PA-GE Gigabit Ethernet Port Adapter Installation and Configuration

Product Numbers: PA-GE(=)

Platforms Supported: Cisco 7100 Series Routers, Cisco 7200 VXR Routers, Cisco 7201 Router, Cisco uBR7246 VXR Router, Cisco 7304 PCI Port Adapter Carrier Card in the Cisco 7304 Router

PA-GE Gigabit Ethernet Port Adapter Installation and Configuration

C O N T E N T S

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Preface

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

Document Revision History

The Document Revision History table below, beginning with version OL-2696-04, records technical changes to this document.

Document Version	Date	Change Summary
OL-2696-04	April, 2007	Adds Cisco 7201 router information.

Objectives

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

- Cisco 7100 series routers, consisting of the Cisco 7120 series and Cisco 7140 series
- Cisco 7200 VXR routers, consisting of the four-slot Cisco 7204VXR router and the six-slot Cisco 7206VXR router
- Cisco uBR7246VXR universal broadband routers
- Cisco 7201 router
- Cisco 7304 PCI Port Adapter Carrier Card in the Cisco 7304 router

Organization

This document contains the following chapters:

Section	Title	Description
Chapter 1	Overview	Describes the PA-GE and its supported features, LED displays, cables, and receptacles.
Chapter 2	Preparing for Installation	Describes specific software and hardware requirements, safety considerations, tools required, procedures you should perform before the actual installation, and important compliance information.
Chapter 3	Removing and Installing Port Adapters	Describes the procedures for installing and removing PA-GE port adapters.
Chapter 4	Attaching the PA-GE Cables	Provides instructions for connecting cables to the PA-GE.
Chapter 5	Configuring the PA-GE	Provides instructions for performing a basic configuration for the PA-GE.

Related Documentation

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

- Cisco IOS software:

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

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

- Cisco 7100 series routers:

    - For an online directory to quickly access documents for Cisco 7100 series routers, refer to the *Cisco 7100 Series Documentation* roadmap at the following URL:

        http://www.cisco.com/en/US/products/hw/vpndevc/ps333/products_product_index09186a008 00fa142.html

    - For hardware installation and configuration information refer to the *Cisco 7100 Series VPN Router Installation and Configuration Guide*.

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

- Cisco 7200 VXR routers:

  – For an online directory to quickly access documents for Cisco 7200 VXR routers, refer to the *Cisco 7200 Series Routers Documentation Roadmap* at the following URL:

  http://www.cisco.com/en/US/products/hw/routers/ps341/products_documentation_roadmap09186a00801c0915.html

  – For hardware installation and maintenance information, refer to the *Cisco 7200 VXR Installation and Configuration Guide* or the *Cisco 7200 VXR Routers Quick Start Guide*.

- Cisco uBR7200 series routers:

  – For an online directory to quickly access documents for Cisco uBR7200 Universal Broadband routers, refer to the *Cisco uBR7200 Universal Broadband Router Documentation Roadmap* at the following URL:

  http://www.cisco.com/en/US/products/hw/cable/ps2217/products_documentation_roadmap09186a00805e0d0c.html

- Cisco 7201 router:

  – For an online directory to quickly access documents for the Cisco 7201 router, refer to the *Cisco 7201 Router Documentation Roadmap* at the following URL:

  http://www.cisco.com/en/US/customer/products/hw/routers/ps341/products_documentation_roadmap09186a00807f635a.html

  – For hardware installation and maintenance information, refer to the *Cisco 7201 Installation and Configuration Guide* or the *Cisco 7201 Router Quick Start Guide*.

- Cisco 7304 PCI port adapter carrier card in Cisco 7304 router:

  – For an online directory to quickly access documents for the Cisco 7304 PCI Port Adapter Carrier Card in the Cisco 7301 router, refer to the *Cisco 7304 Router Line Card, Carrier Card, Port Adapter, Modular Services Card, and Shared Port Adapter Documentation Roadmap* at the following URL:

  http://www.cisco.com/en/US/products/hw/routers/ps352/products_documentation_roadmap09186a00801c0f5e.html

  – For hardware installation and maintenance information, refer to the *Cisco 7304 PCI Port Adapter Carrier Card Installation and Configuration Guide*.

- For international agency compliance, safety, and statutory information for WAN interfaces, refer to the following documents. Use the documentation roadmap for your particular router to link to the appropriate documents for your router:

  – *Regulatory Compliance and Safety Information for Cisco 7100 Series VPN Routers*

  – *Regulatory Compliance and Safety Information for Cisco 7200 Series Routers*

  – *Regulatory Compliance and Safety Information for the Cisco uBR7200 Series Routers*

  – *Regulatory Compliance and Safety Information for the Cisco 7304 Internet Router*

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

C H A P T E R **1**

Overview

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

- Port Adapter Overview, page 1-1

- IEEE 802.3z Gigabit Ethernet Overview, page 1-2

- Features, page 1-2

- Interface Specifications, page 1-3

- LEDs, page 1-8

- Cables and Connectors, page 1-9

- Port Adapter Locations on the Supported Platforms, page 1-12

- Identifying Interface Addresses, page 1-15

Port Adapter Overview

The PA-GE (see Figure 1-1) is a single-port port adapter that, when combined with the appropriate optical fiber cable and a Gigabit Interface Converter (GBIC), provides one Gigabit Ethernet (GE) interface that is compliant with the IEEE 802.3z specification. The GE interface on a PA-GE operates in full-duplex mode.

Figure 1-1 *PA-GE Faceplate View*

Note The PA-GE offers an additional choice of high-speed LAN connection to Cisco 7200 VXR and Cisco uBR7246 VXR routers. The PA-GE does not offer wire rate performance on Cisco 7200 VXR or Cisco uBR7246 VXR routers but does offer performance throughput suitable to WAN aggregation applications. Cisco 7200 VXR and Cisco uBR7246 VXR routers, when deployed as WAN aggregation routers, can be integrated into a Gigabit Ethernet campus backbone using the PA-GE.

Note The PA-GE assembly is a field-replaceable unit (FRU). The GBIC is a separate FRU.

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PA-GE Gigabit Ethernet Port Adapter Installation and Configuration

1-1

IEEE 802.3z Gigabit Ethernet Overview

This section provides an overview of the IEEE 802.3z specification and Gigabit Ethernet. The term *Ethernet* is commonly used for all LANs that generally conform to Ethernet specifications, including Gigabit Ethernet under IEEE 802.3z, which is well suited to applications in which a local communication medium must carry sporadic, occasionally heavy traffic at high peak data rates.

The IEEE 802.3z specification includes the following three physical layer protocols:

- 1000BASE-CX—Full-duplex operation over copper wire
- 1000BASE-SX—Full-duplex operation with short-wavelength (850-nanometer [nm]) devices over multimode optical fiber
- 1000BASE-LX—Full-duplex operation with long-wavelength (1300-nm) devices over multimode or single-mode optical fiber
- 1000BASE-ZX—Full-duplex operation with extended-wavelength (1550-nm) devices over single-mode optical fiber

> **Note**   Cisco Systems offers another version of 1000BASE-LX called 1000BASE-LH, which complies with the IEEE 802.3z 1000BASE-LX specification but extends the transmission distance up to 6.21 miles (10 km). The PA-GE provides connection options for 1000BASE-SX, 1000BASE-LX, 1000BASE-LH, and 1000BASE-ZX.
>
> The PA-GE does not support the 1000BASE-CX physical layer protocol.

Each physical layer protocol has a name that summarizes its characteristics in the format speed/signaling method/segment length, where speed is the LAN speed in megabits per second (Mbps), signaling method is the signaling method used (either baseband or broadband), and segment length is typically the maximum length between stations in hundreds of meters. For example, 1000BASE-SX specifies a 1000-Mbps baseband LAN, with maximum network segments (operating distances) as defined in Table 1-1. Table 1-2, Table 1-3, and Table 1-4 define maximum network segments for 1000BASE-LX, 1000BASE-LH, and 1000BASE-ZX, respectively.

Features

The PA-GE supports the following features:

- Applicable IEEE 802.3z standards; full-duplex operation only
- IEEE 802.3x flow control
- Layer 3 distributed services, including Route Processor (RP) Cisco Express Forwarding (CEF) switching, fast switching, flow switching, and Committed Access Rate (CAR)
- IEEE 802.1Q frames (in tagged or untagged modes)
- Maximum transmission unit (MTU) of 4476 bytes
- Ethernet Inter-Switch Link (ISL) encapsulation
- Online insertion and removal (OIR) of the PA-GE and the Gigabit Interface Converter (GBIC)

- Support for 1000BASE-SX (short wavelength—850 nm), 1000BASE-LX (long wavelength—1300 nm), 1000BASE-LH (long haul wavelength—1300 nm), and 1000BASE-ZX (extended wavelength—1550 nm) operation by way of GBICs (For specific GBIC requirements, see the "Gigabit Interface Converter" section on page 1-9.)

> **Note**   For information about specific software and hardware requirements for the PA-GE, see the "Software and Hardware Requirements" section on page 2-2.

> **Note**   The PA-GE does not support half-duplex operation; it supports only full-duplex operation.

Interface Specifications

This section provides information about Gigabit Ethernet interface specifications, which include interface distance limitations, optical fiber characteristics, and power budget and how to evaluate it.

Gigabit Ethernet Link Distance Limitations

The PA-GE uses two types of optical fiber: single-mode and multimode. 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, whereas 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 cause them to arrive at the destination at different times (a phenomenon called modal dispersion). Single-mode fiber is capable of higher bandwidth and greater cable run distances than multimode fiber.

According to the IEEE 802.3z specification, power budget is defined as the minimum optical power available to overcome the sum of attenuation plus power penalties of the optical path between the transmitter and receiver calculated as the difference between the transmitter launch power (minimum) and the receiver power (minimum). Further, channel insertion loss is defined as the static loss of a link between a transmitter and a receiver. It includes the loss of the fiber, connectors, and splices, and it is used to calculate link distance.

Finally, for fiber-optic links, the power penalties of a link are not attributes of link attenuation. Power penalties include modal noise, relative intensity noise (RIN), intersymbol interference (ISI), mode partition noise, extinction ratio, and eye-opening penalties.

The following tables list worst-case power budgets and penalties by interface type:

- Table 1-1—1000BASE-SX
- Table 1-2—1000BASE-LX
- Table 1-3—1000BASE-LH
- Table 1-4—1000BASE-ZX

Table 1-5 lists optical fiber cable characteristics. Table 1-6 lists minimum and maximum transmit and receive power parameters by transmission and optical fiber type.

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

The minimum distance between two connected stations is 6.56 feet (2 meters).

A mode conditioning patch cord is needed for 1000BASE-LX and 1000BASE-LH multimode connections if these connections are greater than 984.25 feet (300 meters). (For information on the mode conditioning patch cord, see the "Mode Conditioning Patch Cord with a Multimode GBIC-LX and GBIC-LH" section on page 1-10.)

Table 1-1   Worst-Case 1000BASE-SX Link Power Budget and Penalties

Parameter[1]	62.5-micron[2] Multimode		50-micron Multimode	
Modal bandwidth as measured at 850 nm (minimum, overfilled launch)	160 MHz*km	200 MHz*km	400 MHz*km	500 MHz*km
Link power budget	7.5 dB	7.5 dB	7.5 dB	7.5 dB
Operating distance	721.78 feet (ft.) 220 meters (m)	902.23 ft. 275 m	1,640.42 ft. 500 m	1,804.46 ft. 550 m
Channel insertion loss[3, 4]	2.38 dB	2.60 dB	3.37 dB	3.56 dB
Link power penalties[4]	4.27 dB	4.29 dB	4.07 dB	3.57 dB
Unallocated margin in link power budget[4]	0.84 dB	0.60 dB	0.50 dB	0.37 dB

1. Link penalties are used for link budget calculations. They are not requirements and are not meant to be tested.

2. 10^{-6} meters (or 1 micrometer) = 1 micron.

3. Operating distances used to calculate the channel insertion loss are the maximum values.

4. A wavelength of 830 nm is used to calculate channel insertion loss, link power penalties, and unallocated margin.

Table 1-2   Worst-Case 1000BASE-LX Link Power Budget and Penalties

Parameter[1]	62.5-micron[2] Multimode	50-micron Multimode		10-micron Single-Mode
Modal bandwidth as measured at 1300 nm (minimum, overfilled launch)	500 MHz*km	400 MHz*km	500 MHz*km	—
Link power budget	7.5 dB	7.5 dB	7.5 dB	8.0 dB
Operating distance	1,804.46 feet (ft.) 550 meters (m)	1,804.46 ft. 550 m	1,804.46 ft. 550 m	16,404.20 ft. 5000 m
Channel insertion loss[3, 4]	2.35 dB	2.35 dB	2.35 dB	4.57 dB
Link power penalties[4]	3.48 dB	5.08 dB	3.96 dB	3.27 dB
Unallocated margin in link power budget[4]	1.67 dB	0.07 dB	1.19 dB	0.16 dB

1. Link penalties are used for link budget calculations. They are not requirements and are not meant to be tested.

2. 10^{-6} meters (or 1 micrometer) = 1 micron.

3. Operating distances used to calculate the channel insertion loss are the maximum values.

4. A wavelength of 1270 nm is used to calculate channel insertion loss, link power penalties, and unallocated margin.

Table 1-3   Worst-Case 1000BASE-LH Link Power Budget and Penalties

Parameter[1]	10-micron[2] Single-Mode
Link power budget	10.5 dB
Operating distance	32,808.4 feet (ft.) 10,000 meters (m)
Channel insertion loss[3, 4]	7.8 dB
Link power penalties[4]	2.5 dB
Unallocated margin in link power budget[4]	0.2 dB

1. Link penalties are used for link budget calculations. They are not requirements and are not meant to be tested.

2. 10^{-6} meters (or 1 micrometer) = 1 micron.

3. Operating distances used to calculate the channel insertion loss are the maximum values.

4. A wavelength of 1280 nm is used to calculate channel insertion loss, link power penalties, and unallocated margin.

Table 1-4   Worst-Case 1000BASE-ZX Link Power Budget

Parameter[1]	10-micron[2] Single-Mode
Link power budget	23 dB
Operating distance	70,000 meters (m) 100,000 meters (m)[3]

1. Link penalties are used for link budget calculations. They are not requirements and are not meant to be tested.

2. 10^{-6} meters (or 1 micrometer) = 1 micorn.

3. Using dispersion shifted single-mode optical fiber.

Table 1-5   Optical Fiber and Cable Characteristics

Description	62.5-micron[1] Multimode		50-micron Multimode		10-micron Single-Mode
Nominal fiber specification wavelength	850 nm[2]	1300 nm	850 nm	1300 nm	1300 nm
Fiber cable attenuation (maximum)	3.75 dB/km[3]	1.5 dB/km	3.5 dB/km	1.5 dB/km	0.5 dB/km
Modal bandwidth (minimum, overfilled launch)	160 MHz*km	500 MHz*km	400 MHz*km	400 MHz*km	—
	200 MHz*km	500 MHz*km	500 MHz*km	500 MHz*km	—
Zero dispersion wavelength	1320–1365 nm		1295–1320 nm		1300–1324 nm

1. 10^{-6} meters (or 1 micrometer) = 1 micron.

2. nm = nanometers.

3. dB/km = decibels per kilometer.

Table 1-6   Minimum and Maximum Transmit and Receive Power by Transmission and Optical Fiber Types

Transmission Type and Optical Fiber Type	Wavelength	Transmit Power Minimum/Maximum	Receive Power Minimum/Maximum
1000BASE-SX 50-micron[1] multimode 62.5-micron multimode	770–860 nm[2] 770–860 nm	–9.5 dBm/–4 dBm[3] –9.5 dBm/–4 dBm	–17 dBm/0 dBm –17 dBm/0 dBm
1000BASE-LX 50-micron multimode 62.5-micron multimode 10-micron single-mode	1270–1355 nm 1270–1355 nm 1270–1355 nm	–11.5 dBm/–3 dBm –11.5 dBm/–3 dBm –11.5 dBm/–3 dBm	–19 dBm/–3 dBm –19 dBm/–3 dBm –19 dBm/–3 dBm
1000BASE-LH 10-micron single-mode	1280–1350 nm	–9.5 dBm/–3 dBm	–20 dBm/–3 dBm
1000BASE-ZX 10-micron single-mode	1550 nm	0 dBm/5.2 dBm	-24 dBm/-3 dBm

1. 10^{-6} meters (or 1 micrometer) = 1 micron.

2. nm = nanometers.

3. dBm = decibels per milliwatt.

Evaluating the Power Budget

To design an efficient optical data link, you should evaluate the power budget. Proper operation of an optical data link depends on modulated light reaching the receiver with enough power to be correctly demodulated. Data link efficiency is affected by the losses introduced by splices and connectors.

The maximum operating distance listed in Table 1-1, Table 1-2, Table 1-3, and Table 1-4 is an estimate and is based on the following assumptions:

• Total loss from connectors and splices on multimode optical fiber is 1.5 dB.

• Total loss from connectors and splices on single-mode optical fiber is 2.0 dB.

Therefore, for a real network, you could adjust the operating distance as follows:

• If the total loss from connectors and splices is larger than that indicated in these assumptions, then you could use shorter optical fiber cable (as with the single-mode power margin example that follows).

• If the total loss from connectors and splices is smaller than that indicated in these assumptions, then you could use longer optical fiber cable.

You should note that exceeding the maximum operating distance is only feasible with single-mode optical fiber, *not* with multimode optical fiber (because of the penalty of the differential mode delay [DMD] associated with a laser source over multimode fiber). In all applications, we strongly recommend that you follow operating distance guidelines.

Multimode Power Margin Example with Sufficient Power for Transmission

Power margin (PM) is defined as channel insertion loss or cable loss (connector loss plus splice loss). The result should be greater than or equal to 0 and is expressed in decibels (dB).

The following is an example of a power margin (PM) calculation for a 1000BASE-SX PA-GE over multimode optical fiber, based on the following variables:

- Type of multimode: 62.5 micron

- Modal bandwidth (BW) of multimode: 200 MHz*km

- Link length of 250 meters, with a loss of 3.75 dB per km (see Table 1-5)

- Two connectors, each with a loss of 0.5 dB

- One splice, with a loss of 0.5 dB

Estimate the multimode power margin as follows:

(From Table 1-1, the channel insertion loss is 2.60 dB.)

PM = 2.60 dB – 250 m (3.75 dB/km) – 2 (0.5 dB) – 1 (0.5 dB)

PM = 2.60 dB – 0.94 dB – 1 dB – 0.5 dB

PM = 0.16 dB

The positive value 0.16 dB indicates that this link has sufficient power for transmission.

Single-Mode Power Margin Example with Sufficient Power for Transmission

The following example of PM for a 1000BASE-LH over a single-mode optical fiber is based on two buildings, 5 kilometers apart (with a loss of 0.5 dB/km; see Table 1-5), connected through a patch panel in an intervening building with a total of 10 connectors (each with a loss of 0.5 dB).

Estimate the single-mode power margin as follows:

(From Table 1-3, the channel insertion loss is 7.8 dB.)

PM = 7.8 dB – 5 km (0.5 dB/km) – 10 (0.5 dB)

PM = 7.8 dB – 2.5 dB – 5 dB

PM = 0.3 dB

The positive value of 0.3 dB indicates that this link has sufficient power for transmission.

Using Statistics to Estimate the Power Budget

Statistical models more accurately determine the power budget than the worst-case method. 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 publication. For further information, refer to ITU-T standards and your equipment specifications.

Additional Power Budget and Attenuation References

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 Budget Analysis*, AT&T Technical Note, TN89-004LWP, May 1989

LEDs

The PA-GE contains the ENABLED LED for the port adapter and a bank of three status LEDs for the GE interface. (The LEDs are shown in Figure 1-2.)

Figure 1-2   PA-GE LEDs —Partial Faceplate View
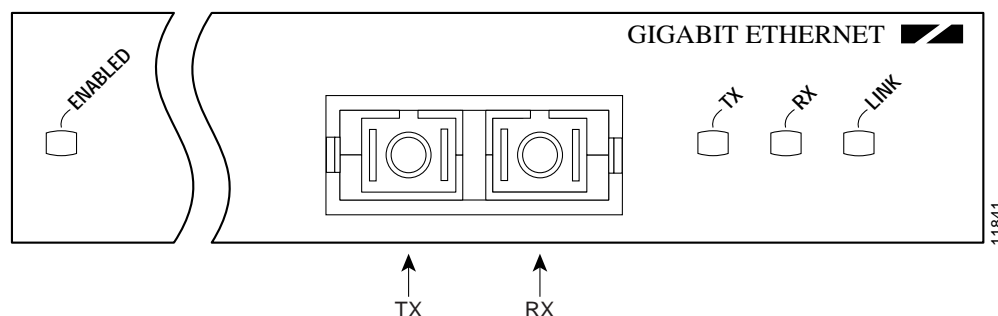
After system initialization, the ENABLED LED comes on to indicate that the PA-GE has been enabled for operation.

The following conditions must be met before the ENABLED LED comes on:

- The PA-GE is correctly connected and receiving power.
- A valid system software image for the port adapter must be installed.
- The system bus recognizes the PA-GE.

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

Table 1-7 lists LED colors and indications.

Table 1-7   PA-GE LEDs

LED	Color	State	Indications
ENABLED	Green	On	The port adapter is enabled.
Transmit (TX)	Green	Flickering on	Data is being transmitted.
Receive (RX)	Green	Flickering on	Data is being received.
LINK	Green	On	Interface is receiving a carrier signal from the network.

Note   In older versions of the PA-GE, if a GBIC was not installed or if the GBIC was not connected to a cable, the TX, RX, and LINK LEDs blinked on and off in sequence. The blinking of the LEDs was disabled in more recent versions of the PA-GE, because the blinking LEDs had no specific impact on the functionality.

Cables and Connectors

This section provides information about the cables and connectors you must use with the PA-GE.

Gigabit Interface Converter

This section provides information about cabling and connectors for the Gigabit Interface Converter (GBIC) (see Figure 1-3), which is a required component with the PA-GE and is installed between your PA-GE and your 1000BASE-X-based network.

⚠ **Caution**   To prevent system problems, do not use GBICs from third-party vendors. Use only the GBIC that shipped with your PA-GE.

Figure 1-3   Gigabit Interface Converter (GBIC)
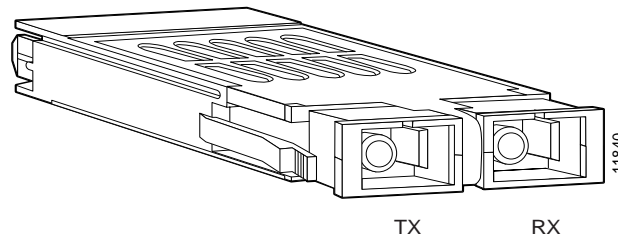
The 1000BASE-SX (GBIC-SX), 1000BASE-LX (GBIC-LX), 1000BASE-LH (GBIC-LH), and 1000BASE-ZX (GBIC-ZX) GBICs have one optical interface in the form of an SC-type duplex receptacle that supports IEEE 802.3z interfaces compliant with the 1000BASE-X standard. (See Figure 1-3.)

✎ **Note**   The PA-GE ships with a GBIC installed. The PA-GE assembly is a field-replaceable unit (FRU). The GBIC is a separate FRU.

Depending on the GBIC you plan to use, it contains a Class 1 laser of 850 nm for 1000BASE-SX (short-wavelength) applications, a Class 1 laser of 1300 nm for 1000BASE-LX (long-wavelength) applications, or a Class 1 laser of 1300 nm for 1000BASE-LH (long haul–wavelength) applications.

Optical Fiber Cables

This section provides information about the optical fiber cables you should use with the PA-GE. Figure 1-4 and Figure 1-5 show the simplex and duplex SC-type connectors on your multimode or single-mode optical fiber cables. For simplex connections, one cable is required for transmit (TX) and a second cable is required for receive (RX). For duplex connections, one duplex connection is required for TX and RX. You can use either simplex or duplex connections for the PA-GE. (Optical fiber cables are commercially available; they are not available from Cisco Systems.)

⚠ **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

Warning   **Class 1 laser product.** Statement 1008

The optical fiber cables you must use with the GBIC on a PA-GE are as follows:

- 1000BASE-SX—50/125-micron or 62.5/125-micron multimode optical fiber

- 1000BASE-LX—9/125-micron or 10/125-micron single-mode optical fiber, or 50/125-micron or 62.5/125-micron multimode optical fiber where transmission distances are less than 984.25 feet (300 meters)

- 1000BASE-LH—9/125-micron or 10/125-micron single-mode optical fiber, or 50/125-micron or 62.5/125-micron multimode optical fiber where transmission distances are greater than 984.25 feet (300 meters)

- 1000BASE-ZX—9/125-micron or 10/125-micron single-mode optical fiber where transmission distances are greater than 984.25 feet (300 meters)

Figure 1-4   Simplex SC-Type Connector
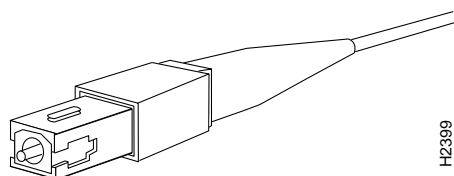
Figure 1-5   Duplex SC-Type Connector
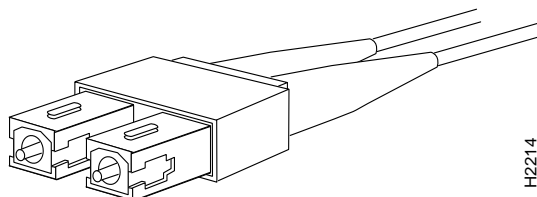
Mode Conditioning Patch Cord with a Multimode GBIC-LX and GBIC-LH

Both the GBIC-LX and the GBIC-LH option for the PA-GE have a 1300-nm (long-wavelength) Class 1 laser as a light source and provide a connection to 50/125-micron or 62.5-micron multimode optical fiber.

When an unconditioned laser source designed for operation on single-mode optical fiber is directly coupled to a multimode optical fiber cable, an effect known as differential mode delay (DMD) might result in a degradation of the modal bandwidth of the optical fiber cable.

This degradation results in a decrease in the link span (the distance between a transmitter and a receiver) that can be supported reliably. The effect of DMD can be overcome by conditioning the launch characteristics of a laser source. A practical means of performing this conditioning is to use a device called a *mode conditioning patch cord*.

A mode conditioning patch cord is an optical fiber cable assembly that consists of a pair of optical fibers terminated with connector hardware. Figure 1-6 shows a diagram of the mode conditioning patch cord assembly. Specifically, the mode conditioning patch cord is composed of a single-mode optical fiber permanently coupled off center to a graded-index multimode optical fiber. (See *Offset* in Figure 1-6.)

Note   The mode conditioning patch cord is not required with 1000BASE-SX multimode connections, 1000BASE-LX single-mode connections, 1000BASE-LH single-mode connections, or 1000BASE-ZX single-mode connections.

Figure 1-6   Mode Conditioning Patch Cord Assembly
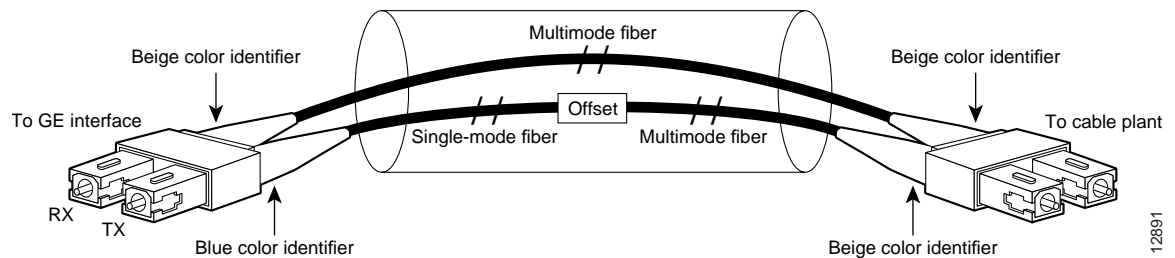
The mode conditioning patch cord assembly is composed of duplex optical fibers, including a single-mode-to-multimode offset launch fiber connected to the transmitter, and a second conventional graded-index multimode optical fiber connected to the receiver. The use of a plug-to-plug patch cord maximizes the power budget of multimode 1000BASE-LX and 1000BASE-LH links.

Caution   If you plan to use a GBIC-LX or a GBIC-LH in your PA-GE at distances greater than 984.25 feet (300 meters) over 50/125-micron or 62.5/125-micron multimode fiber, to prevent data transmission problems you *must* use the mode conditioning patch cord. Proceed to the "Attaching a Mode Conditioning Patch Cord to a GBIC-LX or GBIC-LH" section on page 4-4.

A typical application of a mode conditioning patch cord is shown in Figure 1-7.

Figure 1-7   Typical Application of the Mode Conditioning Patch Cord
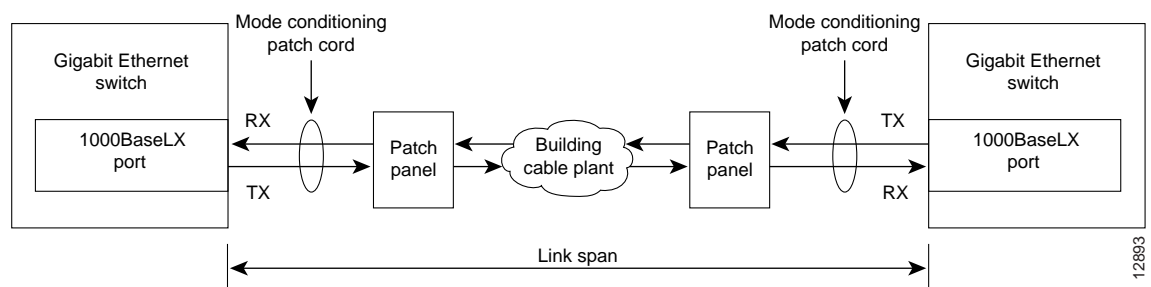
Port Adapter Locations on the Supported Platforms

This section describes the port adapter slot numbering for the platforms that support the PA-GE:

- Cisco 7100 Series Routers Slot Numbering, page 1-12
- Cisco 7200 VXR Routers Slot Numbering, page 1-13
- Cisco 7304 PCI Port Adapter Carrier Card Slot Numbering, page 1-14
- Cisco uBR7246 VXR Slot Numbering, page 1-14
- Cisco 7304 PCI Port Adapter Carrier Card Slot Numbering, page 1-14

Cisco 7100 Series Routers Slot Numbering

The PA-GE can be installed in port adapter slot 3 in Cisco 7120 series routers, and in port adapter slot 4 in Cisco 7140 series routers. Figure 1-8 shows the slot numbering on a Cisco 7120 series router. Figure 1-9 shows the slot numbering on a Cisco 7140 series router.

Figure 1-8   *Port Adapter Slots in the Cisco 7120 Series Router*
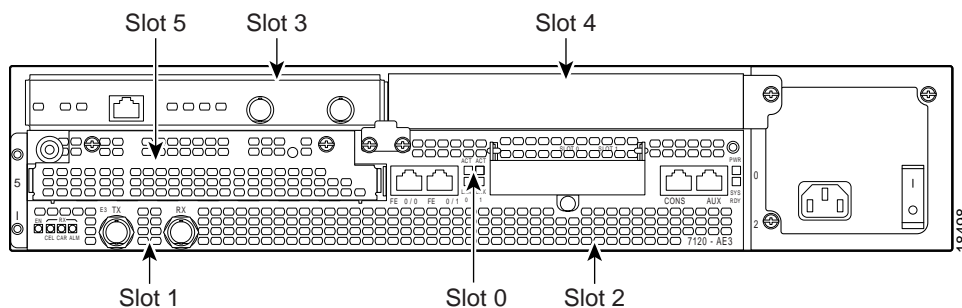
Figure 1-9   *Port Adapter Slots in the Cisco 7140 Series Router*
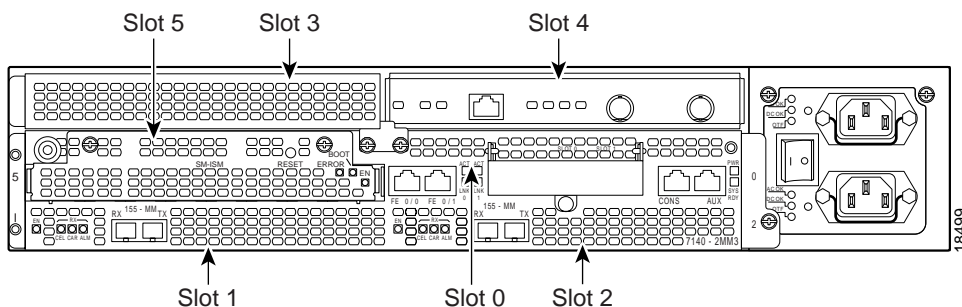
Cisco 7200 VXR Routers Slot Numbering

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 is not shown

Cisco 7206VXR routers have six slots for port adapters, and one slot for an input/output (I/O) controller. The slots are numbered from the lower left to the upper right, beginning with slot 1 and continuing through slot 6. You can place a port adapter in any of the six slots (slot 1 through slot 6). Slot 0 is always reserved for the I/O controller. Figure 1-10 shows the slot numbering on a Cisco 7206VXR router.

Figure 1-10   *Port Adapter Slots in the Cisco 7206VXR Router*
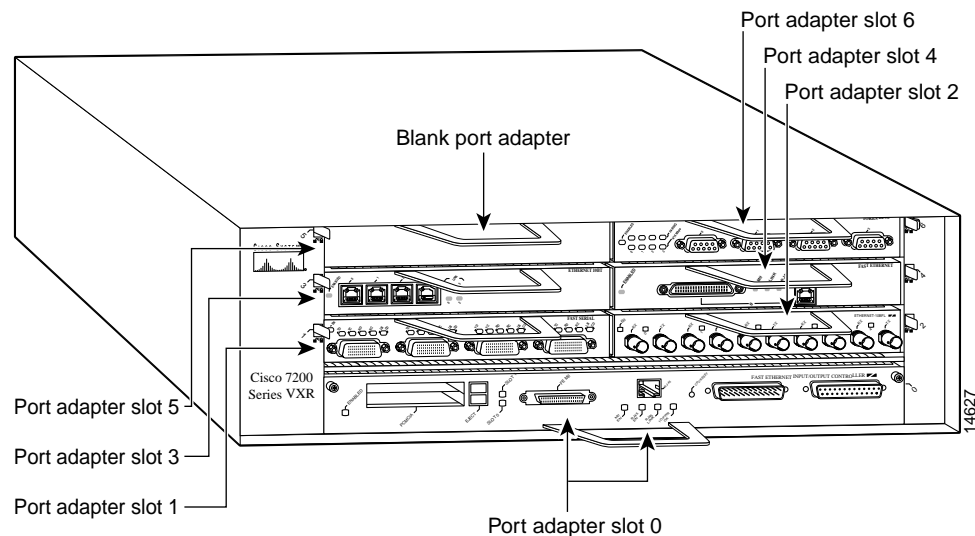
Cisco 7201 Router Slot Numbering

Figure 1-11 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 1-11   *Port Adapter Slot in the Cisco 7201 Router*
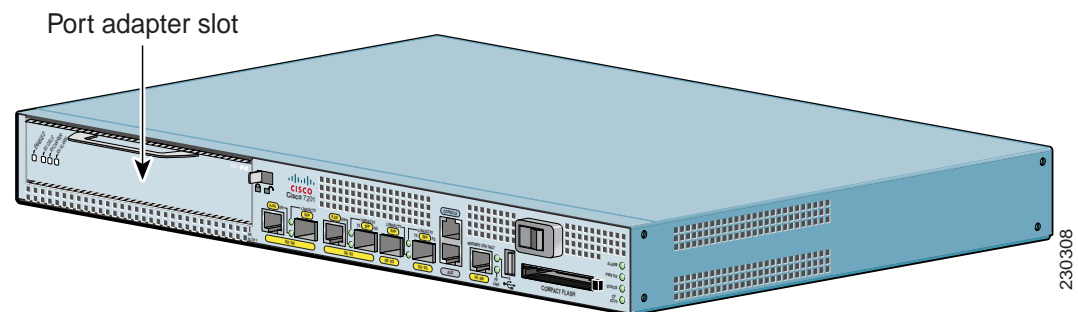
Cisco uBR7246 VXR Slot Numbering

The Cisco uBR7246VXR router has two port adapter slots (slot1 and slot 2). Slot 0 is always reserved for the I/O controller—if present. Figure 1-12 shows the slot numbering of port adapters on a Cisco uBR7246VXR router.

Figure 1-12   Port Adapter Slots in the Cisco uBR7246 VXR Router
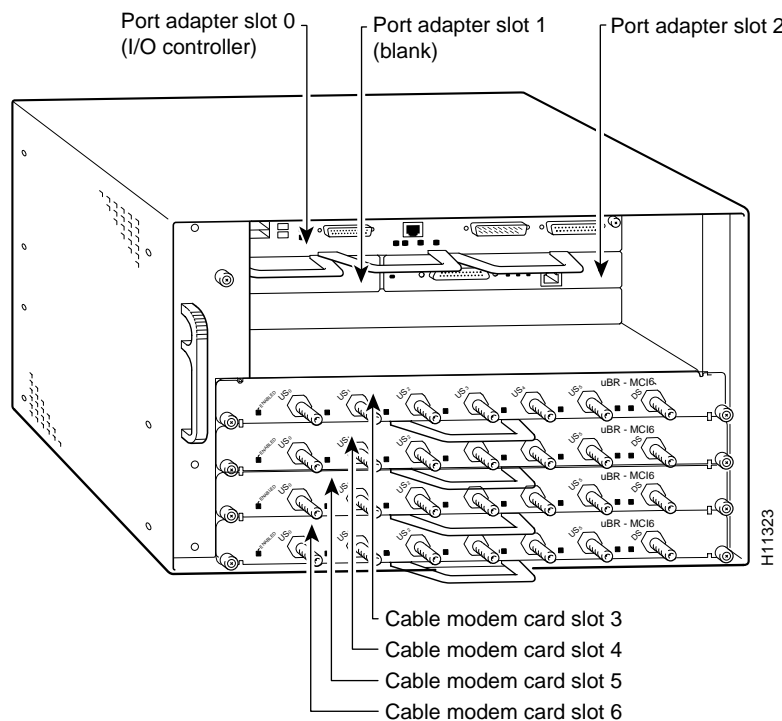
Cisco 7304 PCI Port Adapter Carrier Card Slot Numbering

The Cisco 7304 PCI port adapter carrier card installs in Cisco 7304 router module slots 2 through 5. Figure 1-13 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 1-13   Cisco 7304 PCI Port Adapter Carrier Card—Port Adapter Installed
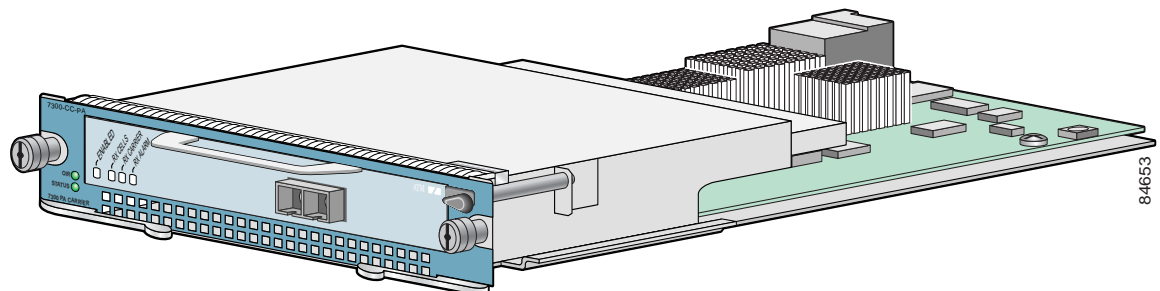
Figure 1-14 shows the module slot numbering on a Cisco 7304 router. The port adapter slot number is the same as the module slot number. Slot 0 and slot 1 are reserved for the NPE module or NSE module.

Figure 1-14   *Module Slots on the Cisco 7304 Router*
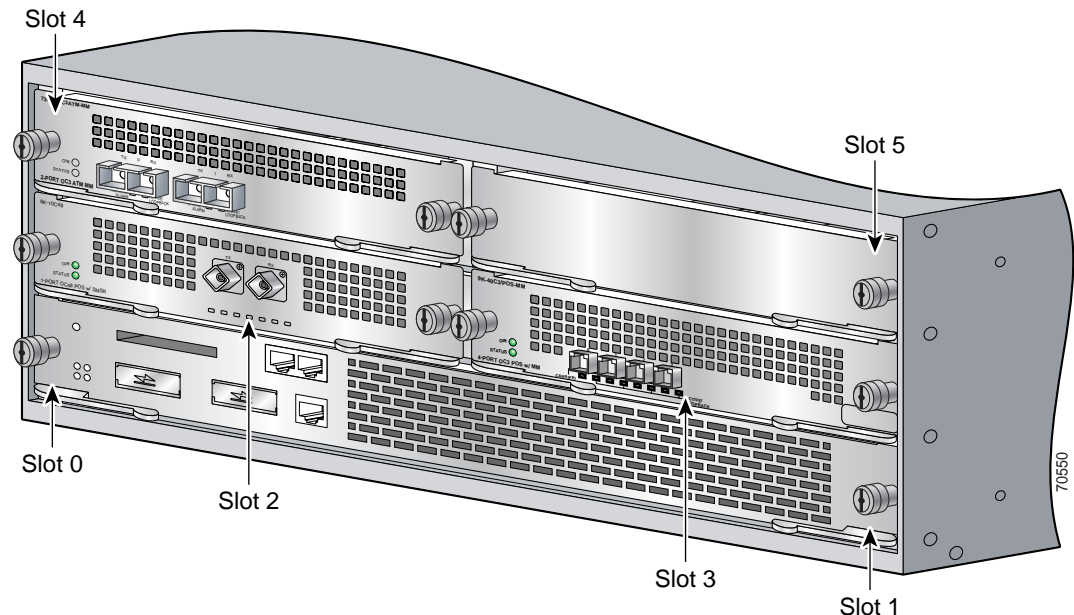
Identifying Interface Addresses

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

Interfaces on a PA-GE 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.

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 7100 Series Routers Interface Addresses, page 1-16
- Cisco 7200 VXR Routers Interface Addresses, page 1-16
- Cisco 7201 Router Interface Addresses, page 1-17
- Cisco uBR7246VXR Router Interface Addresses, page 1-17
- Cisco 7304 PCI Port Adapter Carrier Card Interface Addresses, page 1-17

Table 1-8 summarizes the interface address formats for the supported routers.

Table 1-8   Identifying Interface Addresses

Platform	Interface	Numbers	Syntax
Cisco 7120 series router	Port-adapter-slot-number/interface-port-number	Port adapter slot—always 3 Interface port—0	`3/0`
Cisco 7140 series router	Port-adapter-slot-number/interface-port-number	Port adapter slot—always 4 Interface port—0	`4/0`
Cisco 7200 VXR routers	Port-adapter-slot-number/interface-port-number	Port adapter slot—1 through 6 (depends on the number of slots in the router)[1] 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 uBR7246VXR router	Port-adapter-slot-number/interface-port-number	Port adapter slot—always 1 or 2 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`

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

Cisco 7100 Series Routers Interface Addresses

In the Cisco 7120 series router, port adapters are installed in port adapter slot 3. See Figure 1-8. In the Cisco 7140 series router, port adapters are installed in port adapter slot 4. 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 1-8. For example, if a single-port PA-GE is installed on a Cisco 7120 router, the interface address would be 3/0. If a single-port PA-GE is installed on a Cisco 7140 router, the interface address would be 4/0.

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 slot 1 and continuing through slot 4 for the Cisco 7204VXR router, and slot 6 for the Cisco 7206VXR router. 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 1-10.

The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See Table 1-8. For example, if a single-port PA-GE is installed in slot 1of a Cisco 7200 VXR router, the interface address would be 1/0. If a single-port PA-GE is 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 as slot 1. See Figure 1-11.

The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See Table 1-8. For example, if a single-port PA-GE is installed in a Cisco 7201 router, the interface address would be 1/0.

Cisco uBR7246VXR Router Interface Addresses

In the Cisco uBR7246VXR router, port adapters can be installed in two port adapter slots (slot1 and slot 2). Slot 0 is always reserved for the I/O controller—if present. See Figure 1-12.

The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See Table 1-8. For example, if a single-port PA-GE is installed in slot 2 of a Cisco uBR7246VXR router, the interface address would be 2/0.

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 1-14.

The interface address is composed of a two-part number in the format *module-slot-number/interface-port-number*. See Table 1-8. For example, if a single-port PA-GE 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.

Preparing for Installation

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

Required Tools and Equipment

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

- PA-GE
- Cisco 7304 PCI Port Adapter Carrier Card (for installation in a Cisco 7304 router)
- Number 2 Phillips screwdriver
- Number 1 Phillips and a 3/16-inch flat-blade screwdriver
- Your own electrostatic discharge (ESD)-prevention equipment or the disposable grounding wrist strap included with all upgrade kits, field-replaceable units (FRUs), and spares
- Antistatic mat
- Antistatic container
- Gigabit Interface Converter (GBIC) appropriate for your application: GBIC-SX(=), GBIC-LX(=), GBIC-LH(=), or GBIC-ZX(=). (For specific GBIC requirements, see the "Gigabit Interface Converter" section on page 1-9.)
- Multimode or single-mode optical fiber cables appropriate for your application. These optical fiber cables must have SC-type connections. Cisco Systems does not supply optical fiber cables; these cables are available commercially. (For specific cable requirements, see Table 1-5 and the "Optical Fiber Cables" section on page 1-9.)
- Mode conditioning patch cord appropriate for your application. (For specific requirements related to the mode conditioning patch cord, see the "Mode Conditioning Patch Cord with a Multimode GBIC-LX and GBIC-LH" section on page 1-10.)

The mode conditioning patch cord is available from Cisco Systems as
Product Number CAB-GELX-625= and is recommended for 62.5/125-μ multimode optical fiber,
1000BASE-LX applications where transmission distances are greater than 984.25 feet (300 meters).

Software and Hardware Requirements

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

Table 2-1 **PA-GE Software Requirements**

Platform	Recommended Minimum Cisco IOS Release
Cisco 7100 series routers Cisco 7120 series and Cisco 7140 series	Cisco IOS Release 12.1(4)E
Cisco 7200 VXR routers[1] Cisco 7204VXR and Cisco 7206VXR	Cisco IOS Release 12.0(6)XE or a later release of 12.0XE Cisco IOS Release 12.0(6)T or a later release of 12.0T Cisco IOS release 12.0(7)S or a later release of 12.0S Cisco IOS Release 12.2(4)B or a later release of 12.2B
Cisco uBR7200 series routers Cisco uBR7246 VXR	Cisco IOS Release 12.0(8)SC or a later release of 12.0SC Cisco IOS Release 12.0(7)T or a later release of 12.0T Cisco IOS Release 12.0(7)XR or a later release of 12.0XR Cisco IOS Release 12.2(4)B or a later release of 12.2B
Cisco 7201 router	Cisco IOS Release 12.4(4)XD7 or a later release of 12.4XD Cisco IOS Release 12.2(31)SB5 or a later release of 12.2SB
Cisco 7304 router • With Cisco 7304 PCI Port Adapter Carrier Card	Cisco IOS Release 12.2(14)SZ or a later release of 12.2SZ

1. The PA-GE is supported only by the high-speed network processing engines (NPE-300, NPE-400, and NSE-1) and only in Cisco 7200 VXR and Cisco uBR7246 VXR routers. The PA-GE is not supported by earlier NPE models (which include NPE-100, NPE-200, or NPE-225) or by other Cisco 7200 series routers.

For configuration guidelines on port adapters in Cisco 7200 VXR routers, refer to the *Cisco 7200 Series Port Adapter Hardware Configuration Guidelines. For* configuration guidelines on port adapters in the Cisco uBR7246VXR routers, refer to the *Cisco uBR7200 Series Universal Broadband Router Hardware Installation Guide.*

Checking Hardware and Software Compatibility

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

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

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

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

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 figyelmezeto jel veszélyre utal. Sérülésveszélyt rejto helyzetben van. Mielott bármely berendezésen munkát végezte, legyen figyelemmel az elektromos áramkörök okozta kockázatokra, és ismerkedjen meg a szokásos balesetvédelmi eljárásokkal. A kiadványban szereplo figyelmeztetések fordítása a készülékhez mellékelt biztonsági figyelmeztetések között található; a fordítás az egyes figyelmeztetések végén látható szám alapján keresheto 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 legemesbeskadigelse. 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 للحيلولة دون وقوع أي حوادث. استخدم رقم البيان الموجود في أخر 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 συνήθεις 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 לסכנות הכרוכות במעגלים חשמליים ולהכיר את הנהלים המקובלים למניעת תאונות. השתמש במספר ההוראה המסופק בסופה של כל אזהרה כד לאתר את התרגום באזהרות הבטיחות המתורגמות שמצורפות להתקן.

שמור הוראות אלה

Opomena

ВАЖНИ БЕЗБЕДНОСНИ НАПАТСТВИЈА
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 преведените безбедносни предупредувања што се испорачани со уредот.
ЧУВАЈТЕ ГИ ОВИЕ 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 when potentially hazardous conditions exist.
- Never assume that power has been disconnected from a circuit; always check.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe; carefully examine your work area for possible hazards such as moist floors, ungrounded power extension cables, and missing safety grounds.

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

Telephone Wiring Guidelines

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

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

Preventing Electrostatic Discharge Damage

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

Following are guidelines for preventing ESD damage:

- Always use an ESD wrist or ankle strap and ensure that it makes good skin contact.
- Connect the equipment end of the strap to an unfinished chassis surface.
- When installing a component, use any available ejector levers or captive installation screws to properly seat the bus connectors in the backplane or midplane. These devices prevent accidental removal, provide proper grounding for the system, and help to ensure that bus connectors are properly seated.
- When removing a component, use any available ejector levers or captive installation screws to release the bus connectors from the backplane or midplane.
- Handle carriers by available handles or edges only; avoid touching the printed circuit boards or connectors.

- Place a removed board component-side-up on an antistatic surface or in a static shielding container. If you plan to return the component to the factory, immediately place it in a static shielding container.

- Avoid contact between the printed circuit boards and clothing. The wrist strap only protects components from ESD voltages on the body; ESD voltages on clothing can still cause damage.

- Never attempt to remove the printed circuit board from the metal carrier.

⚠

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

FCC Class A Compliance

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

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

- Turn the television or radio antenna until the interference stops.

- Move the equipment to one side or the other of the television or radio.

- Move the equipment farther away from the television or radio.

- Plug the equipment into an outlet that is on a different circuit from the television or radio. (That is, make certain the equipment and the television or radio are on circuits controlled by different circuit breakers or fuses.)

✎

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

General Compliance Information

The PA-GE is designed to comply with and meet the following agency approvals:

Approvals	Agencies
Safety	CSA-C22.2 No. 950 (Canada) EN60950 (Germany) IEC 950 (International) TS001, AS/NZS 3269 (Australia) UL 1950 (United States)
Emissions	CE mark (Europe) CISPR 22 Class B (International) FCC Part 15 Class A (United States) EN55022 Class B (Europe) ICES-003 Class A (Canada) VCCI Class 2 (Japan)

Removing and Installing Port Adapters

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

- Handling Port Adapters, page 3-1
- Online Insertion and Removal, page 3-2
- Warnings and Cautions, page 3-2
- Port Adapter Removal and Installation, page 3-3

Handling Port Adapters

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

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

Caution 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*

Metal carrier

Printed circuit board

H6420
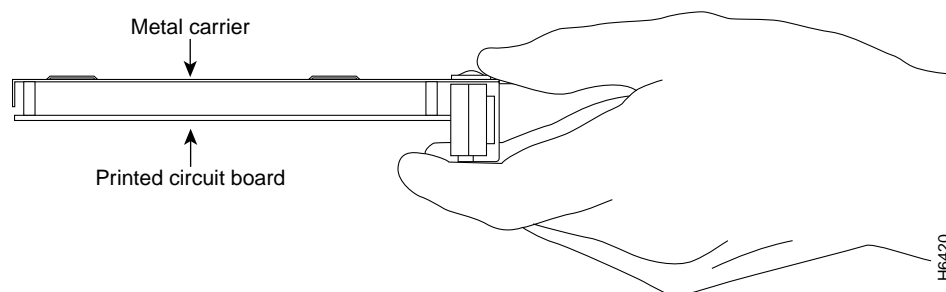
Online Insertion and Removal

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-GE in the Cisco 7100 series routers, Cisco 7200 VXR routers, Cisco 7201 router, and Cisco uBR7246 VXR router.

Although the Cisco 7304 PCI port adapter carrier card supports OIR, individual port adapters do not. To remove or install port adapters on a Cisco 7304 PCI port adapter carrier card, you must first remove the Cisco 7304 PCI port adapter carrier card from the router and then remove or install the port adapter as required. If a blank port adapter is installed on the Cisco 7304 PCI port adapter carrier card on which you want to install a new port adapter, you must first remove the Cisco 7304 PCI port adapter carrier card from the router and then remove the blank port adapter.

⚠️
Caution   To prevent system problems, do not remove port adapters from the Cisco 7304 PCI port adapter carrier card, and do not attempt to install other port adapters on the Cisco 7304 PCI port adapter carrier card when the system is operating. To install or replace port adapters, first remove the Cisco 7304 PCI port adapter carrier card from the router.

✎
Note   As you disengage the port adapter from the system, OIR administratively shuts down all active interfaces in the port adapter. For more information on OIR and the Cisco uBR7246 VXR, refer to the *Cisco uBR7200 Series Universal Broadband Router Hardware Installation Guide*.

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

Warnings and Cautions

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

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

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

⚠️
Warning   **During this procedure, wear grounding wrist straps to avoid ESD damage to the card. Do not directly touch the midplane with your hand or any metal tool, or you could shock yourself.** Statement 181

Port Adapter Removal and Installation

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

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

Cisco 7100 Series Routers—Removing and Installing a Port Adapter

Step 1

To remove the port adapter, use a number 2 Phillips screwdriver to loosen the screws on the locking tab. Then slide the tab down to the unlocked position.
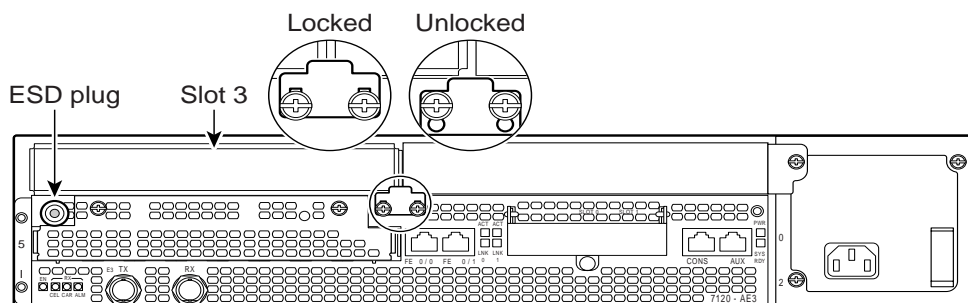
Step 2

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.

Step 4

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

Step 5

To insert the port adapter, carefully align the port adapter carrier between the upper and the lower edges of the port adapter slot.
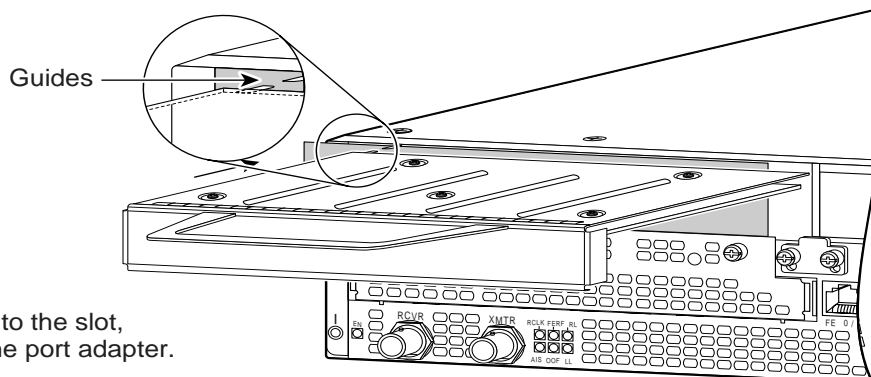
Step 6

With the port adapter halfway into the slot, connect all required cables to the port adapter.

Step 7

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

Step 8

After the port adapter is properly seated, lock the port adapter retaining mechanism.

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.)

Port adapter lever (locked position)

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

Port adapter lever (unlocked position)

Slot guide

27996

Cisco uBR7200 Series Routers—Removing a Port Adapter

Step 1

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

Port adapters

Port adapter lever
(locked position)

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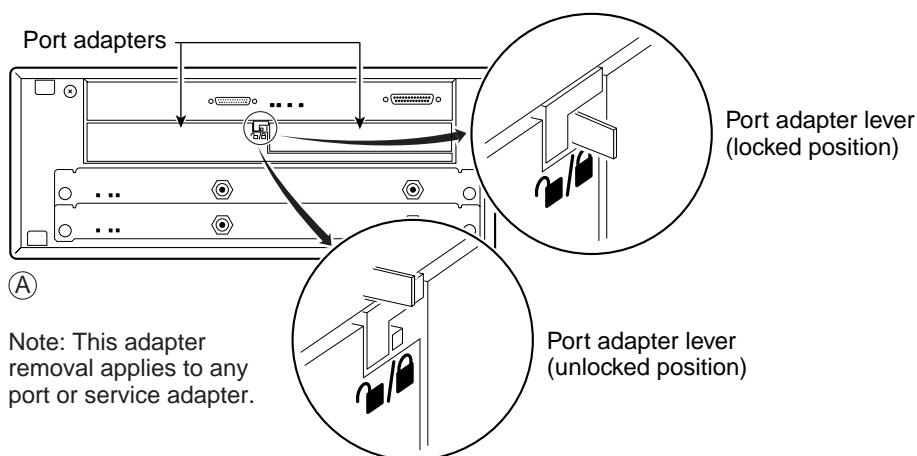
Place the port adapter lever (Cisco uBR7223, see A), or the port adapter retention clip (Cisco uBR7246 and Cisco uBR7246 VXR, see B) in the unlocked position. Either mechanism remains in the unlocked position.

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

Port adapter lever
(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.

Port adapter
retention clip
(locked position)

Port adapters

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.

Port adapter
retention clip
(unlocked position)

26523

B
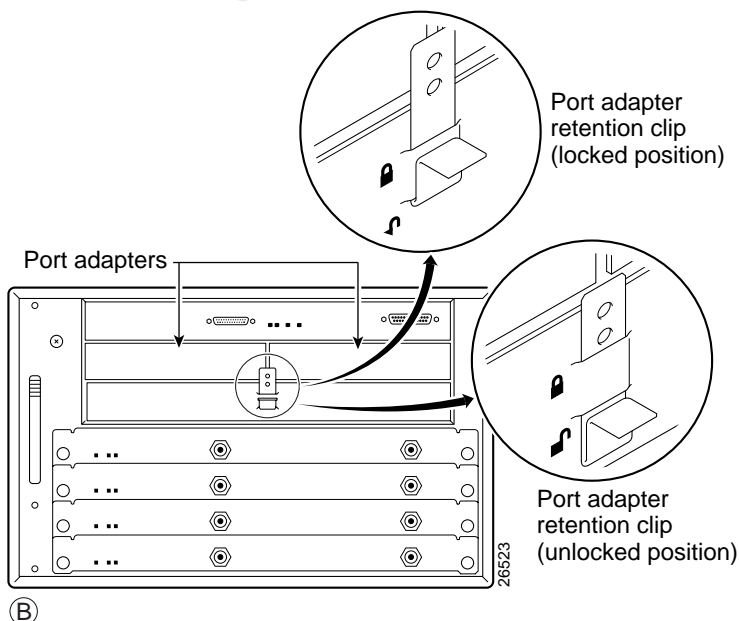
Cisco uBR7200 Series Routers—Installing a Port Adapter

Step 1

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

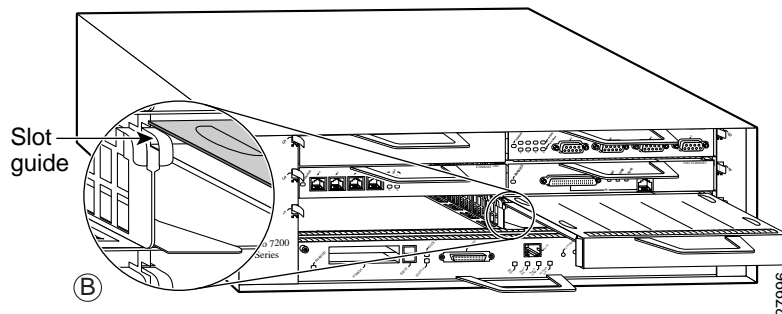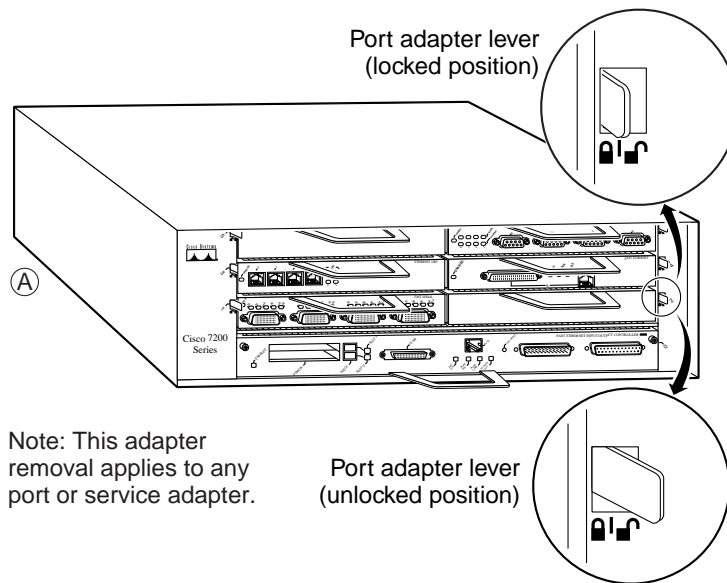Metal carrier

Inside slot guide

PC board

26524
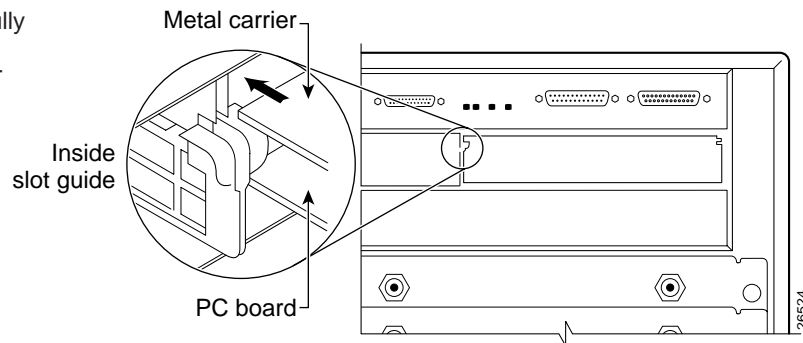
Step 2

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

Step 3

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

Step 4

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

Cisco 7201 Router—Removing and Installing a Port Adapter

Step 1

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

Step 2

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

**Step 3**

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

Step 4

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

Caution

The port adapter must slide into the slot guides close to the chassis lid. Do not allow the port adapter components to come in contact with the system board or the port adapter could be damaged.
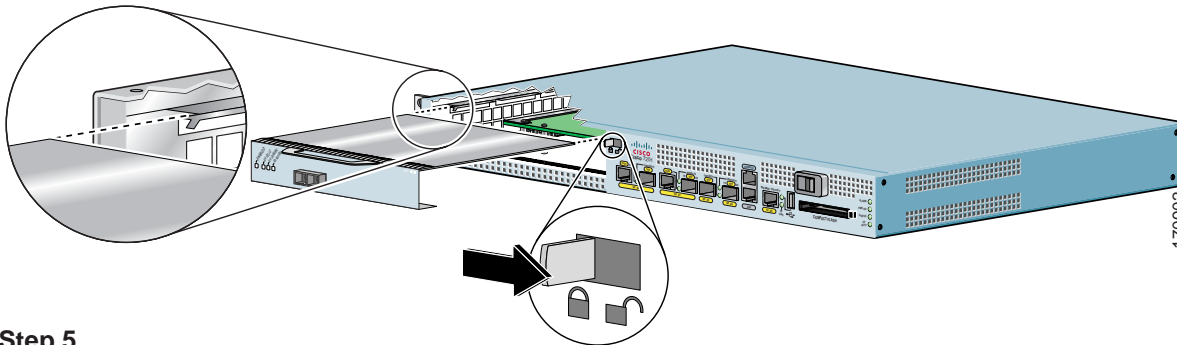
Step 5

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

Step 6

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

Step 7

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

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

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

Warning   **During this procedure, wear grounding wrist straps to avoid ESD damage to the card. Do not directly touch the midplane with your hand or any metal tool, or you could shock yourself.** Statement 181

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

Step 1   If the Cisco 7304 PCI Port Adapter Carrier Card is still in the router, you must remove the Cisco 7304 PCI Port Adapter Carrier Card before removing a port adapter.

Step 2   To remove the port adapter from the Cisco 7304 PCI Port Adapter Carrier Card, turn the port adapter lock from its locked and horizontal position shown in A of Figure 3-2 to its unlocked and vertical position shown in B of Figure 3-2.

Step 3   Grasp the handle of the port adapter and pull the port adapter from the Cisco 7304 PCI Port Adapter Carrier Card. (You have already disconnected the cables from the port adapter when removing the Cisco 7304 PCI Port Adapter Carrier Card).

Step 4   To insert the port adapter in the Cisco 7304 PCI Port Adapter Carrier Card, locate the guide rails inside the Cisco 7304 PCI Port Adapter Carrier Card that hold the port adapter in place. They are at the top left and top right of the port adapter slot and are recessed about an inch, as shown in C of Figure 3-2.

Step 5   Carefully slide the port adapter in the Cisco 7304 PCI Port Adapter Carrier Card until the port adapter makes contact with the port adapter interface connector. When fully seated, the port adapter front panel should be flush with the face of the Cisco 7304 PCI Port Adapter Carrier Card.

Step 6   After the port adapter is properly seated, turn the port adapter lock to its locked and horizontal position, as shown in A of Figure 3-2.

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

Figure 3-2   *Cisco 7304 PCI Port Adapter Carrier Card—Port Adapter Removal and Installation*
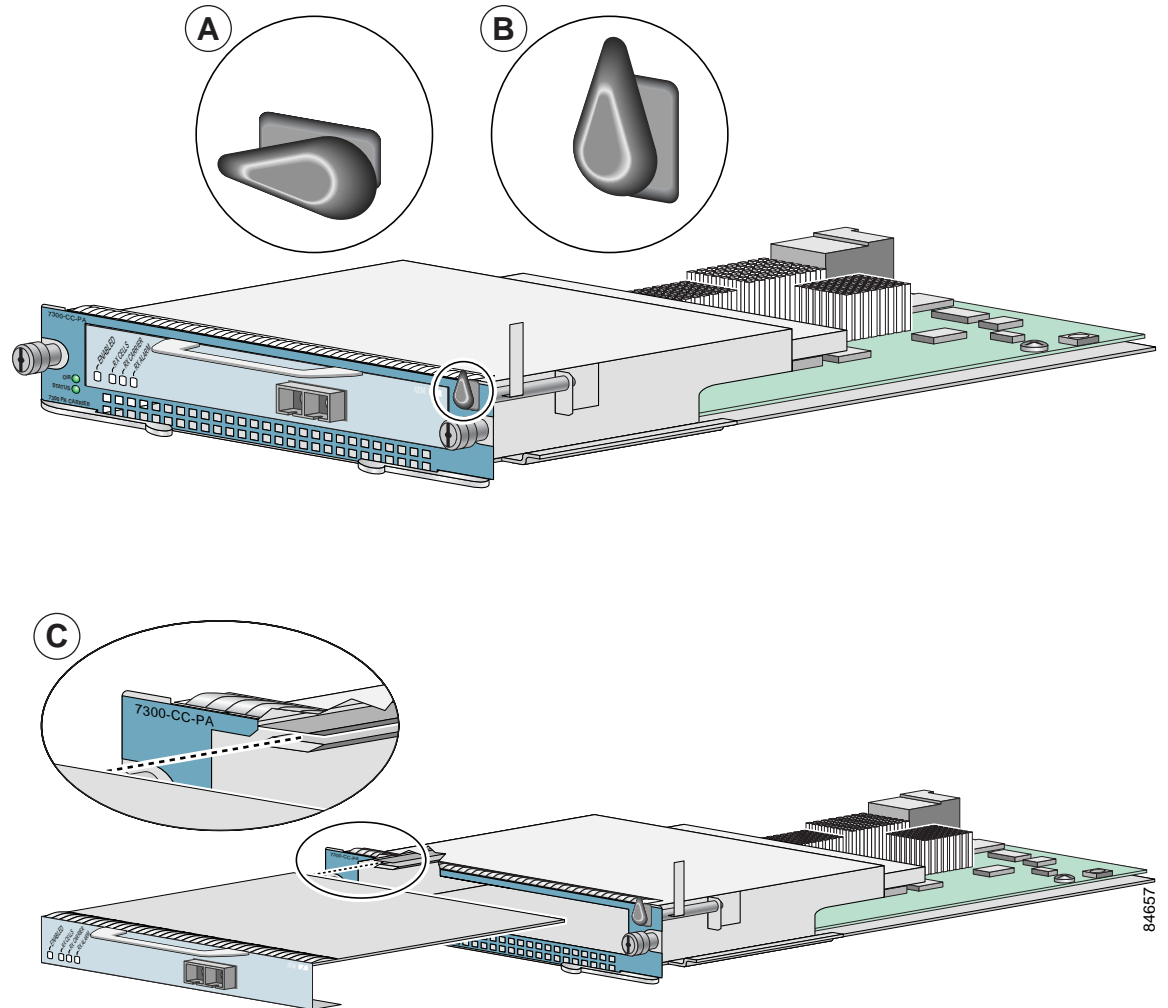
Attaching the PA-GE Cables

To continue your PA-GE port adapter installation, you must attach the cables to the Gigabit Interface Converter (GBIC) on your port adapter.

Your PA-GE shipped with a GBIC installed, depending on the PA-GE model you ordered (1000BASE-SX, 1000BASE-LX, 1000BASE-LH, or 1000BASE-ZX).

This chapter contains the following sections:

Note If your PA-GE arrived *without* the GBIC installed and you need to install it now, or you need to change your GBIC for another reason, use the procedures in the "Replacing a GBIC in the PA-GE" section on page 4-5.

If your GBIC is installed, use the procedures in the "Connecting Cables to the PA-GE" section that follows.

Connecting Cables to the PA-GE

The two cabling options for the PA-GE are discussed in the following sections:

Use this cabling option for the following connections:

- PA-GE with a GBIC-SX
- PA-GE with a GBIC-LX or a GBIC-LH, when you expect transmission distances to be less than 984.25 feet (300 meters) over 50/125-micron or 62.5/125-micron multimode fiber
- PA-GE with a GBIC-ZX

(For specific information about multimode and single-mode optical fiber cables, refer to Table 1-5 and the "Optical Fiber Cables" section on page 1-9.)

• Attaching a Mode Conditioning Patch Cord to a GBIC-LX or GBIC-LH, page 4-4

Use this cabling option for a PA-GE with a GBIC-LX or a GBIC-LH when you expect transmission distances to be greater than 984.25 feet (300 meters) over 50/125-micron or 62.5/125-micron multimode fiber. (For specific information about the mode conditioning patch cord, see the "Mode Conditioning Patch Cord with a Multimode GBIC-LX and GBIC-LH" section on page 1-10.)

⚠

Caution   To prevent transmission problems, do not use the mode conditioning patch cord with 9/125-micron or 10/125-micron *single-mode* optical fiber under any circumstances.

Attaching Multimode and Single-Mode Optical Fiber Cables to a GBIC

This section provides the cable-attachment procedure for the following connections:

• GBIC-SX with 50/125-micron or 62.5/125-micron multimode optical fiber cables

• GBIC-LX or GBIC-LH with 50/125-micron or 62.5/125-micron multimode optical fiber cables, when you expect maximum transmission distances to be less than 984.25 feet (300 meters)

• GBIC-LX with 10/125-micron single-mode optical fiber cables

• GBIC-LH with 10/125-micron single-mode optical fiber cables

• GBIC-ZX with 10/125-micron single-mode optical fiber cables

✎

Note   Optical fiber cables are not available from Cisco Systems; they are available from outside commercial cable vendors. (For information on the proper cables to use, see Table 1-5 and the "Optical Fiber Cables" section on page 1-9.)

Use the following procedure to attach multimode or single-mode optical fiber cables to your GBIC:

Step 1   Attach the appropriate optical fiber cable directly to the SC-type receptacle on the GBIC. (See Figure 4-1.) Use a cable with either one duplex SC-type connector or two simplex SC-type connectors.

Figure 4-1   *Attaching Multimode or Single-Mode Optical Fiber Cables to a GBIC—Horizontal Orientation Shown*
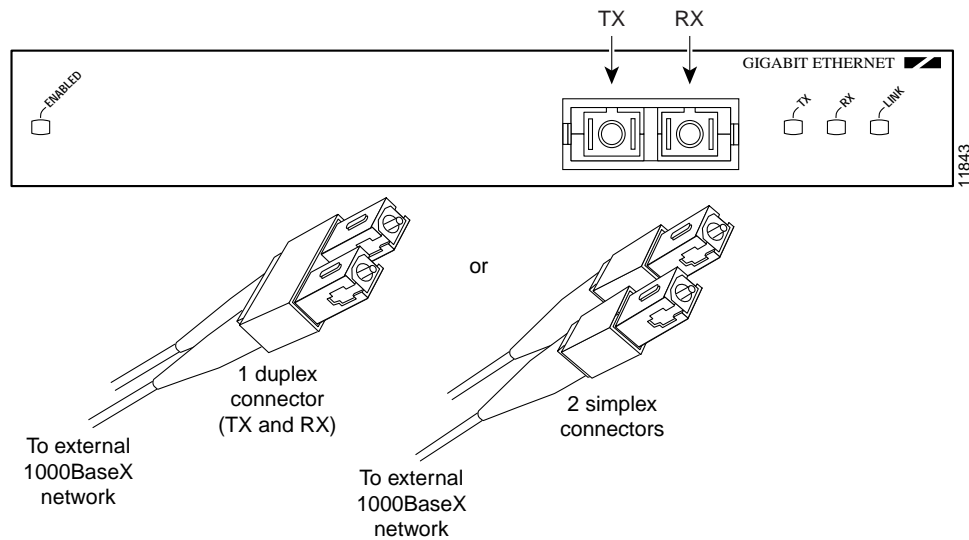
⚠ Caution   To prevent transmission problems, ensure that you connect the TX and RX ports on one end of the optical fiber cable to the RX and TX ports (respectively) on the other end. In other words, connect TX to RX and RX to TX.

⚠ Warning   **Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.** Statement 105

⚠ Warning   **Class 1 laser product.** Statement 1008

Step 2   Attach the network ends of your optical fiber cables to the 1000BASE-X equipment in your cable plant.

This completes the procedure for attaching optical fiber cable to your GBIC.

Attaching a Mode Conditioning Patch Cord to a GBIC-LX or GBIC-LH

This section describes the procedure for attaching a mode conditioning patch cord to your GBIC-LX or GBIC-LH when you expect transmission distances to be greater than 984.25 feet (300 meters) over 50/125-micron or 62.5/125-micron multimode fiber. The mode conditioning patch cord is available from Cisco Systems as Product Number CAB-GELX-625=. (For specific information about the mode conditioning patch cord, see the "Mode Conditioning Patch Cord with a Multimode GBIC-LX and GBIC-LH" section on page 1-10.)

> ✎ **Note** If you use a GBIC-LX or GBIC-LH with *single-mode* optical fiber connections, you do *not* need to use the mode conditioning patch cord; therefore, proceed to the "Attaching Multimode and Single-Mode Optical Fiber Cables to a GBIC" section on page 4-2.

The network end of the GBIC has a duplex SC-type receptacle. You must attach the mode conditioning patch cord to the SC-type receptacle on your GBIC (the Gigabit Ethernet interface).

Use the following procedure to attach the mode conditioning patch cord to your GBIC:

Step 1   Attach the mode conditioning patch cord to the SC-type receptacle on the GBIC. (See Figure 4-2.)

Figure 4-2   *Attaching a Mode Conditioning Patch Cord to a GBIC—Horizontal Orientation Shown*
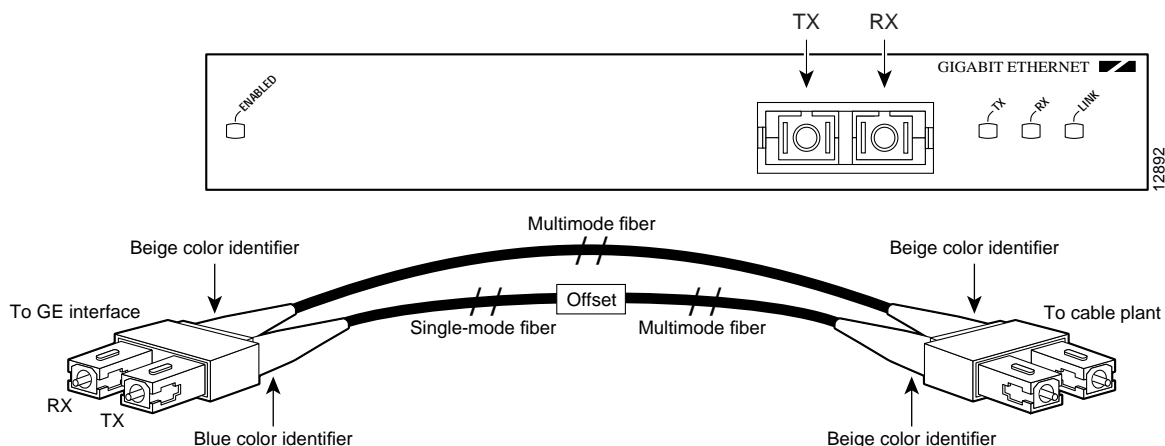
> ⚠ **Caution**   To prevent transmission problems, ensure that you connect the TX and RX ports on one end of the patch cord to the RX and TX ports (respectively) on the other end. In other words, connect TX to RX and RX to TX.

> ⚠ **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

> ⚠ **Warning**   **Class 1 laser product.** Statement 1008

Step 2   Attach the network ends of your mode conditioning patch cord to the appropriate 1000BASE-X equipment in your building cable plant. (See Figure 4-2.)

This completes the procedure for attaching a mode conditioning patch cord to your GBIC.

Replacing a GBIC in the PA-GE

Your PA-GE shipped with a GBIC installed, depending on the PA-GE model you ordered (1000BASE-SX, 1000BASE-LX, 1000BASE-LH, or 1000BASE-ZX).

> **Note**   If your PA-GE arrived *without* the GBIC installed and you need to install it now, or you need to change your GBIC for another reason, use the procedures in this section; otherwise, you do *not* need to use these procedures.

> **Caution**   To prevent system problems, do not use GBICs from third-party vendors. Use only the GBIC that shipped with your PA-GE.

> **Note**   If your GBIC is already properly installed, proceed to the "Attaching Multimode and Single-Mode Optical Fiber Cables to a GBIC" section on page 4-2; otherwise, continue with the following procedures.

> **Caution**   To prevent problems associated with data transmission, you must attach this device only to devices compliant with IEEE 802.3x specifications.

> **Note**   You can install and remove GBICs with power on to the system; however, we strongly recommend that you do *not* install or remove the GBIC with optical fiber cables attached to it. Disconnect all cables before removing or installing a GBIC.

Removing a GBIC from the PA-GE

Use the following procedure to remove a GBIC from your PA-GE:

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

Step 2   Disconnect the SC-type optical fiber cables or the mode conditioning patch cord from the GBIC; note which plug is TX and which plug is RX for reattachment.

Step 3   Locate the tabs on either side of the exposed portion of the GBIC and squeeze them with your thumb and forefinger as you gently pull the GBIC out of the GBIC slot. (See arrows in Figure 4-3.)

Figure 4-3   Removing and Inserting a GBIC
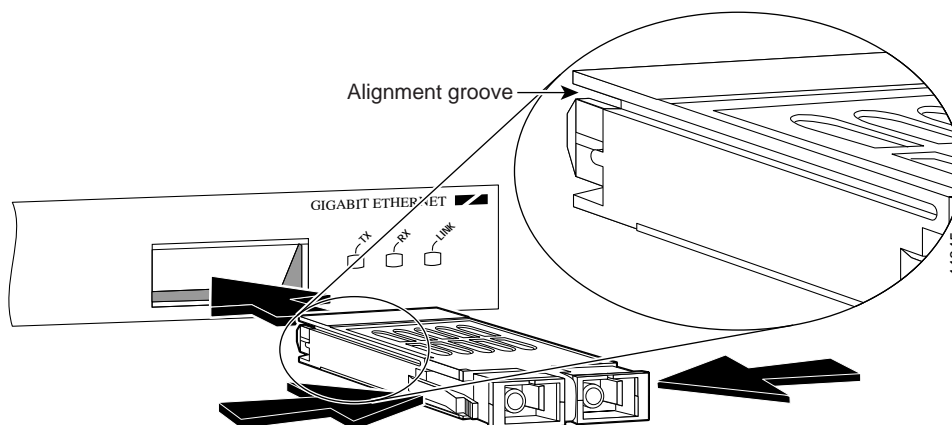
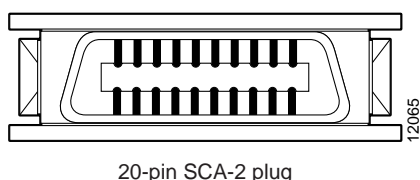## Inserting a GBIC into the PA-GE

Use the following procedure to insert a GBIC into your PA-GE interface:

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

Step 2   Locate the alignment groove on the GBIC. (See the enlargement in Figure 4-3.) Position the GBIC so that this groove is in the position shown in the enlargement, to ensure that the 20-pin plug on the GBIC is in the correct position.

⚠

Caution   To prevent damage to the GBIC plug and receptacle before you insert the GBIC into the GBIC slot on the PA-GE, ensure that the plug is in the orientation shown in Figure 4-4.

Figure 4-4   20-Pin Plug on the GBIC

20-pin SCA-2 plug

Step 3   Squeeze the tabs on each side of the GBIC using your thumb and forefinger, and insert the GBIC into the GBIC slot on the PA-GE. (See Figure 4-3.)

Step 4   Using moderate force, ensure that the GBIC is fully inserted into the 20-pin receptacle at the rear of the GBIC slot. The tabs on either side of the GBIC snap into place when you have completely and properly inserted the GBIC.

Step 5   Reattach the SC-type optical fiber cable or the mode conditioning patch cord to the GBIC. (Use the appropriate procedure in the "Connecting Cables to the PA-GE" section on page 4-1.)

This completes the procedures for replacing the GBIC in your PA-GE interface.

Configuring the PA-GE

To continue your PA-GE port adapter installation, you must configure the Gigabit Ethernet (GE) interface. 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

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

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

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

```
Router> enable

Password:
```

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

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

```
Router#
```

To configure the new interfaces, proceed to the "Configuring the Interface" section on page 5-2.

Configuring the Interface

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

- Protocols you plan to route on each new interface
- IP addresses, if you plan to configure the interfaces for IP routing
- Bridging protocols you plan to use

If you installed a new PA-GE 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-GE that was previously configured, the system recognizes the new interface and brings it up in its existing configuration.

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

You execute configuration commands from the privileged level of the EXEC command interpreter, which usually requires password access. Contact your system administrator, if necessary, to obtain password access. (See the "Using the EXEC Command Interpreter" section on page 5-1 for an explanation of the privileged level of the EXEC.)

Performing a Basic Interface Configuration

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

In the following procedure, press the **Return** key after each step unless otherwise noted. At any time you can exit the privileged level and return to the user level by entering **disable** at the prompt as follows:

```
Router# disable

Router>
```

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

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

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

Table 5-1 provides examples of the **interface gigabitethernet** subcommand for the supported platforms.

Table 5-1   Examples of the interface gigabitethernet Subcommand for the Supported Platforms

Platform	Command	Example
Cisco 7120 series routers	**interface gigabitethernet**, followed by the *slot/port* (port-adapter-slot-number/ interface-port-number)	The example is for interface 0 on a port adapter in port adapter slot 3. `Router(config)# `**`interface gigabitethernet 3/0`** `Router(config-if)#`
Cisco 7140 series routers	**interface gigabitethernet**, followed by the *slot/port* (port-adapter-slot-number/ interface-port-number)	The example is for interface 0 on a port adapter in port adapter slot 4. `Router(config)# `**`interface gigabitethernet 4/0`** `Router(config-if)#`
Cisco 7200 VXR routers	**interface gigabitethernet**, followed by *slot/port* (port-adapter-slot-number/ interface-port-number)	The example is for interface 0 of a port adapter in port adapter slot 6. `Router(config)# `**`interface gigabitethernet 6/0`** `Router(config-if)#`
Cisco 7201 router	**interface**, followed by the *type* (**serial**) and *slot/port* (port-adapter-slot-number/ interface-port-number)	The example is for interface 0 and interface 1 on a port adapter in slot 1. `Router(config)# `**`interface serial 1/0`** `Router(config-if)# `**`shutdown`** `Router(config-if)# `**`interface serial 1/1`** `Router(config-if)# `**`shutdown`** **`Ctrl-Z`** `Router#`
Cisco uBR7246 VXR router	**interface gigabitethernet**, followed by *slot/port* (port-adapter-slot-number/ interface-port-number)	The example is for interface 0 of a port adapter in port adapter slot 2. `Router(config)# `**`interface gigabitethernet 2/0`** `Router(config-if)#`
Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router	**interface gigabitethernet**, followed by *slot/port* (module-slot-number/ interface-port-number)	The example is for interface 0 on a port adapter in a Cisco 7304 PCI Port Adapter Carrier Card in module slot 3 of a Cisco 7304 router. `Router(config)# `**`interface gigabitethernet 3/0`** `Router(config-if)#`

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

```
Router(config-if)# ip address 10.1.1.10 255.255.255.255
```

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

✎   **Note**   Full-duplex operation is the default for the PA-GE. Half-duplex operation is not supported.

Step 5   Re-enable the interfaces using the **no shutdown** command.

Step 6 After including all the configuration subcommands to complete your configuration, press **Ctrl-Z**—hold down the **Control** key while you press **Z**—or enter **end** or **exit** to exit configuration mode.

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.

Checking the Configuration

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

- Using show Commands to Verify the New Interface Status, page 5-4
- Using the ping Command to Verify Network Connectivity, page 5-12

Using show Commands to Verify the New Interface Status

Table 5-2 demonstrates how you can use the **show** commands to verify that new interfaces are configured and operating correctly and that the PA-GE appears in them correctly. Sample displays of the output of selected **show** commands appear in the sections that follow. For complete command descriptions and examples, refer to the publications listed in the "Related Documentation" section on page viii.

Table 5-2   Using show Commands

Command	Function	Example
show version or **show hardware**	Displays system hardware configuration, the number of each interface type installed, Cisco IOS software version, names and sources of configuration files, and boot images	Router# **show version**
show controllers	Displays all the interface processors and their interfaces	Router# **show controllers**
show diag *slot*	Displays types of port adapters installed in your system and information about a specific port adapter slot	Router# **show diag 2**
show interfaces *type* **3**/*interface-port-number*	Displays status information about a specific type of interface (for example, Gigabit Ethernet) in a Cisco 7120 series router	Router# **show interfaces gigabitethernet 3/1**

Table 5-2   Using show Commands (continued)

Command	Function	Example
show interfaces *type* **4**/*interface-port-number*	Displays status information about a specific type of interface (for example, Gigabit Ethernet) in a Cisco 7140 series router	Router# **show interfaces gigabitethernet 4/1**
show interfaces *type port-adapter-slot-number/interface-port-number*	Displays status information about a specific type of interface (for example, Gigabit Ethernet) in a Cisco 7200 VXR router	Router# **show interfaces gigabitethernet 1/0**
show interfaces serial, followed by *slot/port* (port-adapter-slot-number/ interface-port-number)	Displays status information about a specific type of interface (for example, Gigabit Ethernet) in a Cisco 7201 router	Router# **show interfaces gigabitethernet 1/0**
show interfaces *type* **1** or **2**/*interface-port-number*	Displays status information about a specific type of interface (for example, Gigabit Ethernet) in a Cisco uBR7246 VXR router	Router# **show interfaces gigabitethernet 2/0**
show interfaces *type* **2** or **3** or **4** or **5**/ *interface-port-number*	Displays status information about a specific type of interface (for example, Gigabit Ethernet) on a Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router	Router# **show interfaces gigabitethernet 3/0**
show protocols	Displays protocols configured for the entire system and for specific interfaces	Router# **show protocols**
show running-config	Displays the running configuration file	Router# **show running-config**
show startup-config	Displays the configuration stored in NVRAM	Router# **show startup-config**

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

- Using the show version or show hardware Commands, page 5-6
- Using the show diag Command, page 5-8
- Using the show interfaces Command, page 5-10

Choose the subsection appropriate for your system. Proceed to the "Using the ping Command to Verify Network Connectivity" section on page 5-12 when you have finished using the **show** commands.

Using the show version or show hardware Commands

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

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

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

Cisco 7100 Series Routers—Example Output of the show version Command

Following is an example of the **show version** command from a Cisco 7140 series router with a PA-GE installed:

```
Router# show version
Cisco Internetwork Operating System Software
IOS (tm) EGR Software (C7100-JS56I-M),Version 12.1(4)E,
TAC:Home:SW:IOS:Specials for info
Copyright (c) 1986-1999 by cisco Systems, Inc.
Compiled Thu 10-Jun-99 15:32 by linda
Image text-base:0x60008900, data-base:0x60D8E000

ROM:System Bootstrap, Version 12.0(19991025:205336) [tkam-v120_5_xe_throttle_p23411 104],
BOOTFLASH:EGR Software (C7100-BOOT-M), Version 12.0(5)XE2, EARLY DEPLOYMENT RELEASE
SOFTWARE (fc1)

Router uptime is 24 minutes
System restarted by power-on
System image file is "disk0:c7100-is-mz.121-4.E"

cisco 7140-2MM3 (EGR) processor (revision A) with 253952K/73728K bytes of memory.
Processor board ID 15054452
R7000 CPU at 262Mhz, Implementation 39, Rev 1.0, 256KB L2, 2048KB L3 Cache
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.
2 FastEthernet/IEEE 802.3 interface(s)
1 Gigabit Ethernet/IEEE 802.3 interface(s)
2 ATM network interface(s)
125K bytes of non-volatile configuration memory.
40960K bytes of ATA PCMCIA card at slot 1 (Sector size 512 bytes).
8192K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x0
```

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

Following is an example of the **show version** command from a Cisco 7206VXR router:

```
Router# show version
X-UIDL:c2d95baa1be7793e276d7dd3cb13959a

Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-JS-M), Released Version 12.0(6)XE [biff]
Copyright (c) 1986-1999 by cisco Systems, Inc.
Compiled Mon 10-May-99 06:02 by biff
Image text-base:0x60008900, data-base:0x614B2000

ROM:System Bootstrap, Version 12.0(19990210:195103) [12.0XE 105]

Router uptime is 38 minutes
System returned to ROM by reload
System image file is "slot0:c7200-js-mz"

cisco 7206VXR (NPE300) processor with 122880K/40960K bytes of memory.
R7000 CPU at 262Mhz, Implementation 39, Rev 1.0, 256KB L2, 2048KB L3 Cache
6 slot VXR 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.
Primary Rate ISDN software, Version 1.1.

(Additional displayed text omitted from this example)

1 Gigabit Ethernet/IEEE 802.3 interface(s)

(Additional displayed text omitted from this example)

125K bytes of non-volatile configuration memory.

20480K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
4096K bytes of Flash internal SIMM (Sector size 256K).
```

Note The example above is specific to a Cisco 7206VXR router. Actual display information for your Cisco uBR7246 VXR router might be different.

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/wwl/export/crypto/tool/stqrg.html
If you require further assistance please contact us by sending email to export@cisco.com.
Cisco 7201 (c7201) processor (revision A) with 917504K/65536K bytes of memory.
Processor board ID 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
```

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 7100 series router, Cisco 7201 router, Cisco 7200 VXR router, Cisco uBR7246 VXR router, or the *module slot* in a Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router.

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

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

Cisco 7100 Series Routers—Example Output of the show diag Command

Following is an example of the **show diag** command that shows a PA-GE in port adapter slot 4 of a Cisco 7140 series router:

```
Router# show diag 4
Slot 4:
Gigabit Ethernet Port adapter, 1 port
Port adapter is analyzed
Port adapter insertion time 00:08:44 ago
EEPROM contents at hardware discovery:
Hardware revision 1.0          Board revision A1
Serial number     19431171     Part number     73-3144-03
Test history      0x0          RMA number      00-00-00
```

```
EEPROM format version 1
EEPROM contents (hex):
0x20:01 98 01 00 01 28 7F 03 49 0C 48 03 00 00 00 00
0x30:51 02 73 00 00 00 00 00 00 01 FF FF FF FF FF FF
```

Note To use the **show diag** command with the Cisco 7120 series router, replace the slot argument **4** with **3**.

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

Following is an example of the **show diag** command for a PA-GE in port adapter slot 5 of a Cisco 7206VXR router:

```
Router# show diag 5
Slot 5:
       Gigabit Ethernet port adapter, 1 port
       Port adapter is analyzed
       Port adapter insertion time 4d21h ago
       EEPROM contents at hardware discovery:
       Hardware revision 1.0          Board revision A0
       Serial number    11624030      Part number    73-3144-03
       Test history     0x0           RMA number     00-00-00
       EEPROM format version 1
       EEPROM contents (hex):
         0x20:01 98 01 00 00 B1 5E 5E 49 0C 48 03 00 00 00 00
         0x30:50 00 00 00 99 06 03 00 00 01 FF FF FF FF FF FF
Serial number:11623646  Part number:73-3144-03
```

Note The example above is specific to a Cisco 7206VXR router. Actual display information for your Cisco uBR7246 VXR router might be different.

Cisco 7201 Router—Example Output of the show diag Command

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

```
Router# show diag 1
Slot 1:
    Dual OC3 POS Port adapter, 2 ports
    Port adapter is analyzed
    Port adapter insertion time 00:02:19 ago
    EEPROM contents at hardware discovery:
    Hardware Revision : 1.0
    PCB Serial Number : JAE07520DYL
    Part Number : 73-8220-02
    Board Revision : A0
    RMA Test History : 00
    RMA Number : 0-0-0-0
    RMA History : 00
    Deviation Number : 0
    Product (FRU) Number : PA-POS-2OC3
    Top Assy. Part Number : 800-21857-02
    EEPROM format version 4
    EEPROM contents (hex):
        0x00: 04 FF 40 03 E3 41 01 00 C1 8B 4A 41 45 30 37 35
        0x10: 32 30 44 59 4C 82 49 20 1C 02 42 41 30 03 00 81
        0x20: 00 00 00 00 04 00 88 00 00 00 00 CB 94 50 41 2D
        0x30: 50 4F 53 2D 32 4F 43 33 20 20 20 20 20 20 20 20
        0x40: 20 C0 46 03 20 00 55 61 02 FF FF FF FF FF FF FF
        0x50: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
```

```
        0x60: FF 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 FF
```

Using the show interfaces Command

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

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

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

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

Cisco 7100 Series Routers—Example Output of the show interfaces Command

Following is an example of the **show interfaces gigabitethernet** command that shows all of the information specific to the Gigabit Ethernet interface on a PA-GE installed in port adapter slot 4 of a Cisco 7140 router:

```
Router# show interfaces gigabitethernet 4/0
GigabitEthernet4/0 is up, line protocol is up
Hardware is WISEMAN, address is 00d0.9793.8070 (bia 00d0.9793.8070)
Internet address is 10.0.0.2/8
MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
reliability 255/255, txload 1/255, rxload 1/255
Encapsulation ARPA, loopback not set
Keepalive set (10 sec)
Full-duplex mode, link type is autonegotiation, media type is SX
output flow-control is on, input flow-control is on
ARP type:ARPA, ARP Timeout 04:00:00
Last input 00:00:01, output 00:00:05, output hang never
Last clearing of "show interface" counters never
Queueing strategy:fifo
Output queue 0/40, 0 drops; input queue 0/75, 0 drops
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
44 packets input, 4794 bytes, 0 no buffer
Received 12 broadcasts, 0 runts, 0 giants, 0 throttles
0 input errors, 0 CRC, 109 frame, 0 overrun, 0 ignored
0 watchdog, 1 multicast, 0 pause input
0 input packets with dribble condition detected
```

```
49 packets output, 6030 bytes, 0 underruns
0 output errors, 0 collisions, 1 interface resets
0 babbles, 0 late collision, 0 deferred
1 lost carrier, 0 no carrier, 0 pause output
0 output buffer failures, 0 output buffers swapped out
```

Note   To use the **show interfaces gigabitethernet** command with the Cisco 7120 series router, replace the interface address argument **4/0** with **3/0**.

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

Following is an example of the **show interfaces gigabitethernet** command that shows all of the information specific to the Gigabit Ethernet interface on a PA-GE installed in port adapter slot 5 of a Cisco 7206VXR router:

```
Router# show interfaces gigabitethernet 5/0
GigabitEthernet5/0 is up, line protocol is up
  Hardware is (WISEMAN)Gigabit Ethernet, address is 00e0.14e4.6b8c (bia 00e0.14e4.6b8c)
  Internet address is 10.1.1.10/24
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec, rely 255/255, load 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex mode, link type is autonegotiation, media type is LX
  output flow-control is on, input flow-control is on
  ARP type:ARPA, ARP Timeout 04:00:00
  Last input 00:00:02, output 00:00:01, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy:fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     18457 packets input, 1829178 bytes, 0 no buffer
     Received 257 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 7949 frame, 0 overrun, 0 ignored
     0 watchdog, 18084 multicast, 0 pause input
     230005 packets output, 245673899 bytes, 0 underruns
     0 babbles, 0 late collision, 674 deferred
     123 lost carrier, 0 no carrier, 0 pause output
     0 output buffer failures, 0 output buffers swapped out
```

Note   The example above is specific to a Cisco 7206VXR router. Actual display information for your Cisco uBR7246 VXR router might be different.

Cisco 7201 Router—Example Output of the show interfaces Command

Following is an example of the **show interfaces** command for the 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
```

Using the ping Command to Verify Network Connectivity

The packet internet groper (**ping**) command allows you 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.