<sup>43</sup>+1 scrambling and descrambling of packets
- Support for 16- and 32-bit cyclic redundancy checking (CRC-16 and CRC-32)
- Single-mode or multimode fiber-optic cables capability

For information on the single-mode and multimode cables to use with the Cisco PA-POS-10C3 port adapter, see the [“Cables and Connectors” section on page 1-7](#).

# Interface Specifications

The physical layer interface for the PA-POS-10C3 is Optical Carrier-3 (OC-3c), the specification for SONET STS-3c and SDH STM-1 transmission rates, and the PA-POS-10C3 is designed to comply with Packet-over-SONET specifications. The PA-POS-10C3 provides one 155.520-Mbps packet OC-3 network interface for all supported platforms.

The PA-POS-10C3 has a duplex LC-type receptacle that allows connection to single-mode or multimode optical fiber. (For more information on the optical fiber cables you should use with this port adapter, see the “[Cables and Connectors](#)” section on page 1-7.)

Packet data is transported using Point-to-Point Protocol (PPP) and is mapped into the STS-3c/STM-1 frame. The encapsulations used add approximately half the number of bytes of transport overhead as that involved with ATM using ATM Adaptation Layer 5 (AAL5) and line card control (LCC) Subnetwork Access Protocol (SNAP) encapsulations.

The PA-POS-10C3 interface is compliant with RFC 1619, *PPP over SONET/SDH*, and RFC 1662, *PPP in HDLC-like Framing*. The PA-POS-10C3 supports RFC 1619 PPP over SONET/SDH encapsulation, and provides support for SNMP agent v1 (RFC 1155–1157), and Management Information Base (MIB) II (RFC 1213).

## OC-3 Optical Fiber Specifications

The OC-3 specification for optical fiber transmission defines two types of fiber: single-mode and multimode. Within the single-mode category, two types of transmission are defined: intermediate reach and long reach. Within the multimode category, only short reach is available.

Modes can be thought of as bundles of light rays entering the fiber at a particular angle. Single-mode fiber allows only one mode of light to propagate through the fiber, and multimode fiber allows multiple modes of light to propagate through the fiber.

Multiple modes of light propagating through the fiber travel different distances depending on the entry angles, which causes them to arrive at the destination at different times (a phenomenon called *modal dispersion*); therefore, single-mode fiber is capable of higher bandwidth and greater cable run distances than multimode fiber. [Table 1-1](#) lists nominal OC-3 optical parameters for single-mode and multimode optical fiber transmission.

**Note**

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If the distance between two connected stations is greater than the maximum distances listed, significant signal loss can result, making transmission unreliable.

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Table 1-1 lists the OC-3 optical parameters.

**Table 1-1 OC-3 Optical Parameters**

Transceiver Type <sup>1</sup>	Transmit Power	Maximum Power to Receiver <sup>2</sup> , dBm	Receiver Sensitivity, dBm	Loss Budgets, dB	Nominal Distance Between Stations
Single-mode <sup>3</sup> long reach	-5 dBm min. to 0 dBm max. at 1280–1335 nm <sup>4</sup>	-10	-34	10 to 28	Up to 25 mi. (40 km)
Single-mode <sup>5</sup> intermediate reach	-15 dBm min. to -8 dBm max. at 1280–1335 nm <sup>4</sup>	-8	-28	0 to 12	Up to 9 mi. (15 km)
Multimode <sup>6</sup> short reach	-20 dBm min. to -14 dBm max. at 1280–1335 nm <sup>4</sup>	-8	-30	0 to 7	Up to 1.2 mi. (2 km)

1. This table gives nominal OC-3 optical parameters.
2. This value represents the maximum power to which any receiver can be exposed.
3. Complies with Bellcore GR-253-CORE Long Reach Specification (LR-1).
4. Nominal wavelength is 1310 nm.
5. Complies with Bellcore GR-253-CORE Intermediate Reach Specification (IR-1).
6. Complies with Short-Reach OC-3 Specification SR-OC-3.

To calculate link losses and dispersion losses for your application, refer to the following specifications and documents:

- EIA/TIA-IVa Dispersion Unshifted Single-Mode Fiber
- EIA-TIA-IVb Dispersion Shifted Single-Mode Fiber
- GR-20-CORE, *Generic Requirements for Optical Fiber and Fiber-Optic Cable*
- ITU-T Recommendation G.957, *Optical Interfaces for Equipment and Systems Relating to the Synchronous Digital Hierarchy*

## Network Management Support

Following is the protocol and MIB support for the PA-POS-10C3:

- SNMP agent v1 (RFC 1155–1157)
- MIB II (RFC 1213); POS MIB support is available with Cisco IOS Release 12.0

## Encapsulation Method Support

The following encapsulation methods are supported by the PA-POS-10C3:

- RFC 1619 PPP over SONET/SDH

We recommend that you refer to the Internet Draft *Enabling Transparency for the PPP over SONET/SDH Mapping*, which is recognized by the Internet Engineering Task Force (IETF) and Internet Engineering Steering Group (IESG) as an approved addendum to RFC 1619.

- High-Level Data Link Control (HDLC)
- Frame Relay

## Using Statistics to Estimate Link Loss and Power Budget

Statistical models more accurately determine the power budget than standard worst-case methods. Determining the link loss with statistical methods requires accurate knowledge of variations in the data link components. Statistical power budget analysis is beyond the scope of this document. For further information, refer to ITU-T standards and your equipment specifications.

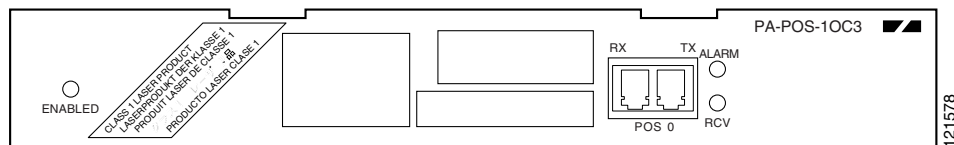
The following publications contain information on determining attenuation and power budget:

- T1E1.2/92-020R2 ANSI, the Draft American National Standard for Telecommunications entitled *Broadband ISDN Customer Installation Interfaces: Physical Layer Specification*.
- *Power Margin Analysis, AT&T Technical Note, TN89-004LWP, May 1989.*

## LEDs

The PA-POS-10C3 faceplate has three LEDs that indicate port adapter and interface status. (See [Figure 1-2](#).)

**Figure 1-2 PA-POS-10C3 LEDs—Faceplate View Shown**



[Table 1-2](#) lists the LEDs colors, status, and function.

**Table 1-2 PA-POS-10C3 LEDs**

LED Label	Color	State	Function
ENABLED	Green	On	Enabled for operation
		Off	Not enabled
ALARM	Orange	On	There are SONET alarms on the interface
		Off	No alarms



**Table 1-2 PA-POS-1OC3 LEDs (continued)**

LED Label	Color	State	Function
RCV	Green	On	Receive signal is present (a cable is attached and the link is up)
		Off	No signal is present
	Green	Blinking	Packets are currently being received
		Off	No signal is present

After system initialization, the ENABLED LED comes on to indicate that power is received and that the PA-POS-1OC3 port adapter is enabled for operation.

The following conditions must all be met before the PA-POS-1OC3 is enabled:

- The PA-POS-1OC3 is correctly connected and receiving power.
- The host system software supports the PA-POS-1OC3.

If any of these conditions are not met, or if the initialization fails, the ENABLED LED does not come on.

## Cables and Connectors

Use single-mode (for intermediate- or long-reach configurations) or multimode optical fiber cable to connect your router to a network or to connect two OC-3-equipped routers back-to-back.



**Note** Long-range SFP optics modules (for long-reach configurations) cannot be connected back-to-back without using an attenuator between the two of them.

The PA-POS-1OC3 provides the following optical fiber options:

- Multimode—155 Mbps, OC-3 optical fiber (SONET STS-3c or SDH STM-1)  
Use a multimode optical fiber that has a core/cladding diameter of 62.5/125 microns.
- Single-mode—155 Mbps, OC-3 optical fiber (SONET STS-3c or SDH STM-1)  
Use a single-mode optical fiber that has a core/cladding diameter of 8-9/125 microns. (Nominal diameter is approximately 10/125 microns.)

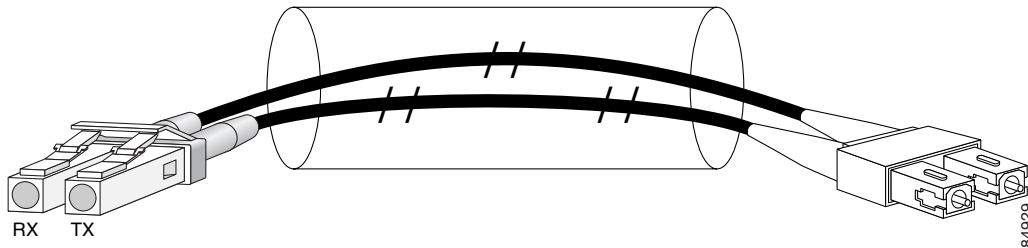


**Note**

For maximum cable lengths between stations, see [Table 1-1 on page 1-5](#). Single-mode and multimode optical fiber cables for the PA-POS-1OC3 are not available from Cisco Systems; however, they are available from commercial cable vendors.

The PA-POS-10C3 has a single duplex LC-type receptacle. For SONET/SDH single-mode and multimode optical fiber connections, you can use a simplex LC-type cable (see [Figure 1-3](#)) for the transmit (TX) and receive (RX) connections.

**Figure 1-3** Duplex Patch Cable with LC-type Connectors



**Note**

For important laser and LED safety information, see the “[Laser Safety](#)” section on page 2-11.

## Port Adapter Slot Locations on the Supported Platforms

The following sections describe the port adapter slot locations in the supported platforms:

- [Cisco 7200 VXR Routers Slot Numbering, page 1-8](#)
- [Cisco 7201 Router Slot Numbering, page 1-9](#)
- [Cisco 7301 Router Slot Numbering, page 1-10](#)
- [Cisco 7304 PCI Port Adapter Carrier Card Slot Numbering, page 1-10](#)
- [Cisco 7401ASR Router Slot Numbering, page 1-11](#)
- [Cisco 7500 Series Routers with VIP Slot Numbering, page 1-12](#)
- [Cisco 7600 Series Routers with FlexWAN and Enhanced FlexWAN Modules, page 1-16](#)

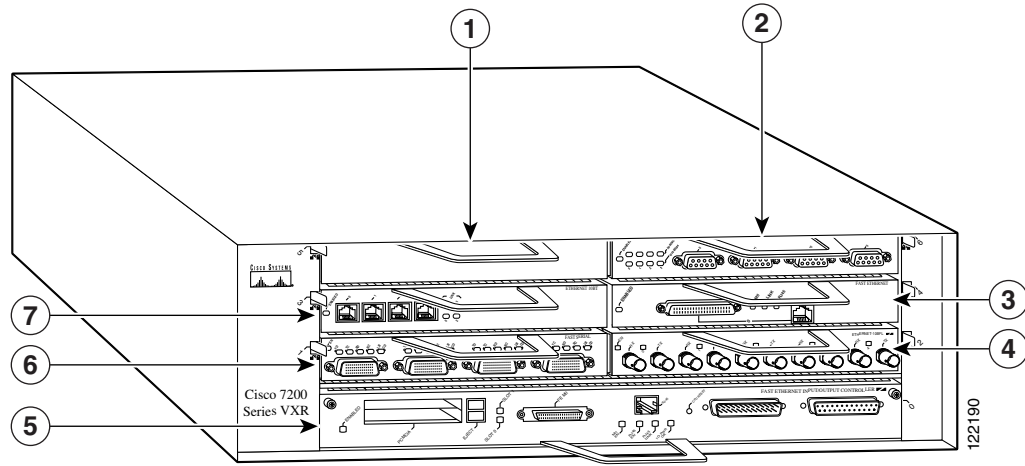
### Cisco 7200 VXR Routers Slot Numbering

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 7204VXR router is not shown.

Cisco 7206VXR routers (including 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 1-4 shows the slot numbering on a Cisco 7206VXR router.

**Figure 1-4** Port Adapter Slots in the Cisco 7206VXR Router

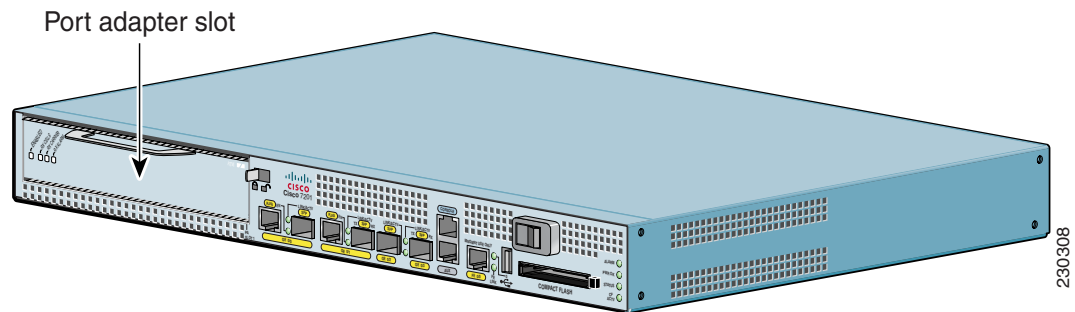


1	Port adapter slot 5	5	I/O controller— slot 0
2	Port adapter slot 6	6	Port adapter slot 1
3	Port adapter slot 4	7	Port adapter slot 3
4	Port adapter slot 2		The network processing engine (not shown) is installed at the rear of the chassis.

## Cisco 7201 Router Slot Numbering

Figure 1-5 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.

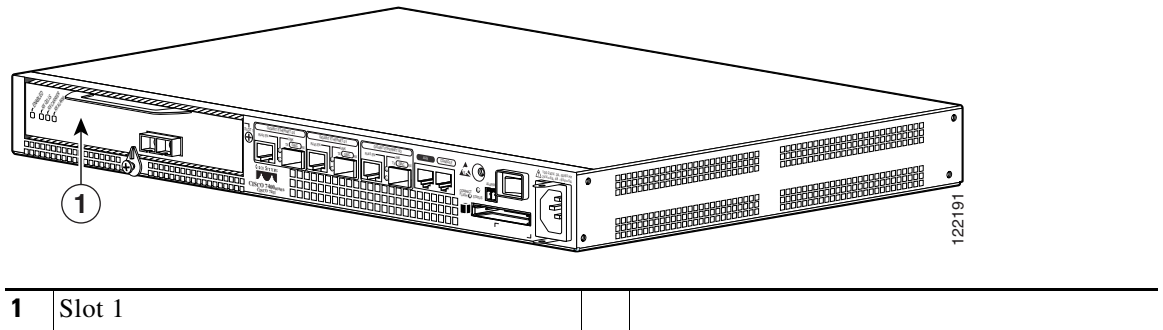
**Figure 1-5** Port Adapter Slot in the Cisco 7201 Router



## Cisco 7301 Router Slot Numbering

Figure 1-6 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 1-6** Port Adapter Slot in the Cisco 7301 Router

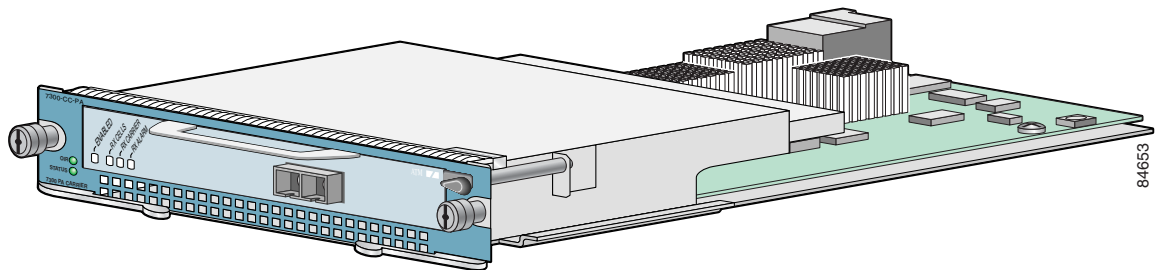


## Cisco 7304 PCI Port Adapter Carrier Card Slot Numbering

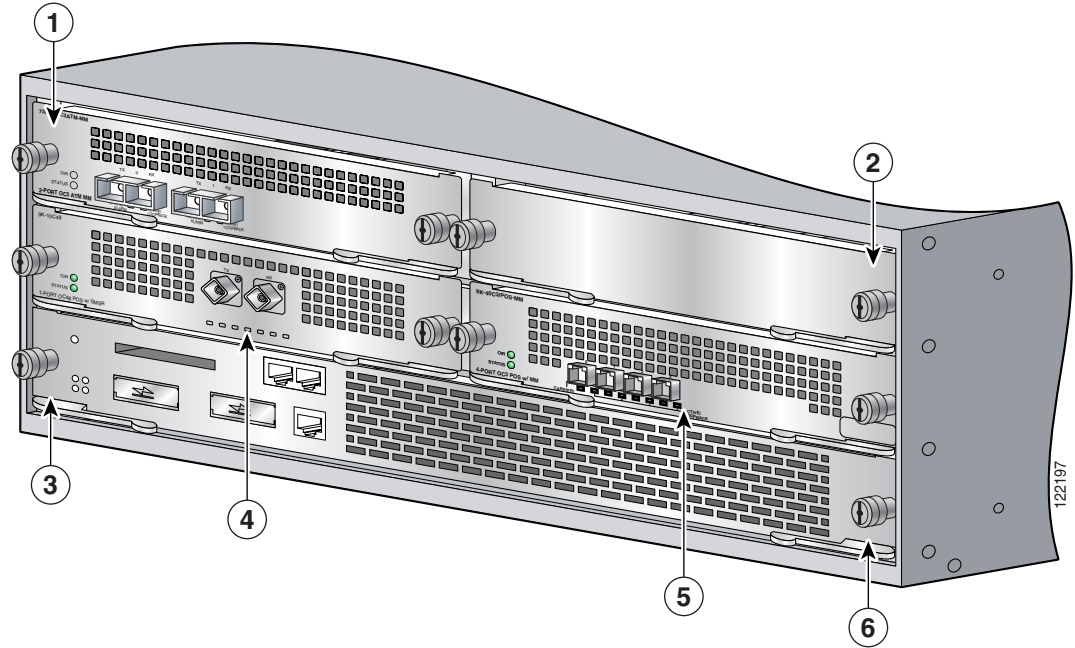
The Cisco 7304 PCI Port Adapter Carrier Card installs in Cisco 7304 router module slots 2 through 5. Figure 1-7 shows a Cisco 7304 PCI Port Adapter Carrier Card with a port adapter installed. The Cisco 7304 PCI Port Adapter Carrier Card accepts one single-width port adapter.

Figure 1-8 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 1-7** Cisco 7304 PCI Port Adapter Carrier Card—Port Adapter Installed



**Figure 1-8** Module Slots on the Cisco 7304 Router

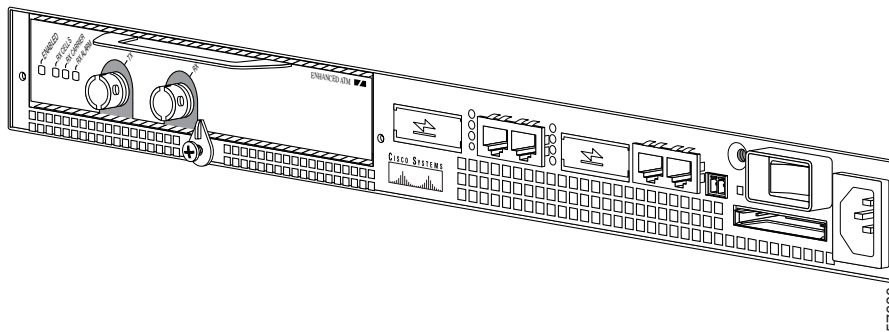


1	Slot 4	4	Slot 2
2	Slot 5	5	Slot 3
3	Slot 0	6	Slot 1

## Cisco 7401ASR Router Slot Numbering

Figure 1-9 shows the front view of a Cisco 7401ASR router with a port adapter installed. There is only one port adapter slot (slot 1) in a Cisco 7401ASR router.

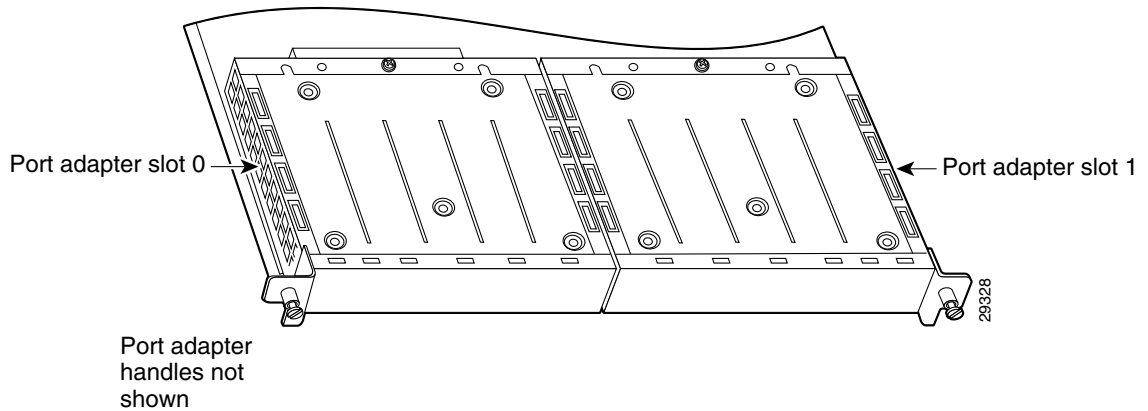
**Figure 1-9** Port Adapter Slot in the Cisco 7401ASR Router



## Cisco 7500 Series Routers with VIP Slot Numbering

The PA-POS-10C3 is supported on the VIP4-50, VIP4-80, and VIP6-80 versatile interface processors used in Cisco 7500 series routers. In the 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 1-10](#) shows the slot numbering on a VIP.

**Figure 1-10** VIP Slot Locations



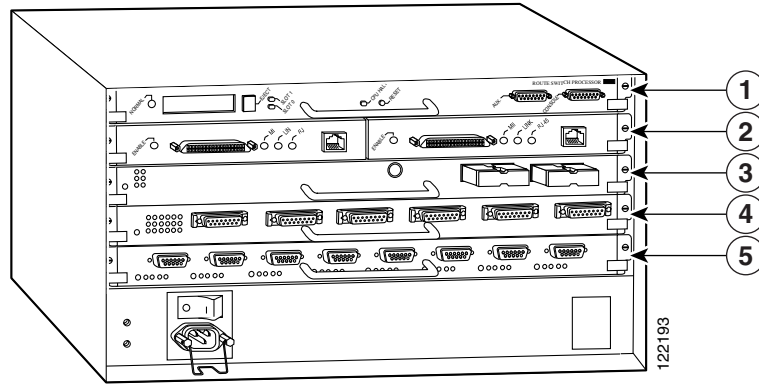
For details on the slot numbering for each individual Cisco 7500 series router, see the following subsections:

- [Cisco 7505 Router Slot Numbering, page 1-13](#)
- [Cisco 7507 Router Slot Numbering, page 1-14](#)
- [Cisco 7513 Router Slot Numbering, page 1-15](#)

## Cisco 7505 Router Slot Numbering

Cisco 7505 routers have four slots for port adapters, and one slot for a Route Switch Processor (RSP). The slots are numbered from bottom to top. You can place the port adapters in any of the VIP interface slots (slot 0 through 3). One slot is always reserved for the RSP. Figure 1-11 shows the slot numbering on a Cisco 7505 router.

**Figure 1-11 Cisco 7505 Router VIP Slot Locations**

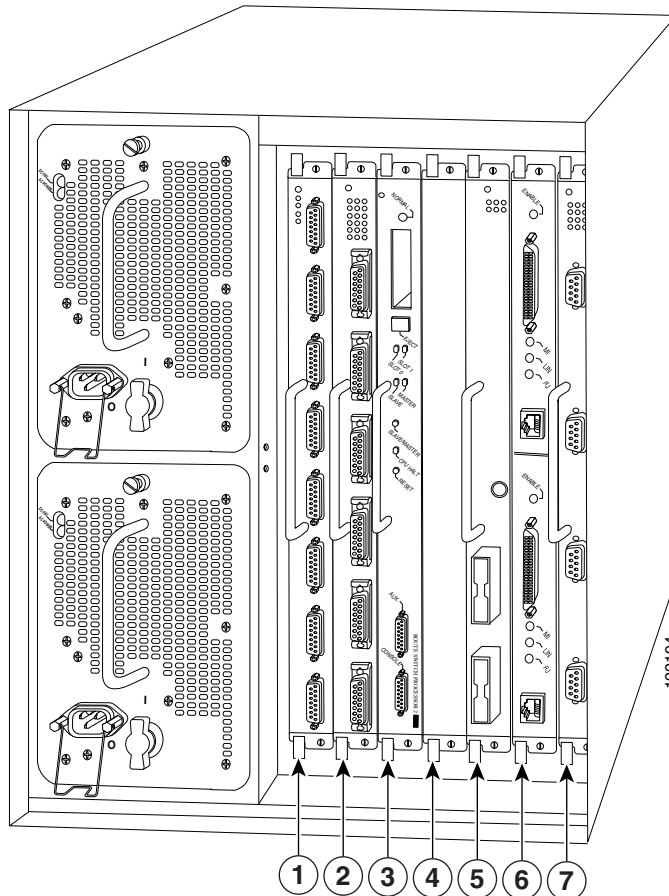


<b>1</b>	RSP	<b>4</b>	VIP interface—slot 1
<b>2</b>	VIP interface—slot 3	<b>5</b>	VIP interface—slot 0
<b>3</b>	VIP interface—slot 2		

## Cisco 7507 Router Slot Numbering

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. Figure 1-12 shows the slot numbering on a Cisco 7507 router.

**Figure 1-12** Cisco 7507 Router VIP Slot Locations



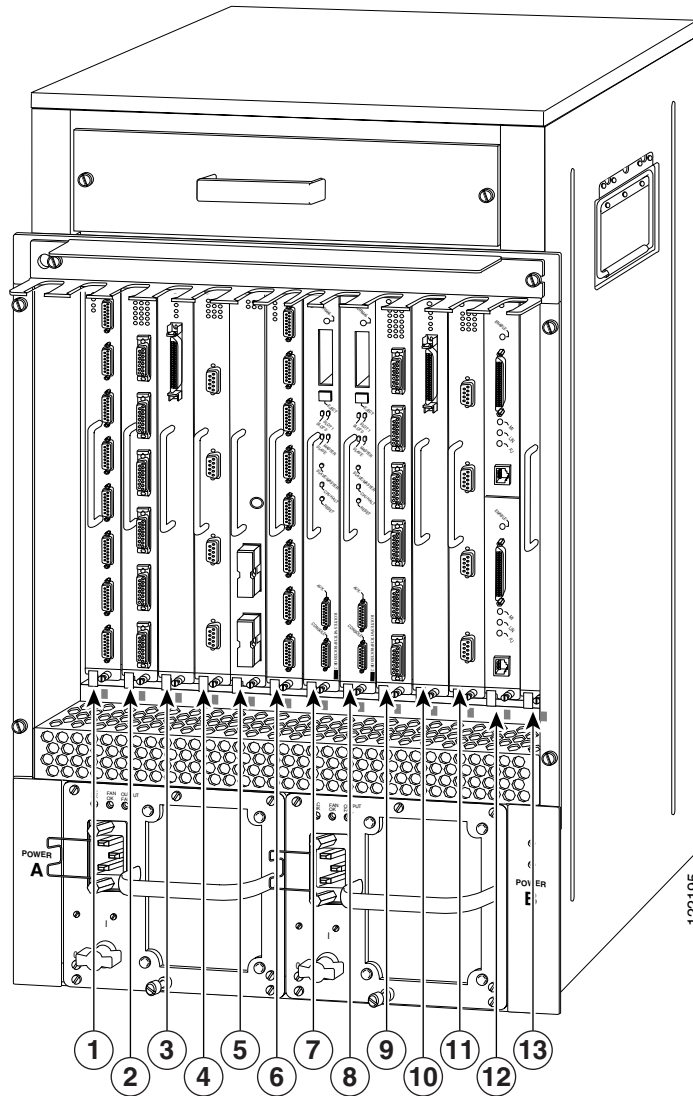
<b>1</b>	VIP interface—slot 0	<b>5</b>	VIP interface—slot 4
<b>2</b>	VIP interface—slot 1	<b>6</b>	VIP interface—slot 5
<b>3</b>	RSP—slot 2	<b>7</b>	VIP interface—slot 6
<b>4</b>	RSP—slot 3		



## Cisco 7513 Router Slot Numbering

Cisco 7513 routers (Cisco 7513 or Cisco 7513-MX) have eleven 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 (slots 0 through 5, or slots 9 through 12). Slots 6 and 7 are always reserved for RSPs. [Figure 1-13](#) shows the slot numbering on a Cisco 7513 router.

**Figure 1-13** Cisco 7513 Router VIP Slot Locations



<b>1</b>	VIP interface—slot 0	<b>8</b>	RSP—slot 7
<b>2</b>	VIP interface—slot 1	<b>9</b>	VIP interface—slot 8
<b>3</b>	VIP interface—slot 2	<b>10</b>	VIP interface—slot 9
<b>4</b>	VIP interface—slot 3	<b>11</b>	VIP interface—slot 10

5	VIP interface—slot 4	12	VIP interface—slot 11
6	VIP interface—slot 5	13	VIP interface—slot 12
7	RSP—slot 6		

## Cisco 7600 Series Routers with FlexWAN and Enhanced FlexWAN Modules

The PA-POS-10C3 is supported on a FlexWAN or Enhanced FlexWAN module used in the Cisco 7603 router, Cisco 7606 router, Cisco 7609 router, and Cisco 7613 router. The FlexWAN module can be installed in any slot of a Cisco 7600 series router except slot 1, which is reserved for the supervisor engine. Port adapters can be installed into either port adapter bay 0 or port adapter bay 1 on the FlexWAN module.

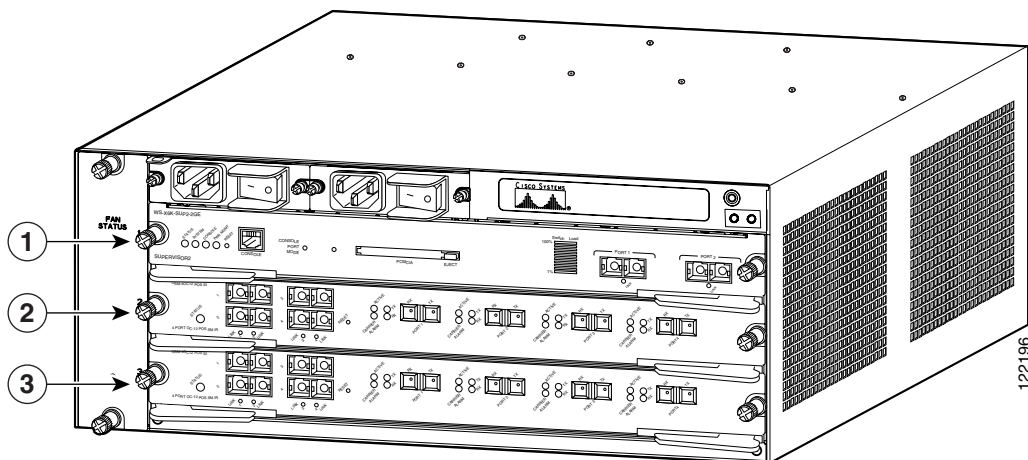
For details on the slot numbering for each individual Cisco 7600 series router, see the following subsections:

- [Cisco 7603 Router Slot Numbering, page 1-16](#)
- [Cisco 7606 Router Slot Numbering, page 1-17](#)
- [Cisco 7609 Router Slot Numbering, page 1-18](#)
- [Cisco 7613 Router Slot Numbering, page 1-19](#)

### Cisco 7603 Router Slot Numbering

Cisco 7603 routers have two slots for port adapters. The slots are numbered from top to bottom. You can place the port adapters in either of the FlexWAN module slots (slot 2 or 3). Slot 1 is always reserved for the supervisor engine. [Figure 1-14](#) shows the slot numbering on a Cisco 7603 router.

**Figure 1-14** FlexWAN and Enhanced FlexWAN Slots in the Cisco 7603 Router

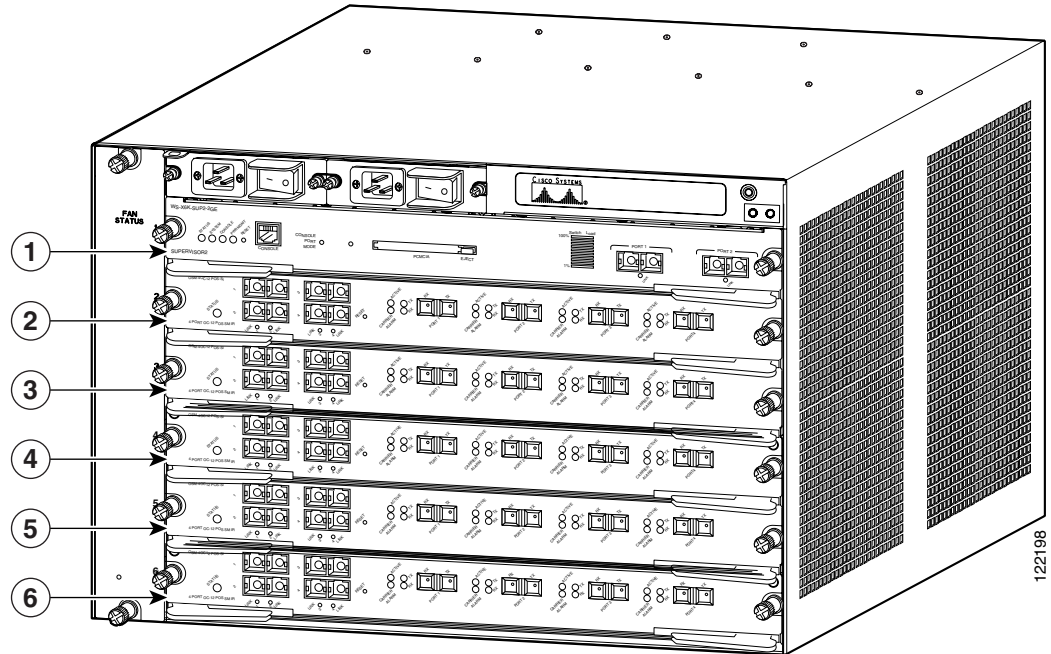


1	Supervisor engine—slot 1	3	FlexWAN module—slot 3
2	FlexWAN module—slot 2		

## Cisco 7606 Router Slot Numbering

Cisco 7606 routers have five slots for port adapters. The slots are numbered from top to bottom. You can place the port adapters in any of the FlexWAN module slots (slots 2 through 6). Slot 1 is always reserved for the supervisor engine. Figure 1-15 shows the slot numbering on a Cisco 7606 router.

**Figure 1-15** FlexWAN and Enhanced FlexWAN Slots in the Cisco 7606 Router



1	Supervisor engine—slot 1	4	FlexWAN module—slot 4
2	FlexWAN module—slot 2	5	FlexWAN module—slot 5
3	FlexWAN module—slot 3	6	FlexWAN module—slot 6



### Note

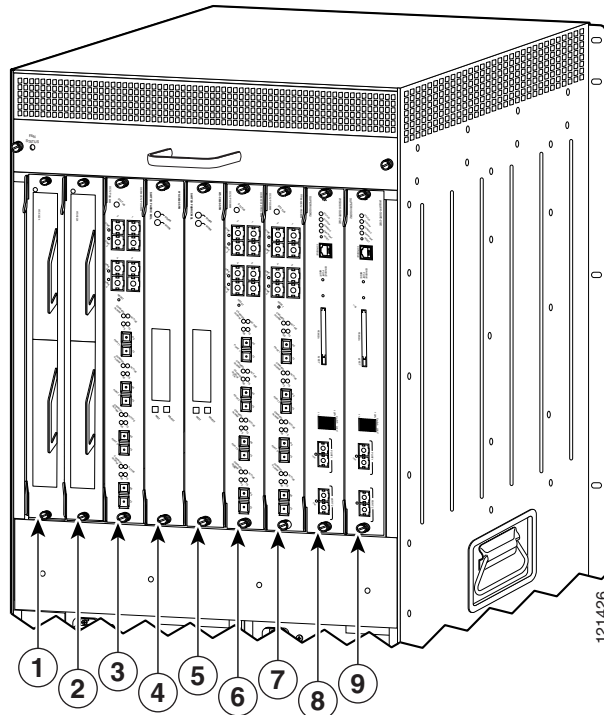
Some of the slots used for the FlexWAN module on the Cisco 7606 router can also be used for other supervisor engines, RSPs, or OSMs. For details, refer to the *Cisco 7600 Series Router Installation Guide* at the following URL:

[http://www.cisco.com/en/US/products/hw/routers/ps368/products\\_installation\\_guide\\_book09186a008080269a.html](http://www.cisco.com/en/US/products/hw/routers/ps368/products_installation_guide_book09186a008080269a.html)

## Cisco 7609 Router Slot Numbering

Cisco 7609 routers have eight slots for port adapters. The slots are numbered from right to left. You can place the port adapters in any of the FlexWAN module slots (slots 2 through 9). Slots 1 is always reserved for the supervisor engine. [Figure 1-16](#) shows the slot numbering on a Cisco 7609 router.

**Figure 1-16** FlexWAN and Enhanced FlexWAN Slots in the Cisco 7609 Router



1	FlexWAN module—slot 9	6	FlexWAN module—slot 4
2	FlexWAN module—slot 8	7	FlexWAN module—slot 3
3	FlexWAN module—slot 7	8	FlexWAN module—slot 2
4	FlexWAN module—slot 6	9	Supervisor engine—slot 1
5	FlexWAN module—slot 5,		



### Note

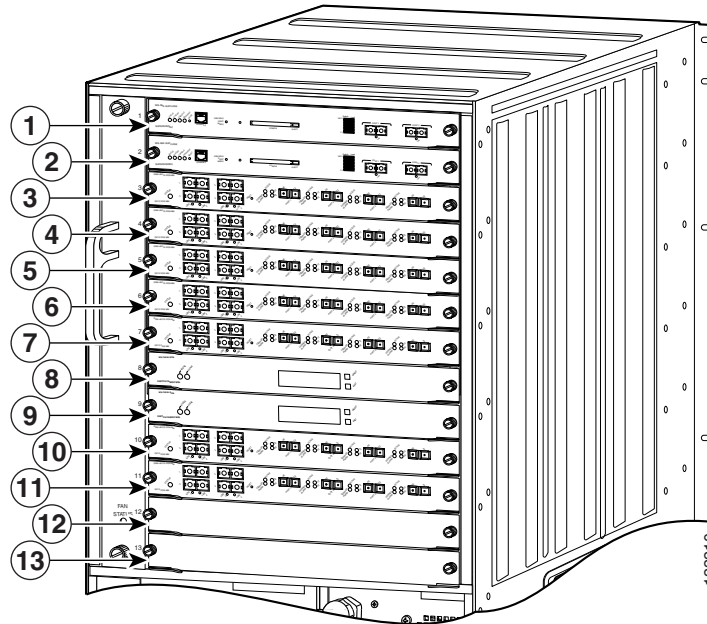
Some of the slots used for the FlexWAN module on the Cisco 7609 router can also be used for other supervisor engines, RSPs, or OSMs. For details, refer to the *Cisco 7600 Series Router Installation Guide* at the following URL:

[http://www.cisco.com/en/US/products/hw/routers/ps368/products\\_installation\\_guide\\_book09186a008080269a.html](http://www.cisco.com/en/US/products/hw/routers/ps368/products_installation_guide_book09186a008080269a.html)

## Cisco 7613 Router Slot Numbering

Cisco 7613 routers have twelve slots for port adapters. The slots are numbered from top to bottom. You can place the port adapters in any of the FlexWAN module slots (slots 2 through 13). Slot 1 is always reserved for the supervisor engine. [Figure 1-17](#) shows the slot numbering on a Cisco 7613 router.

**Figure 1-17** FlexWAN and Enhanced FlexWAN Slots in the Cisco 7613 Router



<b>1</b>	Supervisor engine—slot 1	<b>8</b>	FlexWAN module—slot 8
<b>2</b>	FlexWAN module—slot 2	<b>9</b>	FlexWAN module—slot 9
<b>3</b>	FlexWAN module—slot 3	<b>10</b>	FlexWAN module—slot 10
<b>4</b>	FlexWAN module—slot 4	<b>11</b>	FlexWAN module—slot 11
<b>5</b>	FlexWAN module—slot 5	<b>12</b>	FlexWAN module—slot 12
<b>6</b>	FlexWAN module—slot 6	<b>13</b>	FlexWAN module—slot 13
<b>7</b>	FlexWAN module—slot 7		



### Note

Some of the slots used for the FlexWAN module on the Cisco 7613 router can also be used for other supervisor engines, RSPs, or OSMs. For details, refer to the *Cisco 7600 Series Router Installation Guide* at the following URL:

[http://www.cisco.com/en/US/products/hw/routers/ps368/products\\_installation\\_guide\\_book09186a008080269a.html](http://www.cisco.com/en/US/products/hw/routers/ps368/products_installation_guide_book09186a008080269a.html)

# Identifying Interface Addresses

This section describes how to identify interface addresses for the PA-POS-10C3 in supported platforms. Interface addresses specify the actual physical location of each interface on a router or switch.

Interfaces on a port adapter 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 port adapter 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:

- [Cisco 7200 VXR Routers Interface Addresses, page 1-21](#)
- [Cisco 7201 Router Interface Addresses, page 1-21](#)
- [Cisco 7301 Router Interface Addresses, page 1-21](#)
- [Cisco 7304 PCI Port Adapter Carrier Card Interface Addresses, page 1-22](#)
- [Cisco 7401ASR Router Interface Addresses, page 1-22](#)
- [Cisco 7500 Series Routers VIP Interface Addresses, page 1-22](#)
- [Cisco 7600 Series Routers FlexWAN Module Interface Addresses, page 1-23](#)

Table 1-3 summarizes the interface address formats for the supported platforms.

**Table 1-3**      **Interface Addresses**

Platform	Interface Address Format	Numbers	Syntax
Cisco 7200 VXR routers (7204VXR, 7206VXR)	Port-adapter-slot-number/interface-port-number	Port adapter slot—1 through 6 (depends on the number of slots in the router) <sup>1</sup> 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 router	Module-slot-number/interface-port-number	Module slot—2 through 5 Interface port—0	3 / 0
Cisco 7401ASR router	Port-adapter-slot-number/interface-port number	Port adapter slot—always 1 Interface port—0	1 / 0

**Table 1-3** Interface Addresses (continued)

Platform	Interface Address Format	Numbers	Syntax
VIPs in the Cisco 7500 series routers (7505, 7507, 7513)	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
Cisco 7600 series routers (7603, 7606, 7609, 7613) with FlexWAN or Enhanced FlexWAN	Module-slot-number/port-adapter-bay-number/interface-port-number	Module slot—2 <sup>2</sup> through 13 (depends on the number of slots in the router) Port adapter bay—0 or 1 Interface port—0	3/0/0

1. Port adapter slot 0 is reserved for the Fast Ethernet port on the I/O controller (if present).
2. 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.

## Cisco 7200 VXR Routers Interface Addresses

In Cisco 7200 VXR routers, port adapter slots are numbered from the lower left to the upper right, beginning with port adapter slot 1 and continuing through port adapter slot 4 for the Cisco 7204VXR, and slot 6 for the Cisco 7206VXR. Port adapters 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 1-4](#).

The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See [Table 1-3](#). For example, if the single-port PA-POS-10C3 is installed in slot 1 of a Cisco 7200 series router, the interface address would be 1/0. If the single-port PA-POS-10C3 were installed in slot 4, the interface address would be 4/0.

## Cisco 7201 Router Interface Addresses

In the Cisco 7201 router, only one slot accepts port adapters and it is numbered slot 1. See [Figure 1-5](#).

The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See [Table 1-3](#). For example, if a single-port PA-POS-10C3 is installed on 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 slot 1. 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 1-3](#). For example, if a single-port PA-POS-10C3 is installed on 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 1-7](#) and [Figure 1-8](#).

The interface address is composed of a two-part number in the format *module-slot-number/interface-port-number*. See [Table 1-3](#). For example, if a single-port PA-POS-10C3 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 7401ASR Router Interface Addresses

In the Cisco 7401ASR router, only one slot accepts port adapters and it is numbered slot 1. See [Figure 1-9](#).

The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See [Table 1-3](#). For example, if a single-port PA-POS-10C3 is installed on a Cisco 7401ASR router, the interface address would be 1/0.

## Cisco 7500 Series Routers VIP Interface Addresses

In 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 1-10](#), [Figure 1-11](#), [Figure 1-12](#), and [Figure 1-13](#).

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 1-3](#).

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-POS-10C3 is a single-port port adapter, therefore the port is always 0.

For example, if a single-port PA-POS-10C3 is installed in a VIP in interface processor slot 3, port adapter slot 1, the interface addresses would be 3/1/0.

**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 7505 are horizontally oriented, all Cisco 7500 series routers use the same method for slot and port numbering.



## Cisco 7600 Series Routers FlexWAN Module Interface Addresses

In Cisco 7600 series routers, port adapters are installed in a FlexWAN or Enhanced FlexWAN module, which installs in module slots 2 through 13 (depending on the number of slots in the router). The port adapter can be installed in either bay (port adapter bay 0 or 1) on the FlexWAN or Enhanced FlexWAN module. See [Figure 1-14](#), [Figure 1-15](#), [Figure 1-16](#), and [Figure 1-17](#).

The interface address is composed of a three-part number in the format *module-slot-number/port-adapter-bay-number/interface-port-number*. See [Table 1-3](#).

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 Cisco 7609 is the exception with slots numbered right to left, 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-POS-10C3 is a single-port port adapter, therefore the port is always 0

For example, if a single-port PA-POS-10C3 is installed in the FlexWAN module, which is inserted in module slot 3, port adapter bay 0, then the interface address of the port adapter would be 3/0/0 (module slot 3, port adapter bay 0, and port 0). If the same port adapter is in port adapter bay 1 on the FlexWAN module, the interface addresses would be numbered 3/1/0.





## CHAPTER 2

# Preparing for Installation

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This chapter describes the general equipment, safety, and site preparation requirements for installing the PA-POS-1OC3. This chapter contains the following sections:

- [Required Tools and Equipment, page 2-1](#)
- [Software and Hardware Requirements, page 2-2](#)
- [Checking Hardware and Software Compatibility, page 2-3](#)
- [Safety Guidelines, page 2-4](#)
- [FCC Class A Compliance, page 2-11](#)

## Required Tools and Equipment

You need the following tools and parts to install the PA-POS-1OC3. If you need additional equipment, contact a service representative for ordering information.

- PA-POS-1OC3, or PA-POS-1OC3=
- One LC-type duplex or two LC-type simplex, multimode, or single-mode optical fiber cables to connect the interface with the network. (Single-mode and multimode optical fiber cables for the PA-POS-1OC3 are not available from Cisco Systems but are available from commercial cable vendors. For information about optical fiber cables, see the [“OC-3 Optical Fiber Specifications” section on page 1-4](#) and the [“Cables and Connectors” section on page 1-7](#).)
- Phillips screwdriver (1 or 2)
- 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-POS-1OC3 in supported router or switch platforms.

**Table 2-1 PA-POS-1OC3 Software Requirements**

Platform	Recommended Minimum Cisco IOS Release
<b>Cisco 7200 VXR routers</b> <ul style="list-style-type: none"> <li>Cisco 7204VXR and Cisco 7206VXR</li> </ul>	Cisco IOS Release 12.0(30)S or a later release of Cisco IOS Release 12.0S Cisco IOS Release 12.3(10) or a later release of Cisco IOS Release 12.3 Cisco IOS Release 12.3(13)T or a later release of Cisco IOS Release 12.3T Cisco IOS Release 12.2(28)SB6 or later releases of Cisco IOS Release 12.2SB
<b>Cisco 7201 router</b>	Cisco IOS Release 12.4(4)XD7 or a later release of Cisco IOS Release 12.4XD, Cisco IOS Release 12.2(31)SB5 or a later release of Cisco IOS Release 12.2(31)SB5
<b>Cisco 7301 router</b>	Cisco IOS Release 12.2(31)SB2 or later releases of Cisco IOS Release 12.2SB
<b>Cisco 7304 router</b>	Cisco IOS Release 12.2(31)SB2 or later releases of Cisco IOS Release 12.2SB
<b>Cisco 7401 router</b>	Cisco IOS Release 12.2(31)SB3 or later releases of Cisco IOS Release 12.2SB
<b>Cisco 7500 series routers</b> (RSP4+, RSP8, RSP16, VIP4-50, VIP4-80, VIP6-80)	Cisco IOS Release 12.0(30)S or later releases of Cisco IOS Release 12.0S Cisco IOS Release 12.3(10) or later releases of Cisco IOS Release 12.3 Cisco IOS Release 12.3(12.12)T1 or later releases of Cisco IOS Release 12.3T
<b>Cisco 7600 series routers</b>	Cisco IOS Release 12.2(31)SB3 or later releases of Cisco IOS Release 12.2SB



## Note

The PA-POS-1OC3 is considered a high-bandwidth port adapter. Traffic from multiple PA-POS-1OC3 network interfaces could theoretically exceed the bandwidth of the CxBus or CyBus. This would cause packets to be dropped.

## Cisco 7200 VXR Routers

Cisco 7200 VXR routers have certain data-carrying capacity (or bandwidth) restrictions that affect the number of high-bandwidth, medium-bandwidth, and low-bandwidth port adapters you can install. Refer to the *Cisco 7200 Series Port Adapter Hardware Configuration Guidelines* for more information on port adapter installation restrictions.

The PA-POS-1OC3 is supported on Cisco 7200 VXR routers with network processing services engine NSE-1, and network processing engines NPE-400 and forward.

For all systems in which you install the PA-POS-1OC3, use the **show version** command to display the current configuration of the router or switch, including the system software version that is currently loaded and running. Use the **show diag slot** command to view specific information about the hardware installed in your system.

## Cisco 7201 Router

The PA-POS-1OC3 port adapter is installed in the single port adapter slot of the Cisco 7201 router.

## Cisco 7301 Router

The PA-POS-1OC3 port adapter is installed in the single port adapter slot of the Cisco 7301 router.

## Cisco 7401ASR Router

The PA-POS-1OC3 port adapter is installed in the single port adapter slot of the Cisco 7401ASR router.

## Cisco 7500 Series Routers

The PA-POS-1OC3 port adapter is supported with the RSP4+, RSP8, and RSP16, and the VIP4-50, VIP4-80, and VIP6-80.

## Cisco 7600 Series Routers

The Cisco PA-POS-1OC3 port adapters can be installed on FlexWAN or Enhanced FlexWAN modules in slots 2 through 6 or 9. If either slot 7 or slot 8 does not have a supervisor engine in it, that slot is also available.

# 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 Cisco IOS requirements for individual hardware modules or components.

**Note**

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

To access Software Advisor, click **Login** at Cisco.com and go to **Support > Tools and Resources > Software Advisor**. You can also access the tool by pointing your browser directly to [http://www.cisco.com/en/US/support/tsd\\_most\\_requested\\_tools.html](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.

# Safety Guidelines

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

## Safety Warnings

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

### Warning Definition



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. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device.** Statement 1071

#### SAVE THESE INSTRUCTIONS

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. Gebruik het nummer van de verklaring onderaan de waarschuwing als u een vertaling van de waarschuwing die bij het apparaat wordt geleverd, wilt raadplegen.**

#### BEWAAR DEZE INSTRUCTIES

Varoitus

#### TÄRKEITÄ TURVALLISUUSOHJEITA

**Tämä varoitusmerkki merkitsee vaaraa. Tilanne voi aiheuttaa ruumiillisia vammoja. Ennen kuin käsittelet laitteistoa, huomioi sähköpiirien käsittelemiseen liittyvät riskit ja tutustu onnettomuuksien yleisiin ehkäisytapoihin. Turvallisuusvaroitusten käännökset löytyvät laitteen mukana toimitettujen käännettyjen turvallisuusvaroitusten joukosta varoitusten lopussa näkyvien lausuntonumeroiden avulla.**

#### SÄILYTÄ NÄMÄ OHJEET

**Attention    IMPORTANTES INFORMATIONS DE SÉCURITÉ**

Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant entraîner des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers liés aux circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents. Pour prendre connaissance des traductions des avertissements figurant dans les consignes de sécurité traduites qui accompagnent cet appareil, référez-vous au numéro de l'instruction situé à la fin de chaque avertissement.

**CONSERVEZ CES INFORMATIONS****Warnung    WICHTIGE SICHERHEITSHINWEISE**

Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu Verletzungen führen kann. Machen Sie sich vor der Arbeit mit Geräten mit den Gefahren elektrischer Schaltungen und den üblichen Verfahren zur Vorbeugung vor Unfällen vertraut. Suchen Sie mit der am Ende jeder Warnung angegebenen Anweisungsnummer nach der jeweiligen Übersetzung in den übersetzten Sicherheitshinweisen, die zusammen mit diesem Gerät ausgeliefert wurden.

**BEWAHREN SIE DIESE HINWEISE GUT AUF.****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. Utilizzare il numero di istruzione presente alla fine di ciascuna avvertenza per individuare le traduzioni delle avvertenze riportate in questo documento.

**CONSERVARE QUESTE ISTRUZIONI****Advarsel    VIKTIGE SIKKERHETSINSTRUKSJONER**

Dette advarselssymbolet betyr fare. Du er i en situasjon som kan føre til skade på person. Før du begynner å arbeide med noe av utstyret, må du være oppmerksom på farene forbundet med elektriske kretser, og kjenne til standardprosedyrer for å forhindre ulykker. Bruk nummeret i slutten av hver advarsel for å finne oversettelsen i de oversatte sikkerhetsadvarslene som fulgte med denne enheten.

**TA VARE PÅ DISSE INSTRUKSJONENE****Aviso    INSTRUÇÕES IMPORTANTES DE SEGURANÇA**

Este símbolo de aviso significa perigo. Você está em uma situação que poderá ser causadora de lesões corporais. Antes de iniciar a utilização de qualquer equipamento, tenha conhecimento dos perigos envolvidos no manuseio de circuitos elétricos e familiarize-se com as práticas habituais de prevenção de acidentes. Utilize o número da instrução fornecido ao final de cada aviso para localizar sua tradução nos avisos de segurança traduzidos que acompanham este dispositivo.

**GUARDE ESTAS INSTRUÇÕES**

**¡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. Al final de cada advertencia encontrará el número que le ayudará a encontrar el texto traducido en el apartado de traducciones que acompaña a este dispositivo.

**GUARDE ESTAS INSTRUCCIONES****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. Använd det nummer som finns i slutet av varje varning för att hitta dess översättning i de översatta säkerhetsvarningar som medföljer denna anordning.

**SPARA DESSA ANVISNINGAR****Figyelem FONTOS BIZTONSÁGI ELOÍRÁSOK**

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; a fordítás az egyes figyelmeztetések végén látható szám alapján kereshető meg.

**ORIZZE MEG EZEKET AZ UTASÍTÁSOKAT!****Предупреждение ВАЖНЫЕ ИНСТРУКЦИИ ПО СОБЛЮДЕНИЮ ТЕХНИКИ БЕЗОПАСНОСТИ**

Этот символ предупреждения обозначает опасность. То есть имеет место ситуация, в которой следует опасаться телесных повреждений. Перед эксплуатацией оборудования выясните, каким опасностям может подвергаться пользователь при использовании электрических цепей, и ознакомьтесь с правилами техники безопасности для предотвращения возможных несчастных случаев. Воспользуйтесь номером заявления, приведенным в конце каждого предупреждения, чтобы найти его переведенный вариант в переводе предупреждений по безопасности, прилагаемом к данному устройству.

**СОХРАНИТЕ ЭТИ ИНСТРУКЦИИ****警告 重要的安全性说明**

此警告符号代表危险。您正处于可能受到严重伤害的工作环境中。在您使用设备开始工作之前，必须充分意识到触电的危险，并熟练掌握防止事故发生的标准工作程序。请根据每项警告结尾提供的声明号码来找到此设备的安全性警告说明的翻译文本。

请保存这些安全性说明



**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、一般的な事故防止策に留意してください。警告の各国語版は、各注意事項の番号を基に、装置に付属の「Translated Safety Warnings」を参照してください。

これらの注意事項を保管しておいてください。

**주의** 중요 안전 지침

이 경고 기호는 위험을 나타냅니다. 작업자가 신체 부상을 일으킬 수 있는 위험한 환경에 있습니다. 장비에 작업을 수행하기 전에 전기 회로와 관련된 위험을 숙지하고 표준 작업 관례를 숙지하여 사고를 방지하십시오. 각 경고의 마지막 부분에 있는 경고문 번호를 참조하여 이 장치와 함께 제공되는 번역된 안전 경고문에서 해당 번역문을 찾으십시오.

이 지시 사항을 보관하십시오.

**Aviso** INSTRUÇÕES IMPORTANTES DE SEGURANÇA

**Este símbolo de aviso significa perigo. Você se encontra em uma situação em que há risco de lesões corporais. Antes de trabalhar com qualquer equipamento, esteja ciente dos riscos que envolvem os circuitos elétricos e familiarize-se com as práticas padrão de prevenção de acidentes. Use o número da declaração fornecido ao final de cada aviso para localizar sua tradução nos avisos de segurança traduzidos que acompanham o dispositivo.**

**GUARDE ESTAS INSTRUÇÕES****Advarsel** VIGTIGE SIKKERHEDSANVISNINGER

**Dette advarselssymbol betyder fare. Du befinder dig i en situation med risiko for legemeskadedigelse. Før du begynder arbejde på udstyr, skal du være opmærksom på de involverede risici, der er ved elektriske kredsløb, og du skal sætte dig ind i standardprocedurer til undgåelse af ulykker. Brug erklæringsnummeret efter hver advarsel for at finde oversættelsen i de oversatte advarsler, der fulgte med denne enhed.**

**GEM DISSE ANVISNINGER****تحذير****إرشادات الأمان الهامة**

يوضح رمز التحذير هذا وجود خطر. وهذا يعني أنك متواجد في مكان قد ينتج عنه التعرض لإصابات. قبل بدء العمل، احذر مخاطر التعرض للصدمات الكهربائية وكن على علم بالإجراءات القياسية للحيولة دون وقوع أي حوادث. استخدم رقم البيان الموجود في آخر كل تحذير لتحديد مكان ترجمته داخل تحذيرات الأمان المترجمة التي تأتي مع الجهاز. قم بحفظ هذه الإرشادات

**Upozorenje VAŽNE SIGURNOSNE NAPOMENE**

Ovaj simbol upozorenja predstavlja opasnost. Nalazite se u situaciji koja može prouzročiti tjelesne ozljede. Prije rada s bilo kojim uređajem, morate razumjeti opasnosti vezane uz električne sklopove, te biti upoznati sa standardnim načinima izbjegavanja nesreća. U prevedenim sigurnosnim upozorenjima, priloženima uz uređaj, možete prema broju koji se nalazi uz pojedino upozorenje pronaći i njegov prijevod.

**SAČUVAJTE OVE UPUTE****Upozornění DŮLEŽITÉ BEZPEČNOSTNÍ POKYNY**

Tento upozorňující symbol označuje nebezpečí. Jste v situaci, která by mohla způsobit nebezpečí úrazu. Před prací na jakémkoliv vybavení si uvědomte nebezpečí související s elektrickými obvody a seznamte se se standardními opatřeními pro předcházení úrazům. Podle čísla na konci každého upozornění vyhledejte jeho překlad v přeložených bezpečnostních upozorněních, která jsou přiložena k zařízení.

**USCHOVEJTE TYTO POKYNY****Προειδοποίηση ΣΗΜΑΝΤΙΚΕΣ ΟΔΗΓΙΕΣ ΑΣΦΑΛΕΙΑΣ**

Αυτό το προειδοποιητικό σύμβολο σημαίνει κίνδυνο. Βρίσκεστε σε κατάσταση που μπορεί να προκαλέσει τραυματισμό. Πριν εργαστείτε σε οποιοδήποτε εξοπλισμό, να έχετε υπόψη σας τους κινδύνους που σχετίζονται με τα ηλεκτρικά κυκλώματα και να έχετε εξοικειωθεί με τις συνήθειες πρακτικές για την αποφυγή ατυχημάτων. Χρησιμοποιήστε τον αριθμό δήλωσης που παρέχεται στο τέλος κάθε προειδοποίησης, για να εντοπίσετε τη μετάφρασή της στις μεταφρασμένες προειδοποιήσεις ασφαλείας που συνοδεύουν τη συσκευή.

**ΦΥΛΑΞΤΕ ΑΥΤΕΣ ΤΙΣ ΟΔΗΓΙΕΣ****אזהרה****הוראות בטיחות חשובות**

סימן אזהרה זה מסמל סכנה. אתה נמצא במצב העלול לגרום לפציעה. לפני שתעבוד עם ציוד כלשהו, עליך להיות מודע לסכנות הכרוכות במעגלים חשמליים ולהכיר את הנהלים המקובלים למניעת תאונות. השתמש במספר ההוראה המסופק בסופה של כל אזהרה כדי לאתר את התרגום באזהרות הבטיחות המתורגמות שמצורפות להתקן.

**שמור הוראות אלה****Opomena VAŽNI BEZBEDNOSNI NAPATSTVIJA**

Симболот за предупредување значи опасност. Се наоѓате во ситуација што може да предизвика телесни повреди. Пред да работите со опремата, бидете свесни за ризикот што постои кај електричните кола и треба да ги познавате стандардните постапки за спречување на несреќни случаи. Искористете го бројот на изјавата што се наоѓа на крајот на секое предупредување за да го најдете неговиот период во prevedените безбедносни предупредувања што се испорачани со уредот.

**ЧУВАЈТЕ ГИ ОБИЕ НАПАТСТВИЈА**

**Ostrzeżenie WAŻNE INSTRUKCJE DOTYCZĄCE BEZPIECZEŃSTWA**

Ten symbol ostrzeżenia oznacza niebezpieczeństwo. Zachodzi sytuacja, która może powodować obrażenia ciała. Przed przystąpieniem do prac przy urządzeniach należy zapoznać się z zagrożeniami związanymi z układami elektrycznymi oraz ze standardowymi środkami zapobiegania wypadkom. Na końcu każdego ostrzeżenia podano numer, na podstawie którego można odszukać tłumaczenie tego ostrzeżenia w dołączonym do urządzenia dokumencie z tłumaczeniami ostrzeżeń.

**NINIEJSZE INSTRUKCJE NALEŻY ZACHOWAĆ****Upozornenie DÔLEŽITÉ BEZPEČNOSTNÉ POKYNY**

Tento varovný symbol označuje nebezpečenstvo. Nachádzate sa v situácii s nebezpečenstvom úrazu. Pred prácou na akomkoľvek vybavení si uvedomte nebezpečenstvo súvisiace s elektrickými obvodmi a oboznámte sa so štandardnými opatreniami na predchádzanie úrazom. Podľa čísla na konci každého upozornenia vyhľadajte jeho preklad v preložených bezpečnostných upozorneniach, ktoré sú priložené k zariadeniu.

**USCHOVAJTE SI TENTO NÁVOD**

## 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 if potentially hazardous conditions exist.
- Never assume that power has been disconnected from a circuit; always check.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe. Carefully examine your work area for possible hazards such as moist floors, ungrounded power extension cables, and missing safety grounds.

## Telephone Wiring Guidelines

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

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

## Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) damage, which can occur when electronic cards or components are improperly handled, results in complete or intermittent failures. Port adapters and processor modules 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.

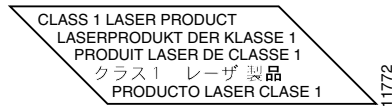
**Caution**

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

## Laser Safety

The multimode aperture has a Class 1 laser warning label, as shown in [Figure 2-1](#).

**Figure 2-1** Class 1 Laser Product Warning Label on the PA-POS-10C3



**Warning**

**Class 1 laser product.** Statement 1008



**Warning**

**Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.** Statement 1051

## FCC Class A Compliance

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

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

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



**Caution**

PA-POS-10C3 is designed to meet these requirements. Modifications to this product that are not authorized by Cisco Systems, Inc. could void the various approvals and negate your authority to operate the product.





# CHAPTER 3

## Removing and Installing the PA-POS-10C3

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This chapter describes how to remove the PA-POS-10C3 from supported platforms, how to install a new or replacement port adapter, and how to connect cables.

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-POS-10C3 Interface Cables, page 3-13](#)
- [Replacing the SFP Optics Module, page 3-14](#)

Before you begin installation, read the “[Required Tools and Equipment](#)” section on [page 2-1](#) for a list of parts and tools required for installation.

## Handling Port Adapters

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



### Note

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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.

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### Caution

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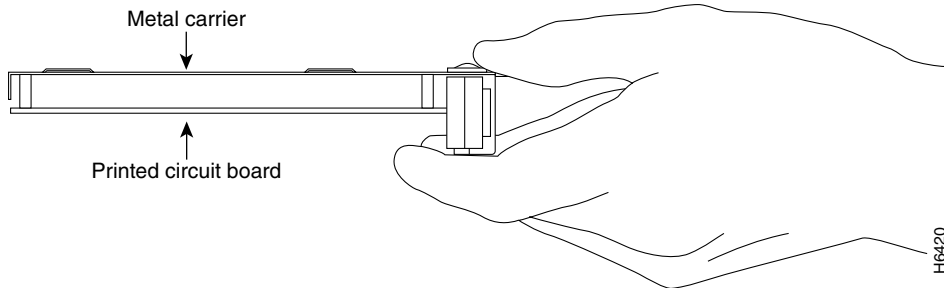
When powering off the router, wait a minimum of 30 seconds before powering it on again.

---

**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-POS-10C3 in the Cisco 7200 VXR routers, Cisco 7201 router, Cisco 7301 router, or Cisco 7401ASR router.

For the Cisco 7304 router, you must remove the Cisco 7304 PCI port adapter carrier card before removing or replacing port adapters.

For Cisco 7500 series routers, you must remove the VIP before removing and replacing port adapters.

For Cisco 7600 series routers, you must remove the FlexWAN module before removing or replacing port adapters.

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

**Note**

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

OIR allows you to install and replace port adapters or service adapters (carrier cards, VIPs and FlexWAN modules) while the router is operating; you do not need to notify the software or shut down the system power, although you should not run traffic through the 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.



## OIR Functional Description

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 were 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.

## Warnings and Cautions

Observe all the 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.

**Caution**

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 [“Port Adapter Removal and Installation” section on page 3-4](#).

**Warning**

**Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.**

Statement 1029

## 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 in each of the following supported platforms:

- [Cisco 7200 VXR Routers—Removing and Installing a Port Adapter, page 3-5](#)
- [Cisco 7201 Router—Removing and Installing a Port Adapter, page 3-6](#)
- [Cisco 7301 Router—Removing and Installing a Port Adapter, page 3-7](#)
- [Cisco 7304 PCI Port Adapter Carrier Card—Removing and Installing a Port Adapter, page 3-8](#)
- [Cisco 7401ASR Router—Removing and Installing a Port Adapter, page 3-10](#)
- [Cisco 7500 Series Routers—Removing and Installing a Port Adapter, page 3-11](#)
- [Cisco 7600 Series Router—Removing and Installing a Port Adapter, page 3-12](#)

For cabling information see the “[Connecting PA-POS-10C3 Interface Cables](#)” section on page 3-13.

## 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

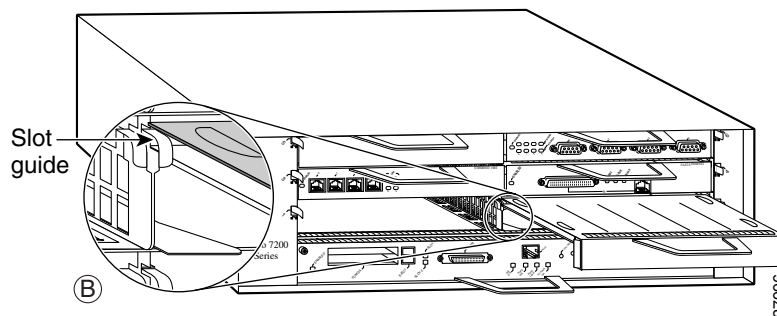
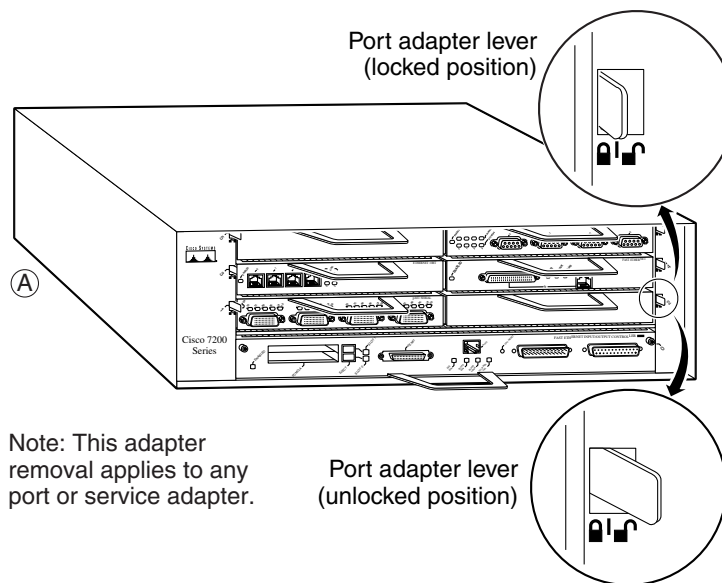
Carefully slide the new port adapter halfway into the port adapter slot. (See B.)

### 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.)



## 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

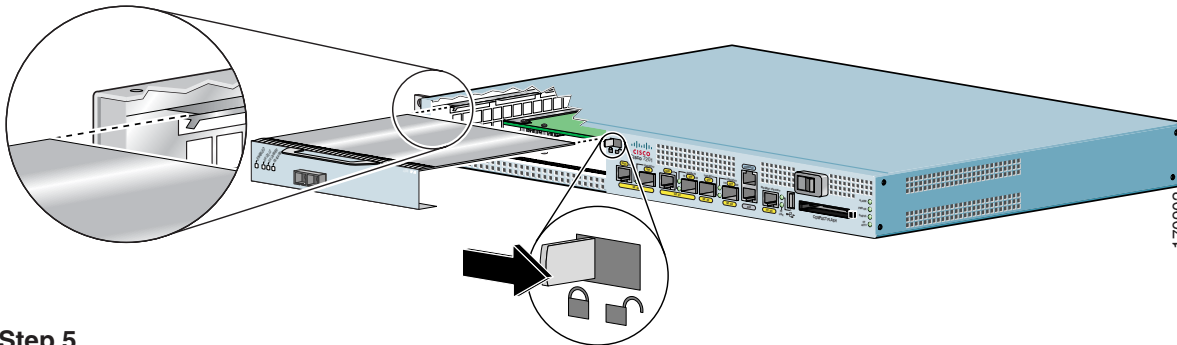
Grasp the handle of the port adapter and pull the port adapter about halfway out of its slot. If you are removing a blank port adapter, pull the blank port adapter completely out of the chassis slot.

### 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

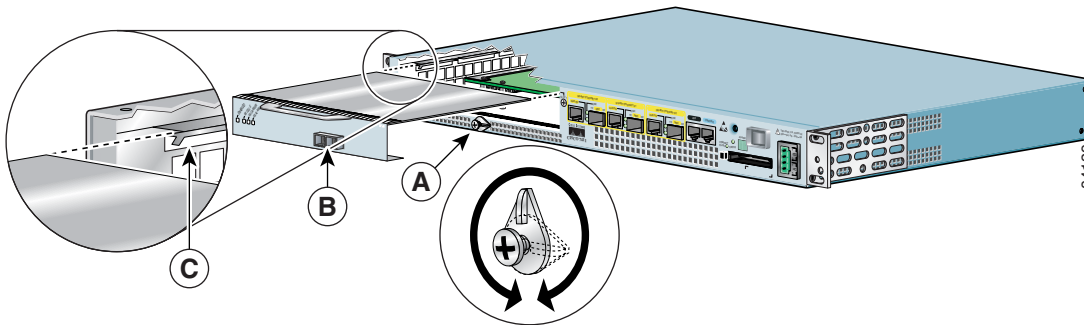
Grasp the handle and pull the port adapter from the router, about halfway out of its slot. (See B.) If you are removing a blank port adapter, pull the blank port adapter completely out of the chassis slot.

### 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.



### Caution

When performing the following procedures, wear a grounding wrist strap to avoid ESD damage to the Cisco 7304 PCI port adapter carrier card.



### Note

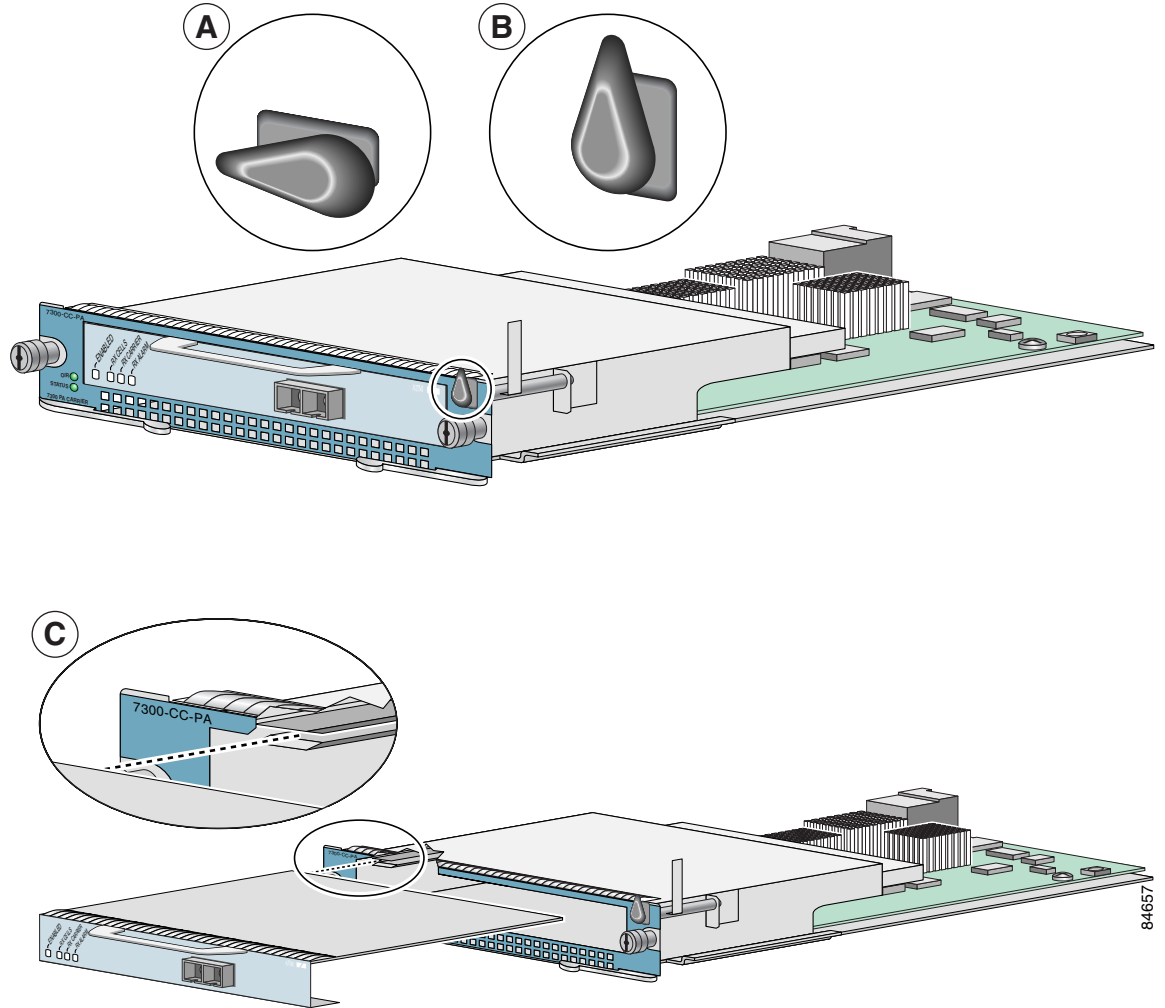
If the Cisco 7304 PCI port adapter carrier card is still in the router, you must remove the port adapter carrier card before removing a port adapter.

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** 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 2** Ensure that the cables are disconnected from the port adapter before removing the Cisco 7304 PCI port adapter carrier card from the chassis.
  - Step 3** Grasp the handle of the port adapter and pull the port adapter from 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**

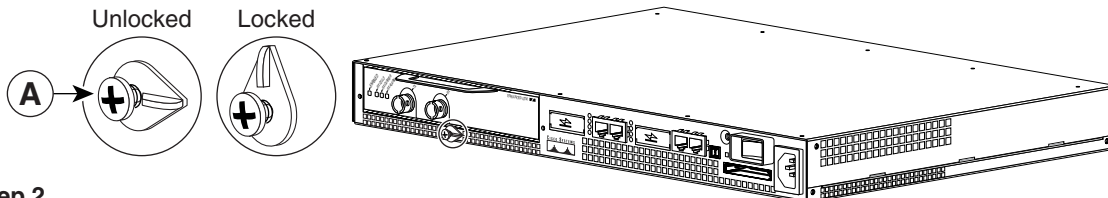


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## Cisco 7401ASR Router—Removing and Installing a Port Adapter

### Step 1

To remove the port adapter, use a number 2 Phillips screwdriver to loosen the screw on the port adapter latch. Rotate the port adapter latch until it clears the faceplate of the port adapter. (See A.) The latch can rotate 360°.



### Step 2

Pull the port adapter from the router, about halfway out of its slot. (If you remove a blank port adapter, keep the blank port adapter for use in the router if you should ever remove the port adapter. The port adapter slot must always be filled.)

### Step 3

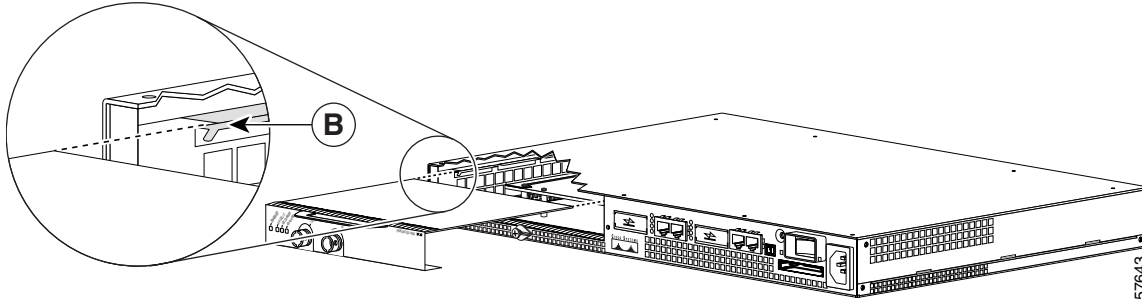
With the port adapter halfway out of the slot, disconnect all cables from the port adapter. After disconnecting the cables, pull the port adapter completely out of the chassis slot.

### Step 4

To insert the port adapter, locate the port adapter slot guides inside the Cisco 7401ASR router. They are near the top, and are recessed about 1/2 inch. (See B.)

### Caution

The port adapter must slide into the slot guides under 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

Insert the port adapter in the slot guides halfway, and then reconnect the port adapter cables.

### Step 6

After the cables are connected, carefully slide the port adapter all the way into the slot until the port adapter is seated in the router midplane. When installed, the port adapter input/output panel should be flush with the face of the router.

### Step 7

After the port adapter is properly seated, rotate the port adapter latch to the upright locked position and use a number 2 Phillips screwdriver to tighten the latch screw. If needed, loosen the latch screw to rotate the latch over the port adapter. Finish the installation by tightening the latch screw.

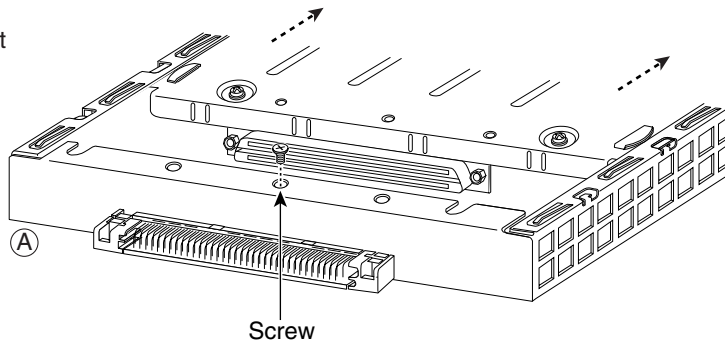


## Cisco 7500 Series Routers—Removing and Installing a Port Adapter

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.)

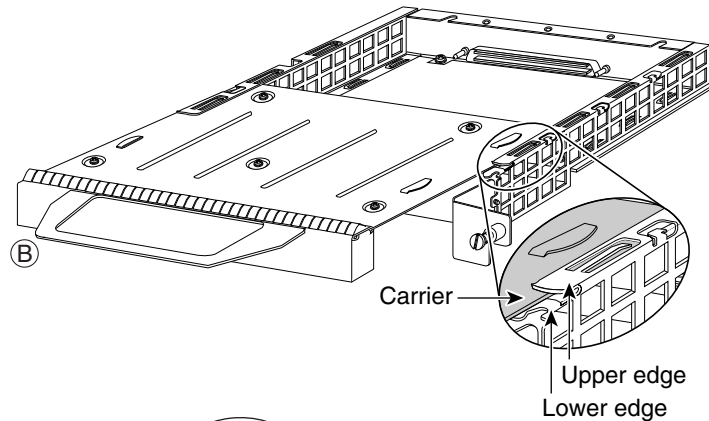


### Step 2

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.)

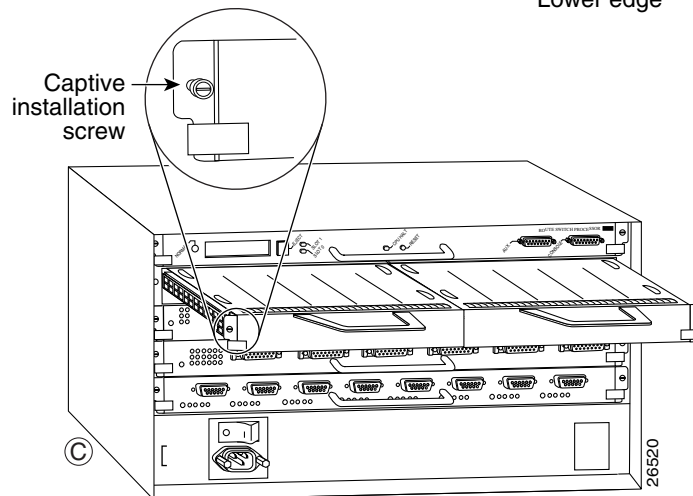


### Step 4

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

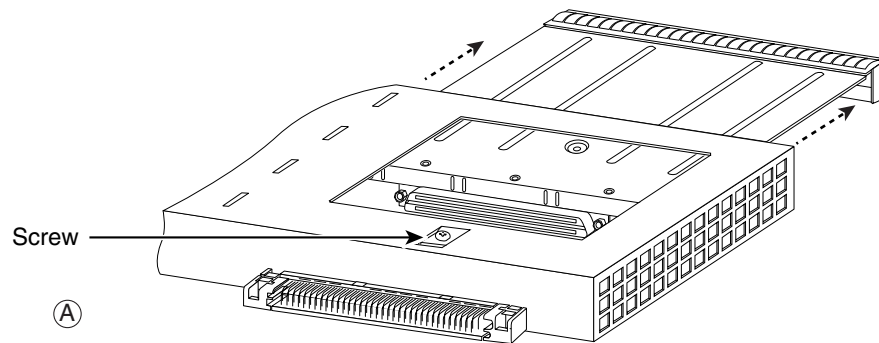
Carefully slide the VIP motherboard into the interface processor slot until the connectors at the rear of the VIP are completely seated in the connectors at the rear of the interface processor slot. Use the ejector levers to seat the VIP in the interface processor slot. Tighten the captive installation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

## Cisco 7600 Series Router—Removing and Installing a Port Adapter

Note: You must first remove the Enhanced FlexWAN Module from the chassis before removing a port adapter from the Enhanced FlexWAN Module.

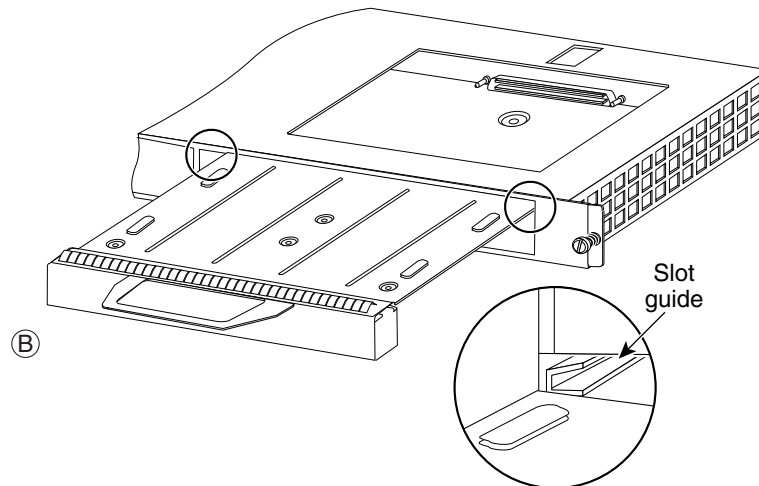
### Step 1

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

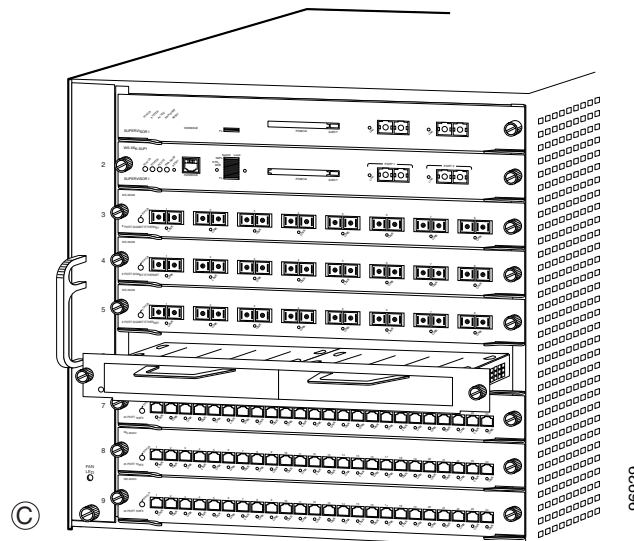
Carefully slide the new port adapter into the port adapter bay until the connector on the port adapter is completely seated in the connector at the rear of the port adapter slot. (See B.)

### Step 5

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

### Step 6

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



## Connecting PA-POS-10C3 Interface Cables

To continue your PA-POS-10C3 installation, you must connect the interface cables. The instructions that follow apply to all supported platforms.



### Note

Optical fiber cables are not available from Cisco Systems; they are available from outside commercial cable vendors. For more information on the cables you should use with this port adapter, see the “[Cables and Connectors](#)” section on page 1-7.



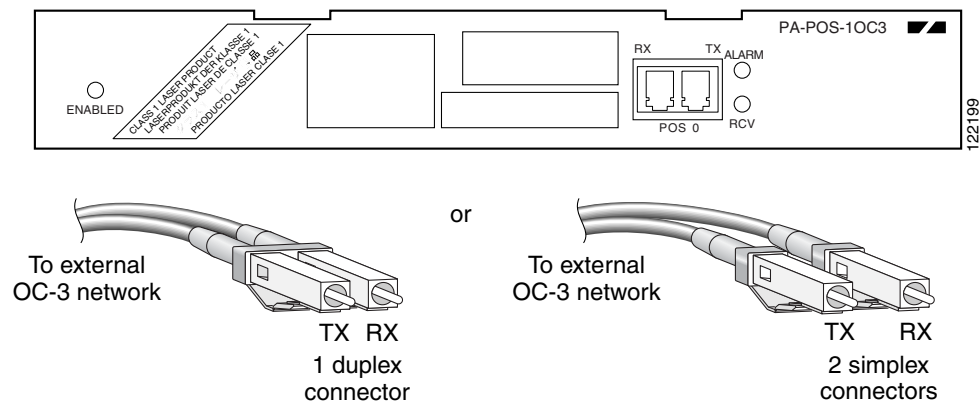
### Note

We strongly recommend cleaning any optical-fiber connectors before making new connections to optical-fiber equipment. For more information, see the *Inspection and Cleaning Procedures for Fiber-Optic Connections* document at [http://www.cisco.com/en/US/tech/tk482/tk876/technologies\\_white\\_paper09186a0080254eba.shtml](http://www.cisco.com/en/US/tech/tk482/tk876/technologies_white_paper09186a0080254eba.shtml), and the *Compressed Air Cleaning Issues for Fiber-Optic Connections* at [http://www.cisco.com/en/US/tech/tk482/tk611/technologies\\_white\\_paper09186a00801b08da.shtml](http://www.cisco.com/en/US/tech/tk482/tk611/technologies_white_paper09186a00801b08da.shtml)

To connect the cables to the PA-POS-10C3, attach either one duplex optical fiber cable or two simplex optical fiber cables between the PA-POS-10C3 interface port on your PA-POS-10C3 and your network. (See [Figure 3-3](#).)

Make sure that the receive (RX) cable goes to the RX LC-type receptacle and transmit (TX) cable goes to the TX LC-type receptacle on the PA-POS-10C3.

**Figure 3-3 Connecting Simplex or Duplex Optical Fiber Cables to the PA-POS-10C3**



### Warning

**Class 1 laser product.** Statement 1008



### Warning

**Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.** Statement 1051

## Replacing the SFP Optics Module

The following section describes how to remove and install the small form-factor pluggable (SFP) optics modules in the PA-POS-10C3.


**Note**


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The SFP optics modules used with the PA-POS-10C3 have LC type connectors

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The SFP optics modules support online insertion and removal (OIR). However, if the port adapter is already installed in the router and the system is operational, we recommend that you administratively shut down the SFP port before installing a new SFP optics module.

Available Cisco SFP optics modules include the following:

- POM-OC3-MM (short range, multimode fiber)
- POM-OC3-SMIR (intermediate range, single-mode fiber)
- POM-OC3-SMLR (long range, single-mode fiber)

## Handling the SFP Optics Module

Before handling the SFP optics module, observe the following guidelines:

- SFP optics modules are static-sensitive. To prevent electrostatic discharge (ESD) damage, follow your normal board- and component-handling procedures.
- SFP optics modules are dust-sensitive. When storing an SFP optics module or when a fiber-optics cable is not plugged into the connector, always keep plugs in the SFP optical bores.

The most common source of contaminants in the optical bores is debris picked up on the ferrules of the optical connectors. For information about inspecting and cleaning fiber optic connections, see the *Inspection and Cleaning Procedures for Fiber-Optic Connections* document at [http://www.cisco.com/en/US/tech/tk482/tk876/technologies\\_white\\_paper09186a0080254eba.shtml](http://www.cisco.com/en/US/tech/tk482/tk876/technologies_white_paper09186a0080254eba.shtml), and the *Compressed Air Cleaning Issues for Fiber-Optic Connections* at [http://www.cisco.com/en/US/tech/tk482/tk611/technologies\\_white\\_paper09186a00801b08da.shtml](http://www.cisco.com/en/US/tech/tk482/tk611/technologies_white_paper09186a00801b08da.shtml).


**Note**


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We strongly recommend cleaning any optical-fiber connectors before making new connections to optical-fiber equipment.

---

## Removing the SFP Optics Module

The following procedure describes removing the SFP optics module from a vertically or horizontally oriented port adapter slot.


**Warning**


---

**Ultimate disposal of this product should be handled according to all national laws and regulations.**  
Statement 1040

---



**Caution**


---

You can remove and install SFP optics modules with power on to the system; however, we strongly recommend that you do not remove or install an SFP optics module with optical fiber cables attached.

---

To remove the SFP optics module, perform the following steps:

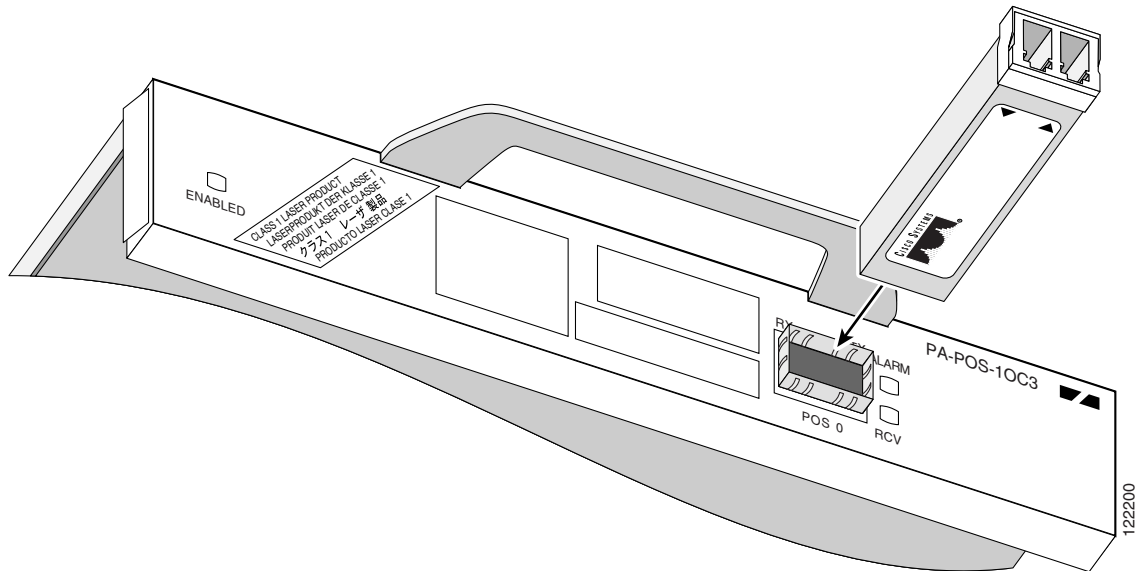
- 
- Step 1** Attach an ESD wrist strap to your wrist and to the ESD connection socket on the chassis or to a bare metal surface on the chassis or frame.
- Step 2** Disconnect the network fiber cable from the SFP optics module connector.
- Step 3** Remove the SFP optics module from the slot.
- Using your thumb and forefinger, grip the colored latching band on the front of the SFP optics module.
  - Gently push the latching band back toward the SFP slot. You may hear a click or feel the SFP optics module disengage from the holding latch.
-  **Note** Not all SFP optics modules have the same kind of latching mechanism.
- While still holding the latching band, pull the SFP optics module forward and out of the slot.
- Step 4** Set the SFP optics module aside on an antistatic surface.
- 

## Installing the SFP Optics Module

Use the following procedure to install the SFP optics modules:

- 
- Step 1** Attach an ESD-preventive wrist strap between you and an unpainted chassis surface.
- Step 2** Verify that you have the correct SFP optics module for your installation.
- Check the part number and distance information on the SFP optics module label.
  - If the distance information is not on the label, use the **show controller pos x/y** command to display the information after the SFP optics module is installed. See [“Verifying the SFP Optics Module Installation” section on page 3-16](#) for directions.
- Step 3** Align the SFP optics module with the slot so that the label is facing away from the handle.

Figure 3-4 Inserting an SFP Optics Module



- Step 4** Holding the module at the latching band (with your thumb and forefinger), insert the SFP optics module into the slot on the port adapter.
- Step 5** Push the module back into the slot until the latch engages. When fully inserted, only the band around the front of the SFP optics module is visible.
- Step 6** Remove the plug from the SFP optical bores and save the plug for future use.
- Step 7** Attach the network interface fiber-optics cable, as described in the [“Cisco 7500 Series Routers—Removing and Installing a Port Adapter”](#) section on page 3-11.

## Verifying the SFP Optics Module Installation

There are two ways that you can verify the SFP installation,

- Check the type of SFP optics module installed using the console.
- Cable the SFP optics module and check the LEDs on the front of the PA-POS-10C3.

Use this procedure to verify the SFP optics module installation in the PA-POS-10C3:

- Step 1** Verify the type of SFP optics module that is installed, by entering **show controller pos x/y** (example: 1/0)
- Step 2** Check the text in the output to verify the type of SFP that is installed.

```
NPE-400#show controller pos 1/0
<< omitted text >>
ipv62tag optimum fs = 0x612C6754, ipv62tagfs = 0x612C6754
SFP is TRP-03L3I1BCS OC3 SM-IR
Serial Number : 2014293
Framer is PMC PM5379 S/UNI-4x155 1 0
<< omitted text >>
```

**Step 3** Verify that the SFP optics module is functioning, by checking that the LINK LED is green.



---

**Note** The green (LINK) LED is turned on only if the cable is connected and the link is up. The orange (ALARM) LED is turned on by the software if there are SONET alarms on the interface.

---

**Step 4** Verify that the cabling is correct—single-mode to single-mode or multimode to multimode.

---



---

**Note** If the wavelength of the SFP optics modules are matched, but different modes are used (multimode to single-mode or vice versa), the SFP optics module functions but not reliably.

---







## CHAPTER 4

# Configuring the PA-POS-10C3

---

The following instructions apply to all supported platforms. Minor differences among 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](#)
- [Customizing the Configuration, page 4-8](#)
- [Checking the Configuration, page 4-12](#)
- [Push Mode Description, page 4-24](#)
- [PA-POS-10C3 Statistics Counters, page 4-25](#)
- [PA-POS-10C3 Error Messages, page 4-25](#)
- [Making a Back-to-Back Connection, page 4-25](#)

## 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.

```
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-POS-10C3 is installed correctly (the ENABLED LED goes on), use the privileged-level **configure** command to configure the new interfaces. Have the following information available:

- IP addresses, if you plan to configure the interface for IP routing
- MTU size
- Framing mode
- Transmit clock source
- Loopback modes (if testing is required)

If you installed a new PA-POS-10C3 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-POS-10C3 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 the interfaces on a PA-POS-10C3, 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. (See the “[Using the EXEC Command Interpreter](#)” section on page 4-1 for an explanation of the privileged level of the EXEC.) Contact your system administrator, if necessary, to obtain password access.

On power-up, the OC-3 interface on a new PA-POS-10C3 is shut down. To enable the interfaces, you must enter the **no shutdown** command in configuration mode. (See “[Performing a Basic Configuration](#)” section on page 4-6.) When the OC-3 interface is enabled (taken out of shutdown) with no additional arguments, the default interface configuration file parameters look like those in [Table 4-1](#).

**Table 4-1 PA-POS-10C3 Configuration Default Values**

Parameter <sup>1</sup>	Configuration Commands	Default Value
MTU	<b>mtu bytes (no mtu bytes)</b>	4470 bytes
Framing	<b>pos framing sdh (no pos framing sdh)</b>	SONET framing
Loopback internal	<b>loop internal (no loop internal)</b>	No internal loopback
Loopback line	<b>loop line (no loop line)</b>	No line loopback
Transmit clocking source	<b>clock source internal clock source line</b>	Loop timing (clock source internal)
Cyclic redundancy checks	<b>crc 16 crc 32</b>	crc 16
SONET payload scrambling	<b>pos scramble-atm (no pos scramble-atm)</b>	No scrambling (no pos scramble-atm)

1. These default parameters apply to the PA-POS-10C3 in all supported platforms.

## Shutting Down an Interface

Before you remove an interface that you will not replace, 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 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 pos** subcommand (followed by the interface address of the interface), and then enter the **shutdown** command.

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

Table 4-2 shows the **shutdown** command syntax for the supported platforms.

**Table 4-2** Syntax of the shutdown Command for the Supported Platforms

Platform	Command	Example
Cisco 7200 VXR routers <sup>1</sup>	<b>interface</b> , followed by the <i>type (pos)</i> and <i>slot/port</i> (port-adapter-slot-number/interface-port-number)  <b>shutdown</b>	The example is for interface 0 on a port adapter in slot 6.  Router(config-if)# <b>interface pos 6/0</b> Router(config-if)# <b>shutdown</b> <b>Ctrl-Z</b> Router#
Cisco 7201 router	<b>interface</b> , followed by the <i>type (pos)</i> and <i>slot/port</i> (port-adapter-slot-number/interface-port-number)  <b>shutdown</b>	The example is for interface 0 on a port adapter in slot 1.  Router(config-if)# <b>interface pos 1/0</b> Router(config-if)# <b>shutdown</b> <b>Ctrl-Z</b> Router#
Cisco 7301 router	<b>interface</b> , followed by the <i>type (pos)</i> and <i>slot/port</i> (port-adapter-slot-number/interface-port-number)  <b>shutdown</b>	The example is for interface 0 on a port adapter in slot 1.  Router(config-if)# <b>interface pos 1/0</b> Router(config-if)# <b>shutdown</b> <b>Ctrl-Z</b> Router#
Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router	<b>interface</b> , followed by the <i>type (pos)</i> and <i>slot/port</i> (module-slot-number/interface-port-number)  <b>shutdown</b>	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)# <b>interface pos 3/0</b> Router(config-if)# <b>shutdown</b> <b>Ctrl-Z</b> Router#

Table 4-2 Syntax of the shutdown Command for the Supported Platforms (continued)

Platform	Command	Example
Cisco 7401ASR router	<b>interface</b> , followed by the <i>type (pos)</i> and <i>slot/port</i> (port-adapter-slot-number/interface-port-number)  <b>shutdown</b>	The example is for interface 0 on a port adapter in slot 1.  Router(config-if)# <b>interface pos 1/0</b> Router(config-if)# <b>shutdown</b> <b>Ctrl-Z</b> Router#
VIP in the Cisco 7500 series routers (7505, 7507, 7513)	<b>interface</b> , followed by the <i>type (pos)</i> <i>slot/port-adapter/port</i> (interface-processor-slot-number/port-adapter-slot-number/interface-port-number)  <b>shutdown</b>	The example is for interface 0 in port adapter slot 1 of a VIP installed in interface processor slot 1.  Router(config)# <b>interface pos 1/1/0</b> Router(config-if)# <b>shutdown</b> <b>Ctrl-Z</b> Router#
Cisco 7600 series routers (7603, 7606, 7609, 7613) with FlexWAN or Enhanced FlexWAN	<b>interface</b> , followed by the <i>type (pos)</i> <i>module/bay/port</i> (module-slot-number/port-adapter-bay-number/interface-port-number)  <b>shutdown</b>	The example is for interface 0 on a port adapter in port adapter bay 0 of a FlexWAN module in module slot 3.  Router# <b>interfaces pos 3/0/0</b> Router(config-if)# <b>shutdown</b> <b>Ctrl-Z</b> Router#

- For the Cisco 7206VXR router shelves in the Cisco AS5800, the interface specified in the above example would include a shelf number. For example, the command **interface serial 5/3/0** specifies the OC-3 interface of the PA-POS-10C3 in port adapter slot 3 of router shelf 5.

**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.

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

Table 4-3 provides examples of the **show interfaces pos** command for the supported platforms.

**Table 4-3 Examples of the show interfaces pos Command for the Supported Platforms**

Platform	Command	Example
Cisco 7200 VXR routers <sup>1</sup>	<b>show interfaces pos</b> , followed by <i>slot/port</i> (port-adapter-slot-number/interface-port-number)	The example is for interface 0 on a port adapter in slot 6. Router# <b>show interfaces pos 6/0</b>  Pos 6/0 is administratively down, line protocol is down  [Additional display text omitted from this example]
Cisco 7201 router	<b>show interfaces pos</b> , followed by <i>slot/port</i> (port-adapter-slot-number/interface-port-number)	The example is for interface 0 on a port adapter in slot 1. Router# <b>show interfaces pos 1/0</b>  Pos 1/0 is administratively down, line protocol is down  [Additional display text omitted from this example]
Cisco 7301 router	<b>show interfaces pos</b> , followed by <i>slot/port</i> (port-adapter-slot-number/interface-port-number)	The example is for interface 0 on a port adapter in slot 1. Router# <b>show interfaces pos 1/0</b>  Pos 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	<b>show interfaces pos</b> , 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# <b>show interfaces pos 3/0</b>  Pos 3/0 is administratively down, line protocol is down  [Additional display text omitted from this example]
Cisco 7401ASR router	<b>show interfaces pos</b> , followed by <i>slot/port</i> (port-adapter-slot-number/interface-port-number)	The example is for interface 0 on a port adapter in slot 1. Router# <b>show interfaces pos 1/0</b>  Pos 1/0 is administratively down, line protocol is down  [Additional display text omitted from this example]

Table 4-3 Examples of the show interfaces pos Command for the Supported Platforms (continued)

Platform	Command	Example
VIP in the Cisco 7500 series routers (7505, 7507, 7513)	<b>show interfaces pos</b> 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 in port adapter slot 1 of a VIP installed in interface processor slot 1.  Router# <b>show interface pos 1/1/0</b> Pos 1/1/0 is administratively down, line protocol is down  [Additional display text omitted from this example]
Cisco 7600 series routers (7603, 7606, 7609, 7613) with FlexWAN or Enhanced FlexWAN	<b>show interfaces pos</b> followed by <i>slot/port-adapter/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 in module slot 3.  Router# <b>show interfaces pos 3/0/0</b>  Pos 3/0/0 is administratively down, line protocol is down  [Additional display text omitted from this example]

- For the Cisco 7206VXR router shelves in the Cisco AS5800, the interface specified in the above example would include a shelf number. For example, the command **show interface 5/3/0** specifies the OC-3 interface of the PA-POS-10C3 in port adapter slot 3 of router shelf 5.

**Step 5** Re-enable interfaces by doing the following:

- Repeat [Step 3](#) to re-enable an interface. Substitute the **no shutdown** command for the shutdown command.
- Repeat [Step 4](#) to write the new configuration to memory. Use the **copy running-config startup-config** command.
- Repeat 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.

## Performing a Basic Configuration

Following are instructions for performing a basic configuration, which include enabling an interface (with the **no shutdown** command) and specifying IP routing. You might also need to enter other configuration commands, depending on the requirements for your system configuration and the protocols you plan to route on the interface.

For complete descriptions of configuration commands and the configuration options available for the interfaces of your port adapter, 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 will be 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 new interface to configure by entering the **interface pos** command, followed by the interface address of the interface you plan to configure.

Table 4-4 provides example of the **interface pos** subcommand for the supported platforms.

**Table 4-4** Examples of the interface pos Subcommand for the Supported Platforms

Platform	Command	Example
Cisco 7200 VXR routers <sup>1</sup>	<b>interface pos</b> , followed by <i>slot/port</i> (port-adapter-slot-number/interface-port-number)	This example is for interface 0 of a PA-POS-10C3 in port adapter slot 6: Router(config)# <b>interface pos 6/0</b> Router(config-if)#
Cisco 7201 router	<b>interface pos</b> , followed by <i>slot/port</i> (port-adapter-slot-number/interface-port-number)	The example is for interface 0 of a PA-POS-10C3 in port adapter slot 1: Router(config)# <b>interface pos 1/0</b> Router(config-if)#
Cisco 7301 router	<b>interface pos</b> , followed by <i>slot/port</i> (port-adapter-slot-number/interface-port-number)	The example is for interface 0 of a PA-POS-10C3 in port adapter slot 1: Router(config)# <b>interface pos 1/0</b> Router(config-if)#
Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router	<b>interface pos</b> , 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# <b>interface pos 3/0</b> Router(config-if)#
Cisco 7401ASR router	<b>interface pos</b> , followed by <i>slot/port</i> (port-adapter-slot-number/interface-port-number)	The example is for interface 0 of a PA-POS-10C3 in port adapter slot 1: Router(config)# <b>interface pos 1/0</b> Router(config-if)#
VIPs in the Cisco 7500 series routers (7505, 7507, 7513)	<b>interface pos</b> , 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 in port adapter slot 1 of a VIP installed in interface processor slot 1. Router(config)# <b>interface pos 1/1/0</b> Router(config-if)#
Cisco 7600 series routers (7603, 7606, 7609, 7613) with FlexWAN or Enhanced FlexWAN	<b>interface pos</b> , followed by <i>slot/port-adapter/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 in module slot 3. Router# <b>interface pos 3/0/0</b> Router(config-if)#

1. For the Cisco 7206VXR router shelves in the Cisco AS5800, the interface specified in the above example would include a shelf number. For example, the command **interface pos 5/3/0** specifies the OC-3 interface of the PA-POS-10C3 in port adapter slot 3 of router shelf 5.

**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** configuration subcommand, as in the following example:

```
Router(config-if)# ip address 10.0.0.10 255.255.255.255
```

**Step 4** Change the shutdown state to up and enable the interface as follows:

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

The **no shutdown** command passes an **enable** command to the interface and causes the PA-POS-10C3 to configure itself based on the previous configuration commands sent.

**Step 5** Add any additional configuration subcommands required to enable routing protocols and set the interface characteristics.

**Step 6** After including all of the configuration commands 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 7** Write the new configuration to NVRAM as follows:

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

---

This completes the procedure for creating a basic configuration. To check the interface configuration with show commands, proceed to the [“Checking the Configuration”](#) section on page 4-12.

## Customizing the Configuration

You can customize the default values of all configuration parameters to match your network environment. Use the interface subcommands in the following sections if you need to customize the PA-POS-10C3 configuration:

- [Setting the MTU Size, page 4-9](#)
- [Configuring Framing, page 4-9](#)
- [Setting the Source of the Transmit Clock, page 4-9](#)
- [Configuring Cyclic Redundancy Checks, page 4-10](#)
- [Configuring SONET Payload Scrambling, page 4-10](#)
- [Configuring APS, page 4-11](#)

The interface subcommands that follow function the same regardless of the platform in which your PA-POS-10C3 is installed; however, all these commands require that you first enter the **interface pos** command to select the interface that you want to configure. In all the configuration examples that follow, the interface address argument for the **interface pos** command is for a Cisco 7200 VXR router: 3/0 (port adapter slot 3, interface 0).

For the appropriate **interface pos** command syntax to use for your particular platform, see [Table 4-4 on page 4-7](#).



## Setting the MTU Size



**Note** The default MTU size is 4470 bytes. The default value, 4470 bytes, exactly matches the maximum transmission unit (MTU) of the fiber distributed data interface (FDDI) and high-speed serial interface (HSSI) for autonomous switching.

**Step 1** To set the MTU size, enter the **mtu bytes** command, where *bytes* is a value in the range of 64 to 117994.

```
Router(config)# interface pos 3/0  
Router(config-if)# mtu 3000
```

**Step 2** To restore the default of 4470 bytes, enter the **no mtu** command.

```
Router(config)# interface pos 3/0  
Router(config-if)# no mtu 3000
```

## Configuring Framing

The default framing setting is SONET STS-3c.

**Step 1** To configure for SDH STM-1, enter the **pos framing sdh** command:

```
Router(config)# interface pos 3/0  
Router(config-if)# pos framing sdh
```

**Step 2** To change back to SONET STS-3c, enter the **no pos framing sdh** command.

```
Router(config)# interface pos 3/0  
Router(config-if)# no pos framing sdh
```

## Setting the Source of the Transmit Clock

The clocking default specifies that the PA-POS-10C3 use the recovered receive (RX) clock to provide transmit (TX) clocking (called *loop timing*).



**Note** If line loopback is selected, the PA-POS-10C3 is forced into loop timing mode until the loopback is disengaged.

**Step 1** To specify that the PA-POS-10C3 generate the transmit clock internally, enter the **clock source internal** command:

```
Router(config)# interface pos 3/0  
Router(config-if)# clock source internal
```

**Step 2** To restore loop timing, enter the **no clock source internal** command or the **clock source line** command.

```
Router(config)# interface pos 3/0
Router(config-if)# no clock source internal
```

---

## Configuring Cyclic Redundancy Checks

The cyclic redundancy check (CRC) default is for a 16-bit CRC. The CRC is an error-checking technique that uses a calculated numeric value to detect errors in transmitted data. The PA-POS-10C3 also supports a 32-bit CRC. The sender of a data frame calculates the frame check sequence (FCS). The sender appends the FCS value to outgoing messages. The receiver recalculates the FCS and compares it to the FCS from the sender. If a difference exists, the receiver assumes that a transmission error occurred and sends a request to the sender to resend the frame.

**Step 1** To configure an interface for a 32-bit CRC, enter the **crc 32** command:

```
Router(config)# interface pos 3/0
Router(config-if)# crc 32
```

**Step 2** To disable the 32-bit CRC and return the interface to the default 16-bit CRC, enter the **no crc 32** command.

```
Router(config)# interface pos 3/0
Router(config-if)# no crc 32
```

---

## Configuring SONET Payload Scrambling

The default is for SONET payload scrambling to be disabled. SONET payload scrambling applies a self-synchronous scrambler ( $x^{43}+1$ ) to the Synchronous Payload Envelope (SPE) of the OC-3 interface to ensure sufficient bit-transition density.



### Note

Both ends of the connection must use the same scrambling algorithm.

You enable SONET payload scrambling using the **pos scramble-atm** command. (This command has no keywords or arguments.)

**Step 1** To enable SONET payload scrambling, use the following command sequence:

```
Router(config)# interface pos 3/0
Router(config-if)# pos scramble-atm
Router(config-if)# no shutdown
Router(config-if)# end
```

**Step 2** To verify that SONET payload scrambling is enabled on an interface, enter the **show startup-config** command. If scrambling is enabled, the following line is displayed in the configuration:

```
pos scramble-atm
```

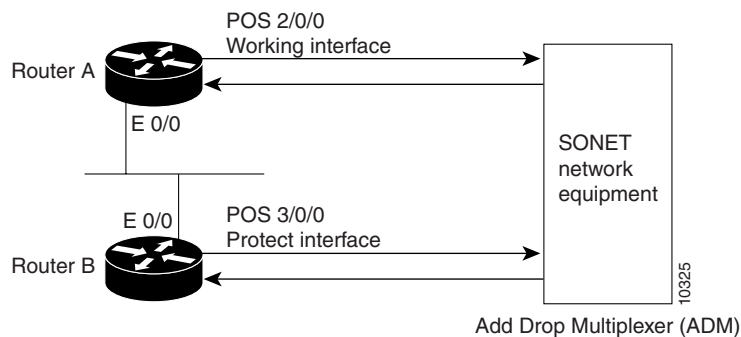
**Step 3** To disable SONET payload scrambling, use the **no pos scramble-atm** command.

```
Router(config)# interface pos 3/0
Router(config-if)# no pos scramble-atm
```

## Configuring APS

The following example shows the configuration of automatic protection switching (APS) on router A and router B. (See Figure 4-1.) In this example, router A is configured with the working interface, and router B is configured with the protect interface. If the working interface on router A becomes unavailable, the connection will automatically switch over to the protect interface on router B.

**Figure 4-1 Basic APS Configuration**



On router A, which contains the working interface, use the following configuration:

```
Router# configure terminal
Router(config)# interface loopback 1
Router(config-if)# ip address 10.7.7.7 255.255.255.0
Router(config)# interface pos 2/0/0
Router(config-if)# aps group 1
Router(config-if)# aps working 1
Router(config-if)# pos ais-shut
Router(config-if)# end
Router#
```

On router B, which contains the protect interface, use the following configuration:

```
Router# configure terminal
Router(config)# interface loopback 2
Router(config-if)# ip address 10.7.7.6 255.255.255.0
Router(config)# interface pos 3/0/0
Router(config-if)# aps group 1
Router(config-if)# aps protect 1 10.7.7.7
Router(config-if)# pos ais-shut
Router(config-if)# end
Router#
```



### Note

The loopback interface is used as the interconnect. The **aps group** command is used even when a single protect group is configured.

To verify the configuration or to determine if a switchover has occurred, use the **show aps** command.

For more information on SONET APS, see the following documents:

- *Automatic Protection Switching of Packet-over-SONET Circuits* at the following URL:  
[http://www.cisco.com/en/US/products/sw/iosswrel/ps1824/products\\_feature\\_guide09186a0080087ad9.html](http://www.cisco.com/en/US/products/sw/iosswrel/ps1824/products_feature_guide09186a0080087ad9.html)
- *Configuring Redundancy for POS/APS* at the following URL:  
[http://www.cisco.com/warp/public/127/POS/pos-aps\\_14680.html](http://www.cisco.com/warp/public/127/POS/pos-aps_14680.html)

## Checking the Configuration

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

- [Using show Commands to Verify the New Interface Status, page 4-12](#)
- [Using the ping Command to Verify Network Connectivity, page 4-22](#)
- [Using loopback Commands, page 4-23](#)

For complete command descriptions and examples, refer to the publications listed in the “[Related Documentation](#)” section on page viii.

## Using show Commands to Verify the New Interface Status

[Table 4-5](#) demonstrates how you can use the **show** commands to verify that new interfaces are configured and operating correctly and that the PA-POS-10C3 appears in them correctly. Sample displays of the output of selected **show** commands appear in the sections that follow.



### 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 4-5** Using show commands

Command	Function	Example
<b>show version</b> or <b>show hardware</b>	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# <b>show version</b>
<b>show diag slot</b>	Displays types of port adapters installed in your system and information about a specific port adapter slot, interface processor slot, or chassis slot	Router# <b>show diag 2</b>
<b>show interfaces pos</b> <i>port-adapter-slot-number/interface port number</i>	Displays status information about the pos interface in the Cisco 7200 VXR routers, Cisco 7201 router, Cisco 7301 router, or Cisco 7401ASR router	Router# <b>show interfaces pos 1/0</b>

Table 4-5 Using show commands (continued)

Command	Function	Example
<b>show interfaces pos 2 or 3 or 4 or 5/ interface-port-number</b>	Displays status information about the pos interface on a Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router	Router# <b>show interfaces pos 3/0</b>
<b>show interfaces pos interface-processor- slot-number/port-adapter-slot-number/ interface-port-number</b>	Displays status information about the pos interface on a VIP in a Cisco 7500 series router	Router# <b>show interfaces pos 3/1/0</b>
<b>show interfaces pos module-slot- number/port-adapter-bay-number/ interface-port-number</b>	Displays status information about the pos interface on a Cisco 7600 series router FlexWAN module	Router# <b>show interfaces pos 3/0/0</b>
<b>show controllers</b>	Displays all the current interface processors and their interfaces	Router# <b>show controllers</b>
<b>show protocols</b>	Displays protocols configured for the entire system and for specific interfaces	Router# <b>show protocols</b>
<b>show running-config</b>	Displays the running configuration file	Router# <b>show running-config</b>
<b>show startup-config</b>	Displays the configuration stored in NVRAM	Router# <b>show startup-config</b>

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

This section includes the following subsections:

- [Using the show version or show hardware Commands, page 4-14](#)
- [Using the show diag Command, page 4-17](#)
- [Using the show interfaces Command, page 4-20](#)

Choose the subsection appropriate for your system. Proceed to the “[Using the ping Command to Verify Network Connectivity](#)” section on page 4-22 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 output of the **show version** command for some of the supported platforms:

- [Cisco 7200 VXR Routers—Example Output of the show version Command, page 4-14](#)
- [Cisco 7201 Router—Example Output of the show version Command, page 4-15](#)
- [Cisco 7301 Router—Example Output of the show version Command, page 4-15](#)
- [VIP in Cisco 7500 Series Routers—Example Output of the show version Command, page 4-16](#)

### Cisco 7200 VXR Routers—Example Output of the show version Command

Following is an example of the **show version** command from a Cisco 7206 VXR router with the PA-POS-10C3 installed:

```
Router# show version

Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-JS-M), Version 12.3(10), RELEASE SOFTWARE (fc3)
Copyright (c) 1986-2004 by cisco Systems, Inc.
Compiled Mon 16-Aug-04 23:46 by kellythw
Image text-base: 0x60008AF4, data-base: 0x62014000
ROM: System Bootstrap, Version 12.3(4r)T1, RELEASE SOFTWARE (fc1)
Router uptime is 3 minutes
System returned to ROM by power-on
System image file is "disk2:c7200-js-mz.123-10"
cisco 7206VXR (NPE-G1) processor (revision A) with 491520K/32768K bytes of memory.
Processor board ID 26813737
SB-1 CPU at 700MHz, Implementation 1, Rev 0.2, 512KB L2 Cache
6 slot VXR midplane, Version 2.6
Last reset from power-on
Bridging software.
X.25 software, Version 3.0.0.
SuperLAT software (copyright 1990 by Meridian Technology Corp).
TN3270 Emulation software.
PCI bus mb1 (Slots 1, 3 and 5) has a capacity of 600 bandwidth points.
Current configuration on bus mb1 has a total of 0 bandwidth points. This configuration is
within the PCI bus capacity and is supported.
PCI bus mb2 (Slots 2, 4 and 6) has a capacity of 600 bandwidth points.
Current configuration on bus mb2 has a total of 300 bandwidth points. This configuration
is within the PCI bus capacity and is supported.
Please refer to the following document "Cisco 7200 Series Port Adaptor Hardware
Configuration Guidelines" on CCO <www.cisco.com>, for c7200 bandwidth points
oversubscription/usage guidelines.

3 Gigabit Ethernet/IEEE 802.3 interface(s)
1 Packet over SONET network interface(s)
509K bytes of non-volatile configuration memory.
125184K bytes of ATA PCMCIA card at slot 2 (Sector size 512 bytes).
```

```
16384K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x0
```

### 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
c7201alpha1 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/wvl/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 2222222222222
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
```

### Cisco 7301 Router—Example Output of the show version Command

Following is an example of the **show version** command from a Cisco 7301 router with the PA-POS-10C3 installed:

```
Router# show version

Cisco Internetwork Operating System Software
IOS (tm) 7301 Software (C7301-JS-M), Version 12.3(10), RELEASE SOFTWARE (fc3)
Copyright (c) 1986-2004 by cisco Systems, Inc.
Compiled Mon 16-Aug-04 22:00 by kellythw
Image text-base: 0x60008AF4, data-base: 0x61F8A000
ROM: System Bootstrap, Version 12.2(8r)B3, RELEASE SOFTWARE (fc1)
rac3-7301 uptime is 0 minutes
System returned to ROM by power-on
System image file is "disk0:c7301-js-mz.123-10"
cisco 7301 (NPE) processor (revision A) with 983040K/65536K bytes of memory.
Processor board ID 74998962
SB-1 CPU at 700MHz, Implementation 1, Rev 0.2, 512KB L2 Cache
1 slot midplane, Version 2.0
```

```

Last reset from power-on
Bridging software.
X.25 software, Version 3.0.0.
SuperLAT software (copyright 1990 by Meridian Technology Corp).
TN3270 Emulation software.
3 Gigabit Ethernet/IEEE 802.3 interface(s)
1 Packet over SONET network interface(s)
509K bytes of non-volatile configuration memory.
125184K bytes of ATA PCMCIA card at slot 0 (Sector size 512 bytes).
32768K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x0

```

## VIP in 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 Cisco PA-POS-10C3 port adapter installed in a VIP:

```
Router#show version
```

```

Cisco Internetwork Operating System Software
IOS (tm) RSP Software (RSP-PV-M), Version 12.2(613), RELEASE SOFTWARE (fc1)
Copyright (c) 1986-2002 by cisco Systems, Inc.
Compiled Sun 08-Dec-02 16:14 by biff
Image text-base:0x60010B50, data-base:0x61620000

ROM:System Bootstrap, Version 11.1(2), RELEASE SOFTWARE (fc1)

Router uptime is 1 minute
System returned to ROM by reload at 00:53:36 UTC Mon Dec 9 2002
System image file is "slot0:rsp-pv-mz"

cisco RSP8 (R7000) processor with 131072K/8216K bytes of memory.
R7000 CPU at 250Mhz, Implementation 39, Rev 1.0, 256KB L2, 2048KB L3 Cache
Last reset from power-on
G.703/E1 software, Version 1.0.
G.703/JT2 software, Version 1.0.
X.25 software, Version 3.0.0.
Bridging software.
Chassis Interface.
1 EIP controller (6 Ethernet).
1 VIP4-50 RM5271 controller (2 POS).
6 Ethernet/IEEE 802.3 interface(s)
2 Packet over SONET network interface(s)
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 0x0

```



## Using the show diag Command

Display the types of port adapters installed in your system (and specific information about each) using the **show diag** slot command, where slot is the port adapter slot in a Cisco 7200 VXR router, Cisco 7201 router, Cisco 7301 router, and 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 Cisco 7500 series routers 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.

The following sections provide output of the **show diag** command for some of the supported platforms:

- [Cisco 7200 VXR Routers—Example Output of the show diag Command, page 4-17](#)
- [Cisco 7201 Router—Example Output of the show diag Command, page 4-18](#)
- [Cisco 7301 Router—Example Output of the show diag Command, page 4-18](#)
- [VIP in Cisco 7500 Series Routers—Example Output of the show diag Command, page 4-19](#)

### Cisco 7200 VXR Routers—Example Output of the show diag Command

Following is an example of the **show diag** command for a PA-POS-10C3 in port adapter slot 2 of a Cisco 7200 VXR router:

```
Router# show diag 2
```

```
Slot 2:
single OC3 POS Port adapter, 1 port
Port adapter is analyzed
Port adapter insertion time 16:01:44 ago
EEPROM contents at hardware discovery:
Hardware Revision      :1.0
PCB Serial Number     :000000000000
Part Number           :73-8220-01
Board Revision        :01
RMA Test History      :00
RMA Number            :0-0-0-0
RMA History           :00
Unknown Field (type 0088):00 00 00 00
Product Number        :PA-POS-10C3
Top Assy. Part Number :800-21857-01
EEPROM format version 4
EEPROM contents (hex):
0x00:04 FF 40 03 E3 41 01 00 C1 8B 30 30 30 30 30 30
0x10:30 30 30 30 30 30 82 49 20 1C 01 42 30 31 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 01 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
```

**Cisco 7201 Router—Example Output of the show diag Command**

Following is an example of the **show diag** command from 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-20C3
  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
```

**Cisco 7301 Router—Example Output of the show diag Command**

Following is an example of the **show diag** command for a PA-POS-10C3 in port adapter slot 1 of a Cisco 7301 router:

```
Router# show diag 1

Slot 1:
  single OC3 POS Port adapter, 1 port
  Port adapter is analyzed
  Port adapter insertion time 7w2d ago
  EEPROM contents at hardware discovery:
  Hardware Revision : 1.0
  PCB Serial Number : JAE080216FB
  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-10C3
  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 38 30
    0x10: 32 31 36 46 42 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 7500 Series Routers—Example Output of the show diag Command

Following is an example of the **show diag** command that shows a PA-POS-10C3 in port adapter slot 4 on a VIP in interface processor slot 1:

```
Router#show diag 1
```

```
Slot 1:
```

```
Physical slot 1, ~physical slot 0xE, logical slot 1, CBus 0
Microcode Status 0x4
Master Enable, LED, WCS Loaded
Board is analyzed
Pending I/O Status:None
EEPROM format version 1
VIP4-80 RM7000 controller, HW rev 2.02, board revision A0
Serial number:18588146 Part number:73-3143-03
Test history:0x00 RMA number:00-00-00
Flags:cisco 7000 board; 7500 compatible
```

```
EEPROM contents (hex):
```

```
0x20:01 22 02 02 01 1B A1 F2 49 0C 47 03 00 00 00 00
0x30:50 13 33 00 00 00 00 00 00 00 00 00 00 00 00 00
```

```
Slot database information:
```

```
Flags:0x4 Insertion time:0x41FCECC (6d22h ago)
```

```
Controller Memory Size:64 MBytes CPU SDRAM, 64 MBytes Packet SDRAM
```

```
PA Bay 0 Information:
```

```
POS PA, 2 port, PA-POS-10C3
EEPROM format version 4
HW rev 1.00, Board revision 01
Serial number:000000000000 Part number:73-8220-01
```

```
--Boot log begin--
```

```
Cisco Internetwork Operating System Software
IOS (tm) VIP Software (SVIP-DW-M), Version 12.2(613), RELEASE SOFTWARE (fc1)
TAC Support:http://www.cisco.com/tac
Copyright (c) 1986-2002 by cisco Systems, Inc.
Compiled Sun 08-Dec-02 16:10 by biff
Image text-base:0x60010930, data-base:0x604C0000
```

```
--Boot log end--
```

## 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, 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 output of the **show interfaces** command for some of the supported platforms:

- [Cisco 7200 VXR Series Routers—Example Output of the show interfaces Command, page 4-20](#)
- [Cisco 7201 Router—Example Output of the show interfaces Command, page 4-21](#)
- [Cisco 7301 Router—Example Output of the show interfaces Command, page 4-21](#)
- [VIP in Cisco 7500 Series Routers—Example Output of the show interfaces Command, page 4-22](#)

### Cisco 7200 VXR Series Routers—Example Output of the show interfaces Command

Following is an example of the **show interfaces pos** command for a PA-POS-10C3 in port adapter slot 4 of a Cisco 7200 VXR router:

```
Router# show interfaces pos 4/0
PE3#sh int pos4/1
POS4/1 is down, line protocol is down
  Hardware is Packet over Sonet
  Internet address is 142.50.8.3/24
  MTU 4470 bytes, BW 155000 Kbit, DLY 100 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, crc 16, loopback not set
  Keepalive not set
  Scramble disabled
  Last input never, output never, output hang never
  Last clearing of "show interface" counters 3d23h
  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 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 IP multicast)
    0 runts, 0 giants, 0 throttles
      0 parity
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    0 packets output, 0 bytes, 0 underruns
    0 output errors, 0 applique, 20 interface resets
    0 output buffer failures, 0 output buffers swapped out
    0 carrier transitions
```



### Note

For the Cisco 7206 VXR router shelves in the Cisco AS5800 Universal Access Router, the **show interfaces pos** command requires a shelf number in the format **show interfaces pos shelf-number/port-adapter-slot-number/interface-port**. For example, the command **show interfaces pos 5/3/0** specifies the OC-3 interface of a PA-POS-10C3 in port adapter slot 3 of router shelf 5.

### 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
```

### Cisco 7301 Router—Example Output of the show interfaces Command

Following is an example of the **show interfaces pos** command for a PA-POS-10C3 in a Cisco 7301 router:

```
Router# show interfaces
(text omitted)
Hardware is Packet over Sonet
  MTU 4470 bytes, BW 155000 Kbit, DLY 100 usec,
  reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, crc 16, loopback not set
  Keepalive set (10 sec)
  Scramble disabled
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  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 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 parity
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
  0 packets output, 0 bytes, 0 underruns
  0 output errors, 0 applique, 0 interface resets
```

```

0 output buffer failures, 0 output buffers swapped out
0 carrier transitions
POS1/1 is administratively down, line protocol is down

```

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

Following is an example of the **show interfaces pos** command used with the VIP. In this example, the pos interfaces is on a port adapter in port adapter slot 1 of a VIP in interface processor slot 1. Most of the status information for each interface is omitted. (Interfaces are administratively shut down until you enable them.)

```

Router#show interface pos 1/1/0
POS1/1/1 is up, line protocol is up
  Hardware is Packet Over Sonet
  Internet address is 11.0.0.1/16
  MTU 4470 bytes, BW 155000 Kbit, DLY 100 usec,
    reliability 240/255, txload 4/255, rxload 1/255
  Encapsulation HDLC, crc 16, loopback not set
  Keepalive not set
  Scramble disabled
  Last input 00:24:38, output 02:58:40, output hang never
  Last clearing of "show interface" counters 00:00:52
  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 366000 bits/sec, 953 packets/sec
  5 minute output rate 2977000 bits/sec, 7476 packets/sec
    100 packets input, 856 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
      0 parity
    8 input errors, 8 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    0 packets output, 0 bytes, 0 underruns
    0 output errors, 0 applique, 0 interface resets
    0 output buffer failures, 0 output buffers swapped out
    0 carrier transitions

```

## Using the ping Command to Verify Network Connectivity

You can use the **ping** command to 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.

## Using loopback Commands

The loopback test allows you to troubleshoot, detect, and isolate equipment malfunctions by testing the connection between the OC-3 interface and a remote device. The **loopback** command places an interface in internal loopback (also called *local loopback*) or line loopback mode, which enables test packets that are generated from the **ping** command to loop through a remote device or a cable. If the packets complete the loop, the connection is good. If not, you can isolate a fault to the remote device or the cable in the path of the loopback test.

**Note**

Engaging line loopback automatically switches the interface to loop timing. The interface switches back to the user-specified timing source once the loopback is disengaged.

## Configuring an Interface for Internal Loopback

The default loopback setting is for no loopback. With internal (or local) loopback, packets from the router are looped back in the framer. Outgoing data gets looped back to the receiver without actually being transmitted. Internal loopback is useful for checking that the PA-POS-10C3 is working.

**Step 1** To configure an interface for internal loopback, enter the **loop internal** command:

```
Router(config)# interface pos 3/0  
Router(config-if)# loop internal
```

**Step 2** To disable internal loopback, enter the **no loop internal** command.

```
Router(config)# interface pos 3/0  
Router(config-if)# no loop internal
```

## Configuring an Interface for Line Loopback

**Note**

Engaging line loopback automatically switches the interface to loop timing. It switches back to the user-specified timing source when the loopback is disengaged.

The default loopback setting is for no loopback. With line loopback, the receive (RX) fiber is logically connected to the transmit (TX) optical fiber cable so that packets from the remote router are looped back to it. Incoming data gets looped around and retransmitted to the remote end omitting the received part, which is of no significance.

---

**Step 1** To configure an interface for line loopback, enter the **loop line** command:

```
Router(config)# interface pos 3/0
Router(config-if)# loop line
```

**Step 2** To disable line loopback, enter the **no loop line** command.

```
Router(config)# interface pos 3/0
Router(config-if)# no loop line
```

---

For more information about interface subcommands and the configuration options available for the supported routers, refer to the publications listed in the [“Related Documentation”](#) section on page viii.

## Push Mode Description

If you have not been advised by Cisco to use the information in this section, do not do so.

The PA-POS-1OC3 and PA-POS-2OC3 port adapters support a different algorithm (from that of most port adapters) for handling data. On the transmit side, it can either pull packets from the CPU (Pull mode) or push packets from the CPU to the port adapter (Push mode). The PA-POS-1OC3 and PA-POS-2OC3 port adapters were developed with a software architecture that deviates from the design of previously developed port adapters. A majority of the port adapters allow data to be pulled from the CPU to their interfaces. Because a few corner-case conditions exist, you may require the ability to configure the PA-POS-1OC3 and PA-POS-2OC3 port adapters to behave the same as the rest of the port adapter product family. The new CLI described in this section allows the customer to change the PA-POS-1OC3 and PA-POS-2OC3 port adapters Push mode behavior to the standard Pull mode.



### Caution

Only customers who have been advised by Cisco to use this CLI should do so. If you have not been advised by Cisco to use the **dma model pull enable** command, do not do so.

---



### Note

Changing from Push mode to Pull mode is applicable only on a Cisco 7200 VXR router with an NPE-G1 and PA-POS-1OC3 or PA-POS-2OC3 installed.

---



### Note

We recommend changing the mode during a standard maintenance window.

---

The Pull Mode is supported on Cisco IOS Release 12.4(15)T1.

To change the TX DMA mode from the default Push mode to Pull mode, follow these steps:

- Enter the **dma model pull enable** command to change the Push mode to Pull mode. When the **dma model pull enable** command is executed, all the PA-POS-1OC3 and PA-POS-2OC3 port adapters installed are soft OIRed to reinitialize them to Pull mode.
- To change the Pull mode to Push mode, enter the **no dma model pull enable** command. When the **no dma model pull enable** command is executed, all the PA-POS port adapters are soft OIRed to reinitialize them to Push mode.



**Caution**

On the execution of either command, all the PA-POS-10C3 and PA-POS-20C3 port adapters installed in the router will be soft OIRed.

## PA-POS-10C3 Statistics Counters

The PA-POS-10C3 maintains counts of certain errors. Each error counter is 16 bits long. Errors include the following:

- CRC errors—Packet corrupted in reception
- Giants received—Packet length too large (greater than 16 KB)
- Runts—Packet length too small (less than or equal to 4 bytes)
- Ignores—No receive buffers available; receive buffers full

## PA-POS-10C3 Error Messages

The only error message you should see is of the following type and format:

```
%POS-0-MSG:%DEBUGGER-0-STACK_DATA8: 00E0 FFFFFFFF 80057F50 00000000 00000000 FFFFFFFF
80032CD4 00000000 00000000
```

Contact the Cisco Technical Assistance Center (TAC) for assistance with this error message. To contact the Cisco TAC, see the [“Obtaining Documentation, Obtaining Support, and Security Guidelines”](#) section on page x.

## Making a Back-to-Back Connection

This section provides an example of two sample configuration files from a Cisco 7200 VXR router and a Cisco 7301 router connected back-to-back through their OC-3 interfaces.

### First router

```
interface POS 3/0 <to select port 0 of PA-POS-10C3 in a Cisco 7200 / Cisco 7301 series
router>
interface POS 3/1 <to select port 1 of PA-POS-10C3 in a Cisco 7200 / Cisco 7301 series
router>
ip address 10.0.0.10 255.255.255.0
no keepalive
clock source internal
```

### Second router

```
interface POS 3/0 <to select port 0 of PA-POS-10C3 in a Cisco 7200 / Cisco 7301 series
router>
interface POS 3/1 <to select port 1 of PA-POS-10C3 in a Cisco 7200 / Cisco 7301 series
router>
ip address 10.0.0.20 255.255.255.0
no keepalive
```

---

**Step 1** To connect two PA-POS-10C3-equipped routers back to back, attach the appropriate cable between the OC-3 interface port on each PA-POS-10C3.

By default, the PA-POS-10C3 uses loop timing mode.

**Step 2** To specify that the PA-POS-10C3 generates the transmit clock internally, add the **clock source internal** command to your configuration (see the first router example above: *clock source internal*).

---

**Note**

---

For back-to-back operation, at least one of the connected OC-3 interfaces *must* be configured to supply its internal clock to the line.

---

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