CHAPTER 1

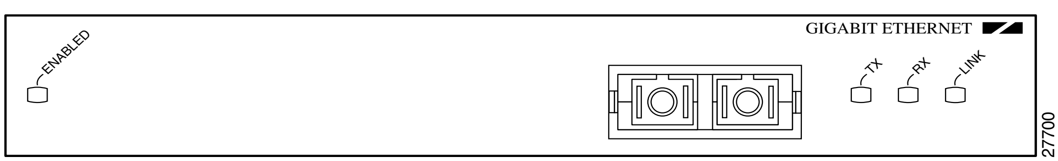
Overview

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

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.

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	770–860 nm[2]	–9.5 dBm/–4 dBm[3]	–17 dBm/0 dBm
62.5-micron multimode	770–860 nm	–9.5 dBm/–4 dBm	–17 dBm/0 dBm
1000BASE-LX			
50-micron multimode	1270–1355 nm	–11.5 dBm/–3 dBm	–19 dBm/–3 dBm
62.5-micron multimode	1270–1355 nm	–11.5 dBm/–3 dBm	–19 dBm/–3 dBm
10-micron single-mode	1270–1355 nm	–11.5 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

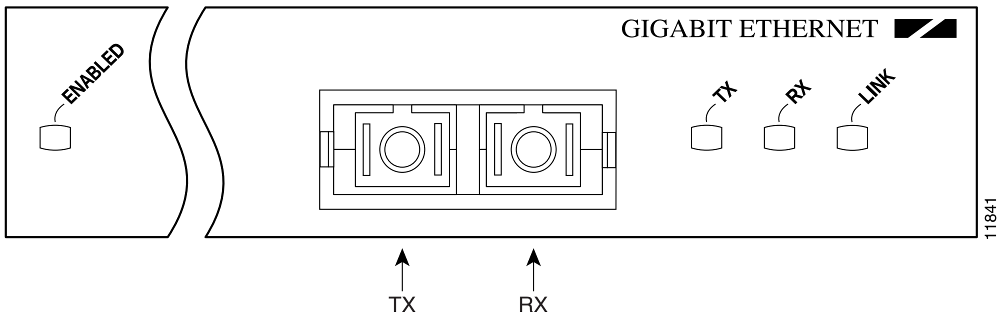
The following publications contain information on determining attenuation and power budget:

- 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

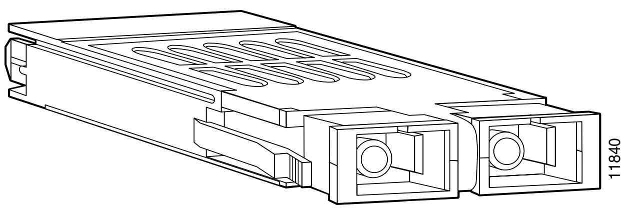
This section provides information about the cables and connectors you must use with the PA-GE.

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 1-4and 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

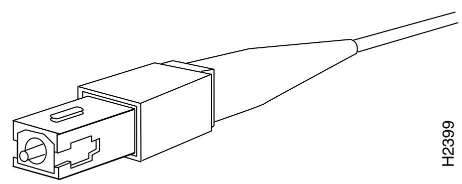
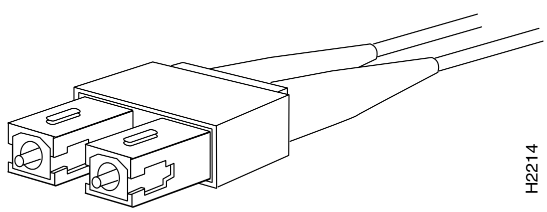


Figure 1-5 Duplex SC-Type Connector



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.

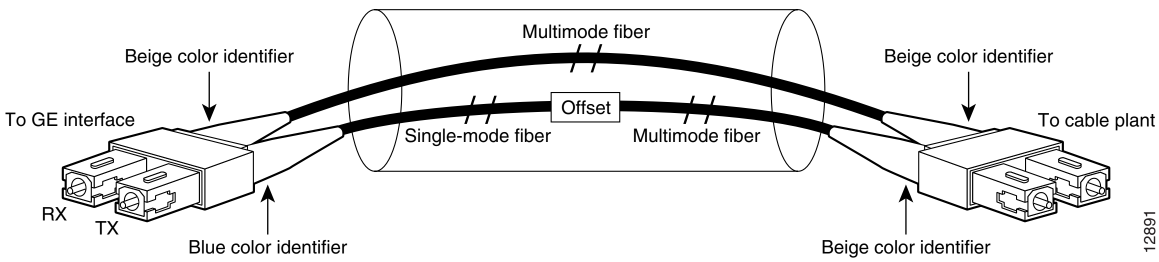
When an unconditioned laser source designed for operation on single-mode optical fiber is directly coupled to a multimode optical fiber cable, an effect known as differential mode delay (DMD) might result in a degradation of the modal bandwidth of the optical fiber cable.

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

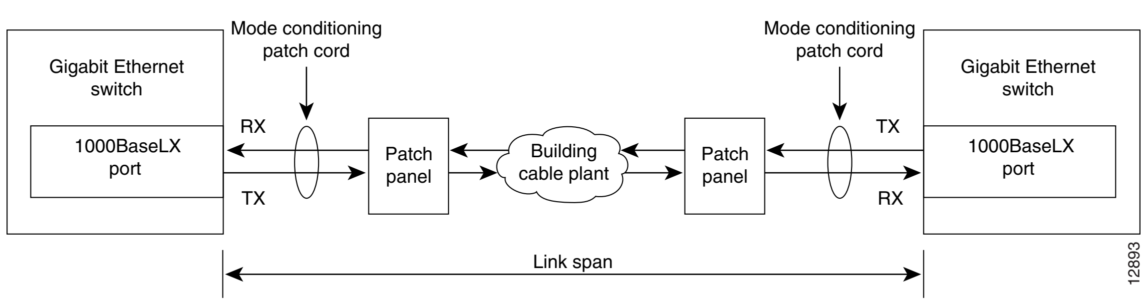


The mode conditioning patch cord assembly is composed of duplex optical fibers, including a single-mode-to-multimode offset launch fiber connected to the transmitter, and a second conventional graded-index multimode optical fiber connected to the receiver. The use of a plug-to-plug patch cord maximizes 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

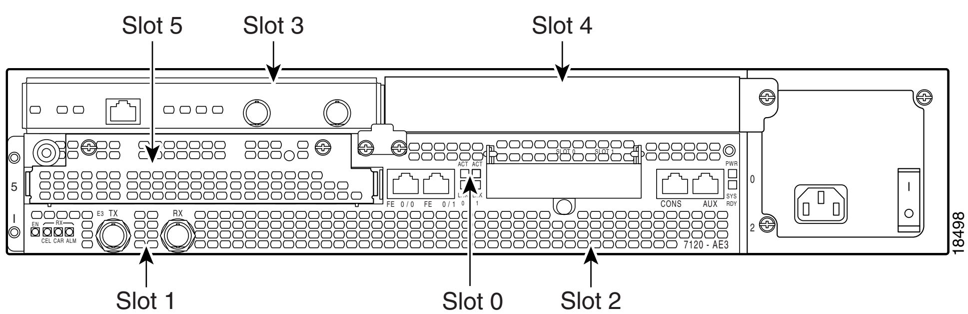
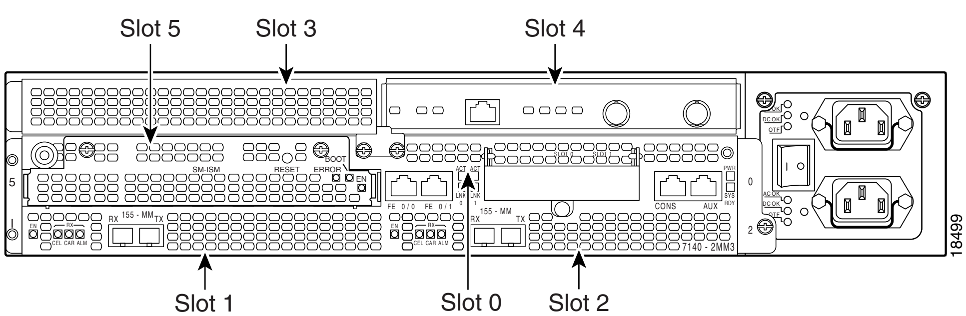


Figure 1-9 Port Adapter Slots in the Cisco 7140 Series Router

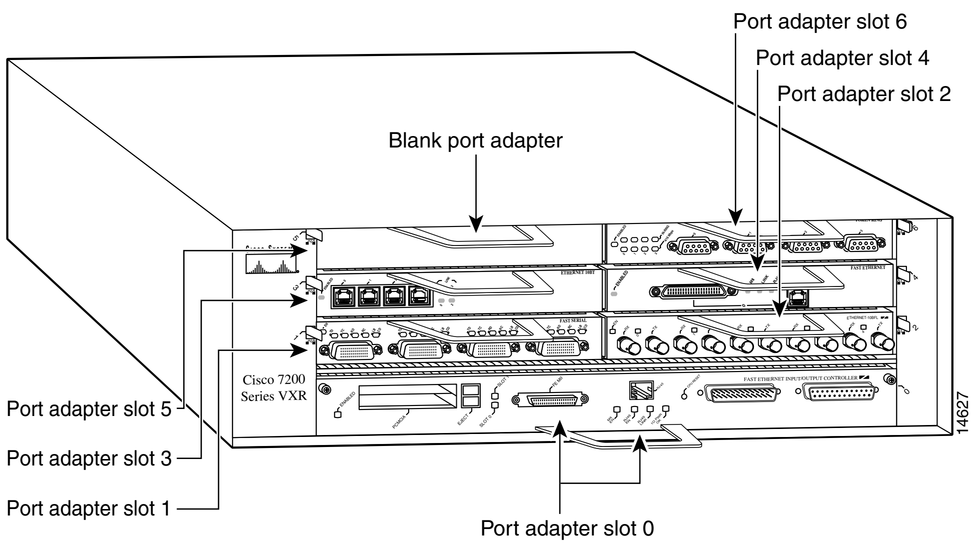


Cisco 7200 VXR Routers Slot Numbering

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.

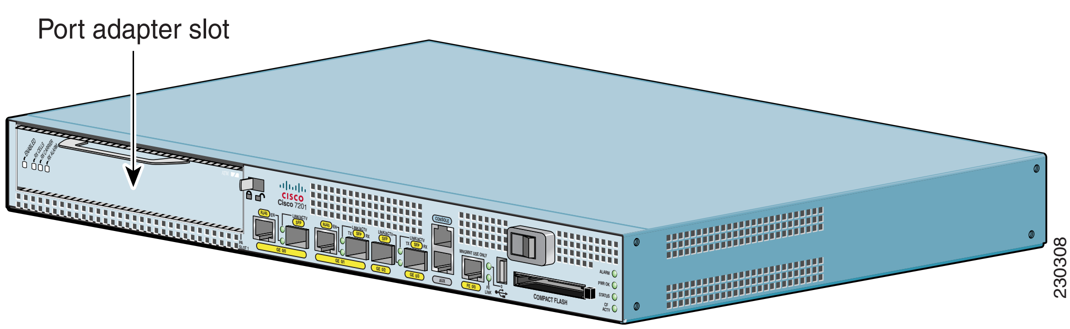
Figure 1-10 Port Adapter Slots in the Cisco 7206VXR Router



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.

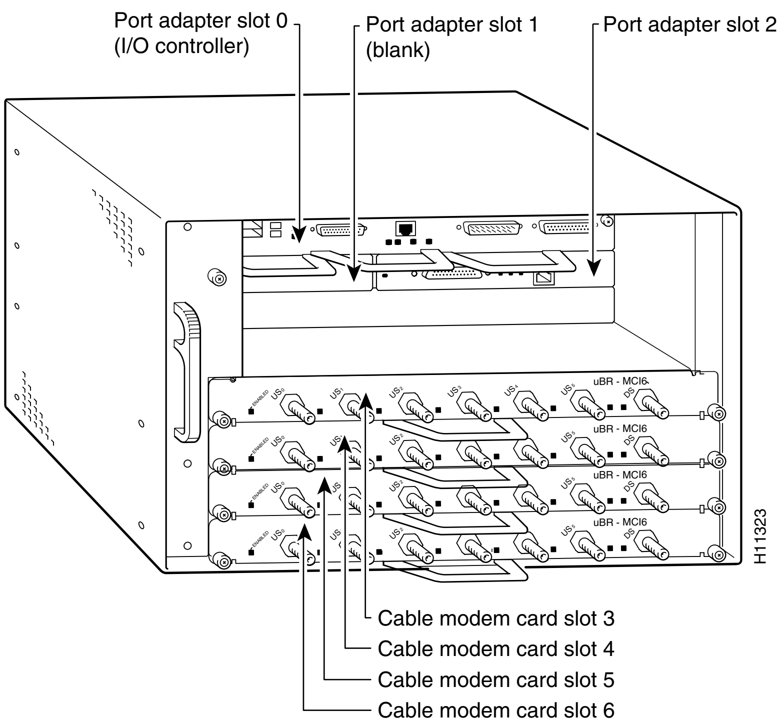
Figure 1-11 Port Adapter Slot in the Cisco 7201 Router



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

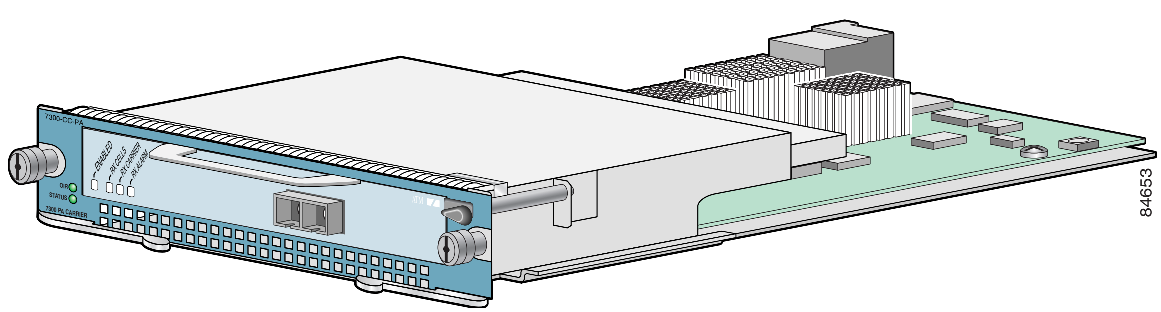
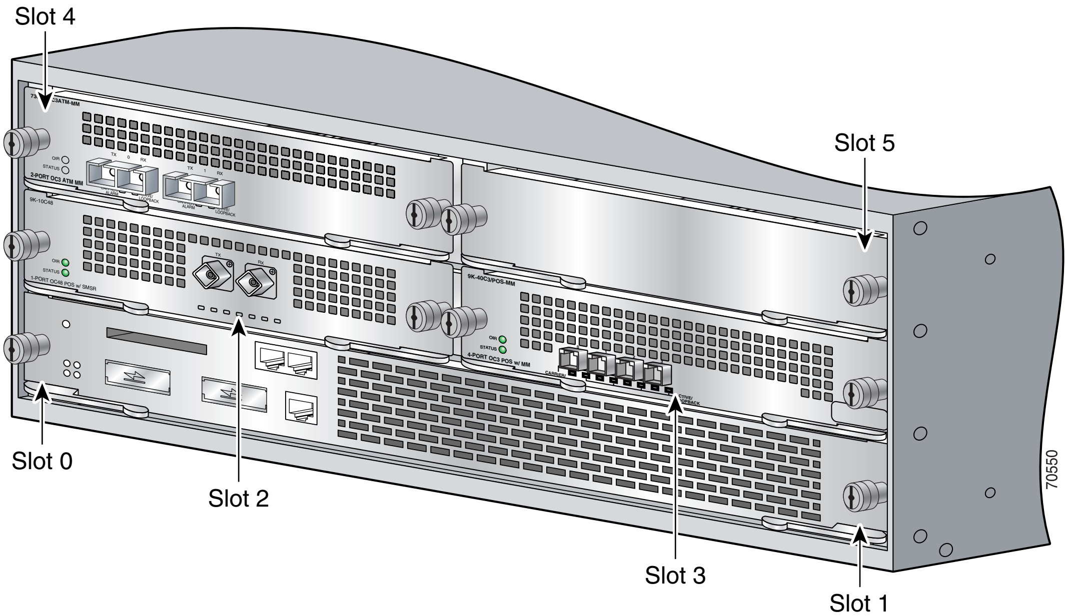


Figure 1-14 shows the module slot numbering on a Cisco 7304 router. The port adapter slot number is the same as the module slot number. Slot 0 and slot 1 are reserved for the NPE module or NSE module.

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.