



CHAPTER 1

PA-A3 Overview

This chapter describes the PA-A3 Enhanced ATM port adapter and contains the following sections:

- [Port Adapter Overview, page 1-1](#)
- [LEDs, page 1-4](#)
- [Cables and Connectors, page 1-5](#)
- [Port Adapter Slot Locations on the Supported Platforms, page 1-12](#)
- [Identifying Interface Addresses, page 1-21](#)

Port Adapter Overview

The PA-A3 is a series of single-width, single-port, ATM port adapters that provide advanced ATM hardware and software features for the Catalyst 5000 family switches with RSM/VIP2, Catalyst 6000 family switches with FlexWAN module, Cisco 7100 series routers, Cisco 7200 series routers, Cisco 7200 VXR routers, Cisco uBR7200 series routers, Cisco 7201 router, Cisco 7301 router, Cisco 7304 PCI Port Adapter Carrier Card in Cisco 7304 router, Cisco 7401ASR router, and Cisco 7000 series routers and Cisco 7500 series routers with VIP.

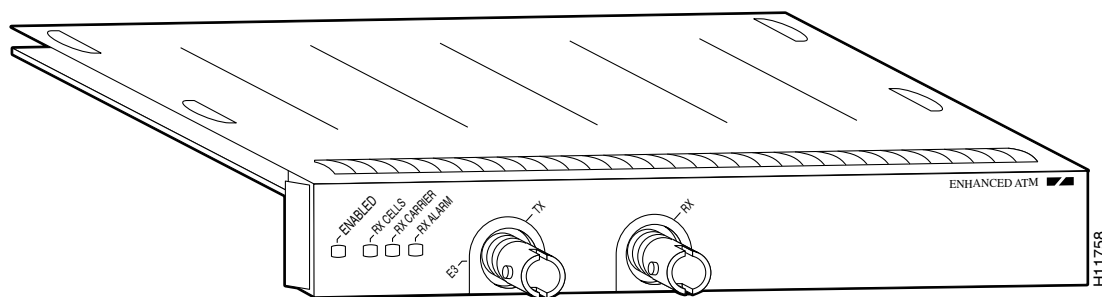
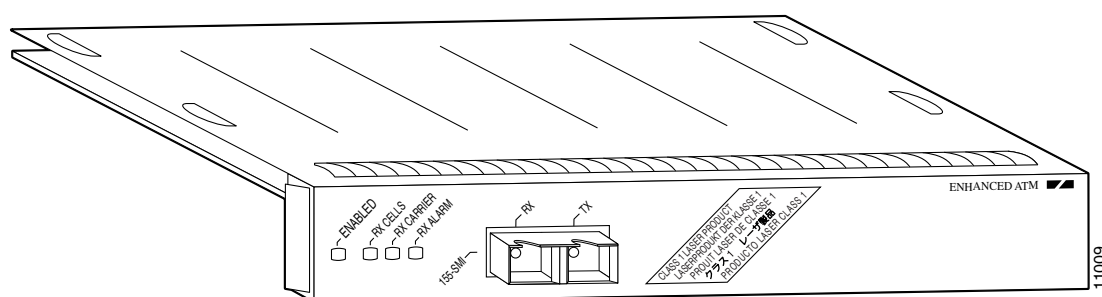
The PA-A3 includes five hardware versions that support the following standards-based physical interfaces:

- E3—PA-A3-E3 (See [Figure 1-1 on page 1-2.](#))
- OC-3c/STM-1 (See [Figure 1-2 on page 1-2.](#))
 - Multimode—PA-A3-OC3MM
 - Single-mode intermediate reach—PA-A3-OC3SMI
 - Single-mode long reach—PA-A3-OC3SML
- T3—PA-A3-T3; supports the digital signal level 3 (DS-3) framing specification (See [Figure 1-3 on page 1-2.](#))

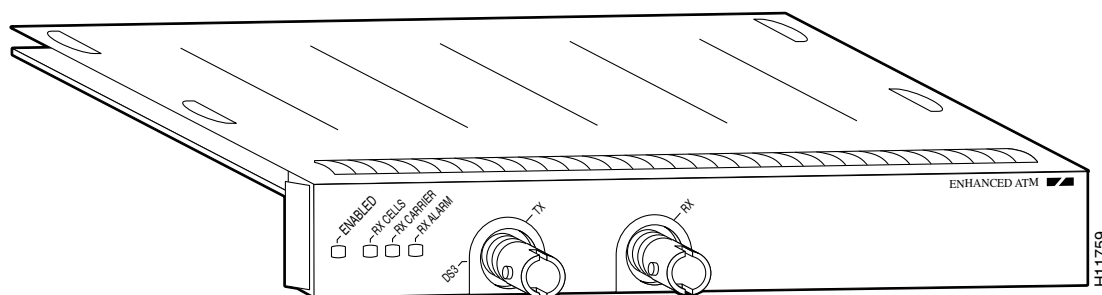


Note

To allow a full view of the port adapter faceplate detail, port adapter handles are not shown.

Figure 1-1 PA-A3-E3**Figure 1-2 PA-A3-OC3SMI****Note**

The PA-A3-OC3MM and the PA-A3-OC3SML have faceplates identical to that of the PA-A3-OC3SMI shown in [Figure 1-2](#).

Figure 1-3 PA-A3-T3**Note**

Traffic from multiple ATM network interfaces could exceed the bandwidth of the CyBus (Catalyst RSM/VIP2, Catalyst 6000 family FlexWAN module, and VIP only), causing packets to be dropped. There is no physical limit on the number of VIP and ATM PA-A3 combinations that can be installed in the same Cisco 7500 series router up to the total that the chassis supports. (For example, a Cisco 7513 can physically have up to 11 VIPs.) However, the Cisco 7500 series backplane bandwidth is finite; if you install three or more VIP and ATM PA-A3 combinations, you need be aware of the Cisco 7500 series bandwidth characteristics. See the [“Related Documentation”](#) section on page ix for documentation related to bandwidth information.

Features

The PA-A3 supports the following features:

- Up to 4096 simultaneously available virtual circuits (VCs)



Note On the Catalyst 6000 family FlexWAN module, each PA-A3 supports up to 1024 VCs.

- Up to 1024 simultaneous segmentations and reassemblies (SARs)
- ATM adaptation layer 5 (AAL5) for data traffic
- Physical interfaces: DS-3 and E3 electrical coaxial cable (models PA-A3-T3 and PA-A3-E3 respectively) ITU G.703; SONET/SDH (software selectable) optical fiber (OC-3c or STM-1)
- Traffic shaping on a per-VC basis
- IP-to-ATM class of service (CoS)
- Non-real-time variable bit rate (nrt-VBR), unspecified bit rate (UBR), and available bit rate (ABR) quality of service (QoS)
- Operation, Administration, and Maintenance alarm indication signal (OAM AIS) cells
- Online insertion and removal (OIR) on the Cisco 7100 series routers, Cisco 7200 series routers, Cisco 7200 VXR routers, Cisco uBR7200 series routers, Cisco 7201 router, Cisco 7301 router, and Cisco 7401ASR router.
- LAN Emulation (LANE)



Note LANE is not supported on the PA-A3 when installed Catalyst 6000 family FlexWAN module.

The PA-A3 supports the following protocols, services, and ATM-specific software:

- User-Network Interface (UNI) signaling
- Integrated Local Management Interface (ILMI)
- RFC 1483



Tip

The FlexWAN supports hardware bridging of RFC 1483. For configuration information, go to the following URL:

http://www.cisco.com/en/US/products/hw/routers/ps368/products_configuration_guide_chapter09186a00801e5c05.html

- RFC 1577

The PA-A3 complies with the environmental specifications listed in [Table 1-1](#).

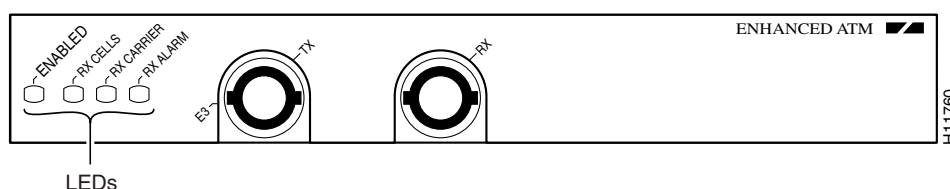
Table 1-1 PA-A3 Environmental Specifications

| Specification | Description |
|-----------------------|--------------------------|
| Environmental | |
| Operating temperature | 50 to 104°F (10 to 40°C) |
| Humidity | 0 to 90%, noncondensing |

LEDs

The PA-A3, shown in [Figure 1-4](#), has one row of three status LEDs and one ENABLED LED.

Figure 1-4 PA-A3 LEDs—Front Panel View



After system initialization, the ENABLED LED goes on, indicating that the port adapter has been enabled for operation.

The following conditions must be met before the PA-A3 is enabled:

- The PA-A3 is correctly connected and is receiving power.
- A valid system software image for the port adapter has been downloaded successfully.
- The system recognizes the PA-A3.

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

[Table 1-2](#) lists LED colors and indications.

Table 1-2 PA-A3 Port LEDs

| LED Label | Color | State | Function |
|------------|-------|-------|---|
| ENABLED | Green | On | Indicates that the PA-A3 is enabled for operation. |
| RX CELLS | Green | On | Indicates that the PA-A3 has received an ATM cell. |
| RX CARRIER | Green | On | Indicates that the PA-A3 has detected a carrier on the receiver cable. For a fiber-optic interface, this means that light is detected, and a valid frame is detected. |
| RX ALARM | Red | On | Indicates that the PA-A3 has detected an alarm condition. |

Cables and Connectors

The PA-A3 interfaces are full duplex. You must use the appropriate ATM interface cable to connect the PA-A3 with an external ATM network.

Table 1-3 summarizes the PA-A3 interface types, connectors, and cables.

Table 1-3 PA-A3 Interface Cable Specifications

| Interface | Rate (Mbps) | Conn Type | Cable Type | TU-T G.957 Standard | Bellcore GR-253 Standard | Wavelength | Maximum Distance |
|--|-------------|-----------|----------------------------|------------------------|--------------------------|------------|------------------|
| T3 | 44.736 | BNC | Coaxial | — | — | — | 450 ft (137.2 m) |
| E3 | 34.368 | BNC | Coaxial | — | — | — | 1250 ft (381 m) |
| OC-3c/STM-1 multimode | 155.52 | SC | 62.5/125 microns multimode | Intra-office STM-1 I-1 | Short-reach OC-3c | 1310 nm | 1.2 mi (2 km) |
| OC-3c/STM-1 single-mode intermediate reach | 155.52 | SC | 9 microns single-mode | Short-haul STM-1 S-1.1 | Intermediate-reach OC-3c | 1310 nm | 9.3 mi (15 km) |
| OC-3c/STM-1 single-mode long reach | 155.52 | SC | 9 microns single-mode | Long-haul STM-1 L-1.1 | Long-reach OC-3c | 1310 nm | 24.8 mi (40 km) |



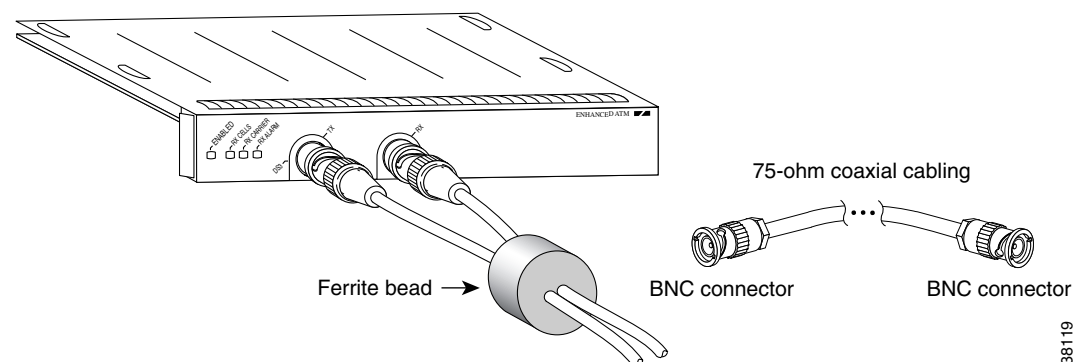
Note

The PA-A3 is considered an ATM end-point device.

T3 and E3 Cables and Connectors

The PA-A3-T3 and PA-A3-E3 port adapters use a 75-ohm coaxial interface cable to connect your router to an ATM T3 or E3 network. The coaxial cables (see Figure 1-5) conform to EIA/TIA-612 and EIA/TIA-613 specifications, and they have BNC connectors.

Figure 1-5 PA-A3-T3 and PA-A3-E3 Cables



A single PA-A3-T3 or PA-A3-E3 contains one ATM T3 or E3 port that consists of two connectors: receive and transmit. The Cisco 75-ohm coaxial cable has two BNC connectors that attach to the T3 or E3 port receptacles.

The T3/E3 75-ohm coaxial cable, which comes with attached ferrite bead (see [Figure 1-5](#)), is available from Cisco in 10 foot (3.04 meters) lengths. The typical maximum distance between stations for T3 transmissions is 450 feet (137.2 meters) and for E3 transmissions is 1300 feet (396 meters).

**Note**

To ensure compliance with electromagnetic interference (EMI) and European certification standards for emission control (EN55022/CISPR22 Class B for radiated emission levels), the TX and RX cables should be tied together along their entire length, and ferrite beads should be installed on each cable near the TX and RX connectors.

The PA-A3-T3 and PA-A3-E3 provide an interface to ATM switching fabrics for the bidirectional transmission and reception of data at rates of up to 45 Mbps (for T3) and 34 Mbps (for E3).

OC-3c Multimode and Single-Mode Cables and Connectors

The PA-A3-OC3 port adapters provide an interface to ATM switching fabrics for transmitting and receiving data at rates of up to 155 Mbps bidirectionally. The PA-A3-OC3 port adapters connect to the SONET/SDH 155-Mbps multimode or single-mode optical fiber. The OC-3c port on the PA-A3 is considered a DTE device.

For SONET/SDH multimode and SONET/SDH single-mode connections, use one duplex SC connector (see [Figure 1-6](#)) or two simplex SC connectors (see [Figure 1-7](#)). The SC connector is shipped with removable dust covers on each connector.

**Note**

For information on SONET specifications for fiber-optic transmissions, understanding power budget, and assistance with approximating the power margin for multimode and single-mode transmissions, see the [“Additional Information” section on page 1-7](#).

Figure 1-6 Duplex SC Connector

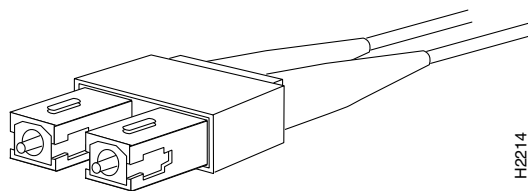
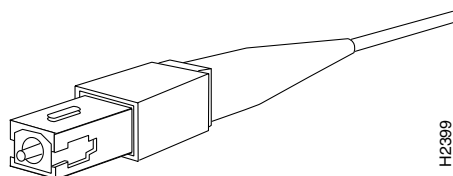


Figure 1-7 Simplex SC Connector



An appropriate fiber optic cable must be used to connect the PA-A3-OC3 to the ATM switch or circuit. These cables are available from Cisco as well as from commercial vendors.

Single-mode and multimode cables should perform to the specifications listed in [Table 1-4](#).

**Note**

A single fiber link should not mix 62.5- and 50-micron cable.

Table 1-4 *Fiber-Optic Cable Specifications*

| Standard | Maximum Path Length | Cabling |
|----------------------|--|---|
| ISO/IEC 9314-3 | 1.2 miles (2 km) all cables in a connection, end to end | 62.5-micron core with an optical loss of 0–9 dB, or 50-micron core with an optical loss of 7 dB |
| IEC 793-2 | 24.8 miles (40 km) for SML and 9.3 mi (15 km) for SMI | 9-micron core |
| ANSI/TIA/EIA-492CAAA | 24.8 miles (40 km) for SML and 9.3 miles (15 km) for SMI | 9-micron core |

Additional Information

This section describes the SONET specifications for fiber-optic transmissions, defines the power budget, and helps you approximate the power margin for multimode and single-mode transmissions. This section includes the following subsections:

- [SONET Distance Limitations, page 1-7](#)
- [SONET Frame Fundamentals, page 1-8](#)
- [Power Budget, page 1-9](#)
- [Approximating the PA-A3 Power Margin, page 1-10](#)
- [Multimode Power Budget Example with Sufficient Power for Transmission, page 1-11](#)
- [Multimode Power Budget Example of Dispersion Limit, page 1-11](#)
- [Single-Mode Transmission, page 1-11](#)
- [Using Statistics to Estimate the Power Budget, page 1-12](#)
- [References on Determining Attenuation and Power Budget, page 1-12](#)

SONET Distance Limitations

The SONET specification for fiber-optic transmission defines two types of 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. Because multiple modes of light propagating through the fiber travel different distances depending on the entry angles, causing 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.

The typical maximum distances for single-mode and multimode transmissions, as defined by SONET, are in [Table 1-5](#). If the distance between two connected stations is greater than this maximum distance, significant signal loss can result, making transmission unreliable.

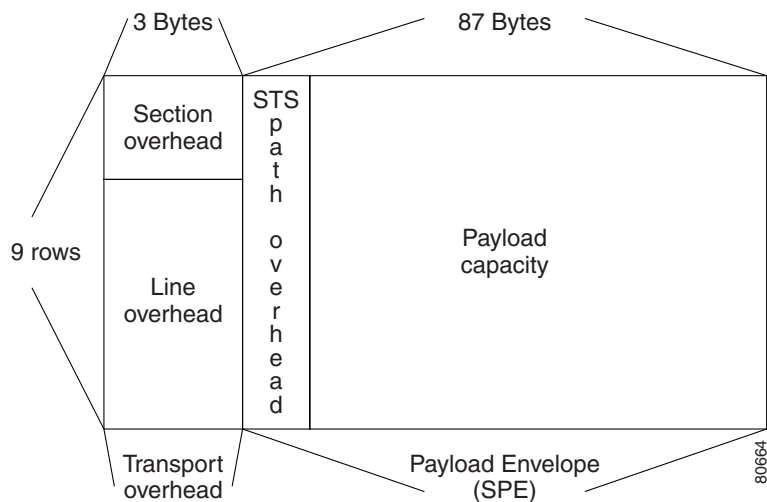
Table 1-5 *SONET Maximum Fiber-Optic Transmission Distances*

| Transceiver Type | Maximum Distance Between Stations |
|--------------------------------------|-----------------------------------|
| Single-mode long reach (SML) | Up to 24.8 miles (40 kilometers) |
| Single-mode intermediate reach (SMI) | Up to 9.3 miles (15 kilometers) |
| Multimode (MM) | Up to 1.2 miles (2 kilometers) |

SONET Frame Fundamentals

SONET is a Layer 1 protocol that uses a layered architecture. The following illustration shows SONET's three layers: section, line, and path. The Section OverHead (SOH) and Line OverHead (LOH) form the Transport OverHead (TOH), while the Path OverHead (POH) and actual payload form the Synchronous Payload Envelope (SPE). (See [Figure 1-8](#).)

Figure 1-8 *Three SONET Layers of a SONET Frame*



Each layer adds some number of overhead bytes to the SONET frame.

Table 1-6 illustrates the overhead bytes of the SONET frame.

Table 1-6 Overhead Bytes of the SONET Frame

| | | | | Path Overhead |
|-----------------------------|-----------------------------|-----------------------------|--------------|-------------------------|
| Section Overhead | A1 Framing | A2 Framing | A3 Framing | J1 Trace |
| | B1 BIP-8 | E1 Orderwire | E1 User | B3 BIP-8 |
| | D1 Data Com | D2 Data Com | D3 Data Com | C2 Signal Label |
| | H1 Pointer | H2 Pointer | H3 Pointer | G1 Path Status |
| Line Overhead | B2 BIP-8 | K1 | K2 | F2 User Channel |
| | D4 Data Com | D5 Data Com | D6 Data Com | H4 Indicator |
| | D7 Data Com | D8 Data Com | D9 Data Com | Z3 Growth |
| | D10 Data Com | D11 Data Com | D12 Data Com | Z4 Growth |
| | S1/Z1 Sync Status/Growth | M0 or M1/Z2 REI-L Growth | E2 Orderwire | Z5 Tandem Connection |

Power Budget

To design an efficient optical data link, evaluate the power budget. The power budget is the amount of light available to overcome attenuation in the optical link and to exceed the minimum power that the receiver requires to operate within its specifications. Proper operation of an optical data link depends on modulated light reaching the receiver with enough power to be correctly demodulated.

Attenuation, caused by the passive media components (cables, cable splices, and connectors), is common to both multimode and single-mode transmission.

The following variables reduce the power of the signal (light) transmitted to the receiver in multimode transmission:

- Chromatic dispersion (spreading of the signal in time because of the different speeds of light wavelengths)
- Modal dispersion (spreading of the signal in time because of the different propagation modes in the fiber)

Attenuation is significantly lower for optical fiber than for other media. For multimode transmission, chromatic and modal dispersion reduce the available power of the system by the combined dispersion penalty. The power lost over the data link is the sum of the component, dispersion, and modal losses.

Table 1-7 lists the factors of attenuation and dispersion for typical fiber-optic cable.

Table 1-7 Typical Fiber-Optic Link Attenuation and Dispersion Limits

| Limits | Single Mode | Multimode |
|-------------|-------------|-------------------------|
| Attenuation | 0.5 dB/km | 1.0 dB/km |
| Dispersion | No limit | 500 MHz/km ¹ |

1. The product of bandwidth and distance must be less than 500 MHz/km.

Approximating the PA-A3 Power Margin

The LED used for a multimode transmission light source creates multiple propagation paths of light, each with a different path length and time requirement to cross the optical fiber, causing signal dispersion (smear). Higher-order mode loss (HOL) results from light from the LED entering the fiber and being radiated into the fiber cladding. A worst-case estimate of power margin (PM) for multimode transmissions assumes minimum transmitter power (PT), maximum link loss (LL), and minimum receiver sensitivity (PR). The worst-case analysis provides a margin of error; not all of the parts of an actual system will operate at the worst-case levels.

The power budget (PB) is the maximum possible amount of power transmitted. The following equation lists the calculation of the power budget:

$$PB = PT - PR$$

$$PB = -20 \text{ dBm} - (-30 \text{ dBm})$$

$$PB = 10 \text{ dBm}$$

The power margin calculation is derived from the power budget minus the link loss, as follows:

$$PM = PB - LL$$

If the power margin is positive, as a rule, the link will work.

Table 1-8 lists the factors that contribute to link loss and the estimate of the link loss value attributable to those factors.

Table 1-8 Link Loss Factors and Values

| Link Loss Factor | Estimate of Link Loss Value |
|--------------------------------|--|
| Higher-order mode losses | 0.5 dB |
| Clock recovery module | 1 dB |
| Modal and chromatic dispersion | Dependent on fiber and wavelength used |
| Connector | 0.5 dB |
| Splice | 0.5 dB |
| Fiber attenuation | 1 dB/km |

After you calculate the power budget minus the data link loss, the result should be greater than zero. Circuits with results that are less than zero may have insufficient power to operate the receiver.

The SONET specification requires that the signal must meet the worst-case parameters listed in Table 1-9.

Table 1-9 PA-A3 Port Adapter SONET Signal Requirements

| | Single Mode (SML) | Single Mode (SMI) | Multimode |
|----|-------------------|-------------------|-----------|
| PT | -5 dBm | -15 dBm | -20 dBm |
| PR | -34 dBm | -31 dBm | -30 dBm |
| PB | 29 dBm | 16 dBm | 10 dBm |

Multimode Power Budget Example with Sufficient Power for Transmission

The following is a sample multimode power budget calculated based on the following variables:

Length of multimode link = 3 kilometers (km)

Four connectors

Three splices

Higher-order mode loss (HOL)

Clock recovery module (CRM)

Estimate the power budget as follows:

$$PB = 10 \text{ dB} - 3 \text{ km (1.0 dB/km)} - 4 (0.5 \text{ dB}) - 3 (0.5 \text{ dB}) - 0.5 \text{ dB (HOL)} - 1 \text{ dB (CRM)}$$

$$PB = 10 \text{ dB} - 3 \text{ dB} - 2 \text{ dB} - 1.5 \text{ dB} - 0.5 \text{ dB} - 1 \text{ dB}$$

$$PB = 2 \text{ dB}$$

The positive value of 2 dB indicates that this link would have sufficient power for transmission.

Multimode Power Budget Example of Dispersion Limit

Following is an example with the same parameters as the previous example, but with a multimode link distance of 4 km:

$$PB = 10 \text{ dB} - 4 \text{ km (1.0 dB/km)} - 4 (0.5 \text{ dB}) - 3 (0.5 \text{ dB}) - 0.5 \text{ dB (HOL)} - 1 \text{ dB (CRM)}$$

$$PB = 10 \text{ dB} - 4 \text{ dB} - 2 \text{ dB} - 1.5 \text{ dB} - 0.5 \text{ dB} - 1 \text{ dB}$$

$$PB = 1 \text{ dB}$$

The value of 1 dB indicates that this link would have sufficient power for transmission. But due to the dispersion limit on the link (4 km x 155.52 MHz > 500 MHz/km), this link would not work with multimode fiber. In this case, single-mode fiber would be the better choice.

Single-Mode Transmission

The single-mode signal source is an injection laser diode. Single-mode transmission is useful for longer distances, because there is a single transmission path within the fiber and smear does not occur. In addition, chromatic dispersion is also reduced because laser light is essentially monochromatic.

The receiver for single-mode intermediate reach (SMI) cannot be overloaded by the SMI transmitter and does not require a minimum fiber cable length or loss. The maximum receive power for single-mode long reach (SML) is -10 dBm, and the maximum transmit power is 0 dBm. The SML receiver can, therefore, be overloaded when short lengths of fiber are used. Overloading the receiver will not damage the receiver but can cause unreliable operation. To prevent overloading an SML receiver connected with short fiber links, insert a minimum 10-dB attenuator on the link between any single-mode long-reach transmitter and the receiver.

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 document. For further information, refer to UNI Forum specifications, ITU-T standards, and your equipment specifications.

References on Determining Attenuation and Power Budget

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

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

Port Adapter Slot Locations on the Supported Platforms

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

- [Catalyst RSM/VIP2 Slot Numbering, page 1-13](#)
- [Catalyst 6000 Family FlexWAN Module Slot Numbering, page 1-14](#)
- [Cisco 7100 Series Routers Slot Numbering, page 1-15](#)
- [Cisco 7200 Series Routers and Cisco 7200 VXR Routers Slot Numbering, page 1-15](#)
- [Cisco uBR7200 Series Router Slot Numbering, page 1-16](#)
- [Cisco 7201 Router Slot Numbering, page 1-17](#)
- [Cisco 7301 Router Slot Numbering, page 1-18](#)
- [Cisco 7304 PCI Port Adapter Carrier Card Slot Numbering, page 1-19](#)
- [Cisco 7401ASR Router Slot Numbering, page 1-20](#)
- [Cisco 7000 Series Routers and Cisco 7500 Series Routers VIP Slot Numbering, page 1-20](#)

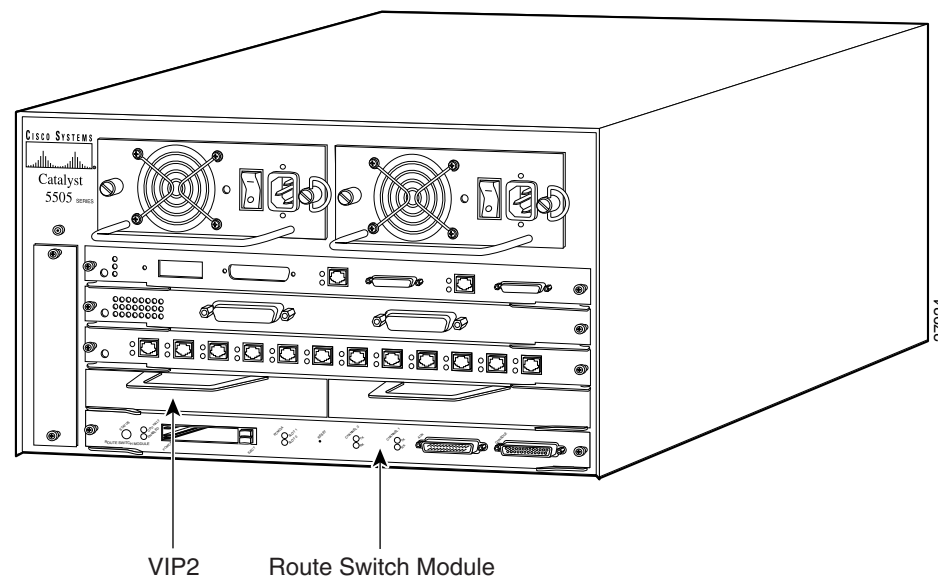
Catalyst RSM/VIP2 Slot Numbering

The Catalyst RSM/VIP2 can be installed in any slot in a Catalyst 5000 family switch except the top slots, which contain the supervisor engine modules. The Catalyst RSM/VIP2 does not use interface processor slot numbering; therefore, slots are not numbered. The PA-A3 can be installed into either port adapter slot 0 or 1 on a Catalyst RSM/VIP2. [Figure 1-9](#) shows a Catalyst RSM/VIP2 with two port adapters installed.

**Note**

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

Figure 1-9 Catalyst 5000 Family Switch with Port Adapters Installed on Catalyst RSM/VIP2



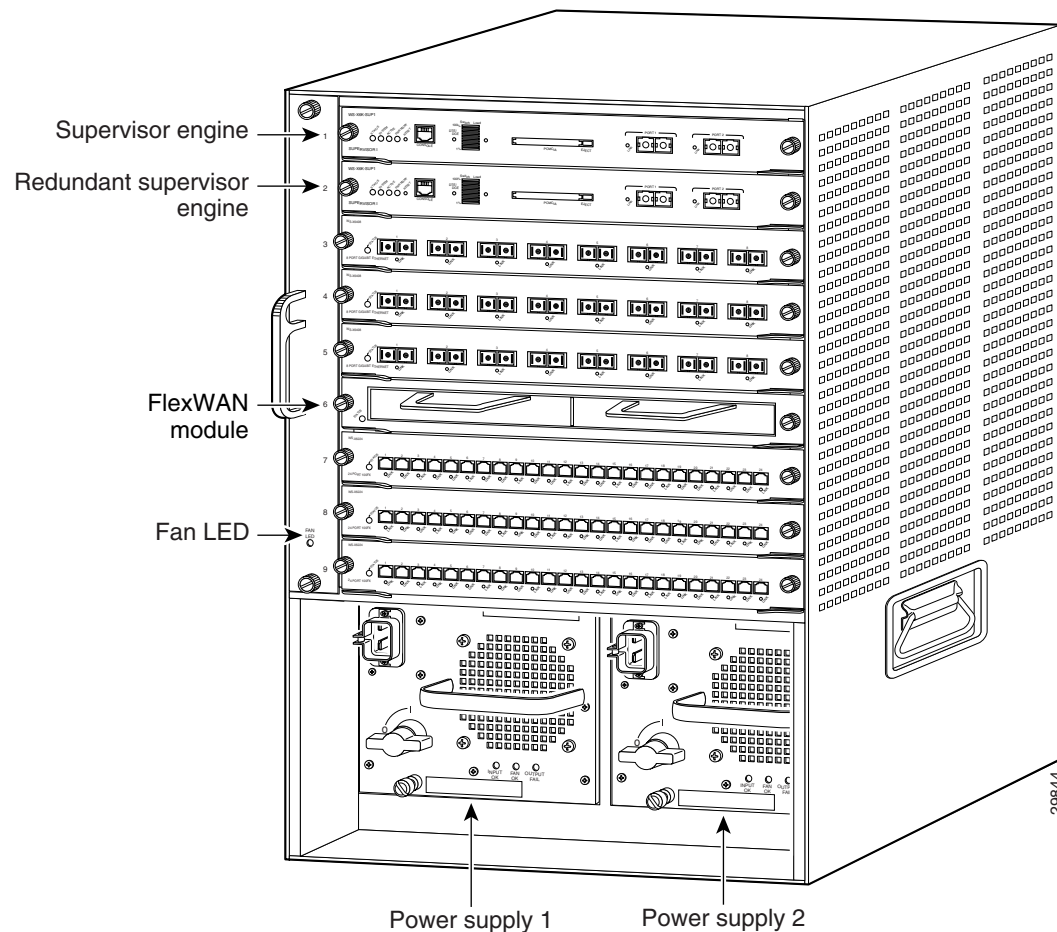
Catalyst 6000 Family FlexWAN Module Slot Numbering

The Catalyst 6000 family FlexWAN module can be installed in any slot in a Catalyst 6000 family switch except slot 1, which is reserved for the supervisor engine. The PA-A3 can be installed into either port adapter bay 0 or bay 1 on a FlexWAN module. [Figure 1-10](#) shows a FlexWAN module with two blank port adapters installed.


Note

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

Figure 1-10 Catalyst 6000 Family Switch with Port Adapters Installed on FlexWAN Module



Cisco 7100 Series Routers Slot Numbering

The PA-A3 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 1-11](#) shows the slot numbering on a Cisco 7120 series router. [Figure 1-12](#) shows the slot numbering on a Cisco 7140 series router.

Figure 1-11 Port Adapter Slots in the Cisco 7120 Series Router

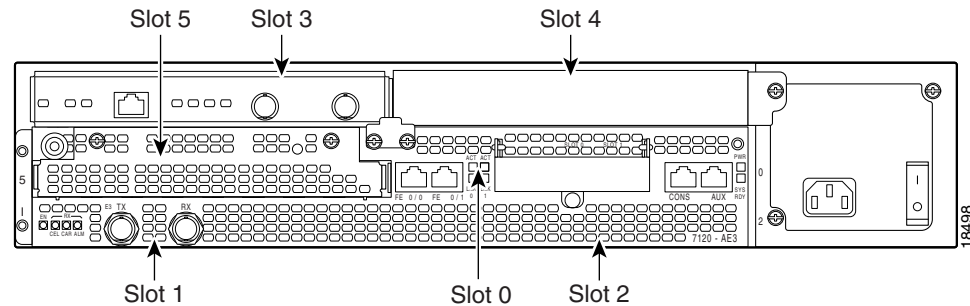
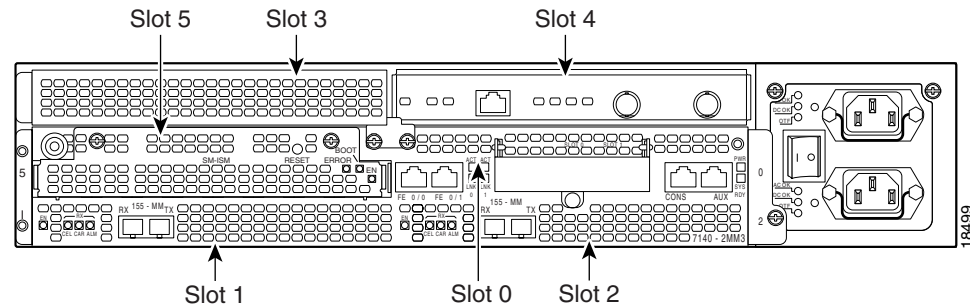


Figure 1-12 Port Adapter Slots in the Cisco 7140 Series Router



Cisco 7200 Series Routers and Cisco 7200 VXR Routers Slot Numbering

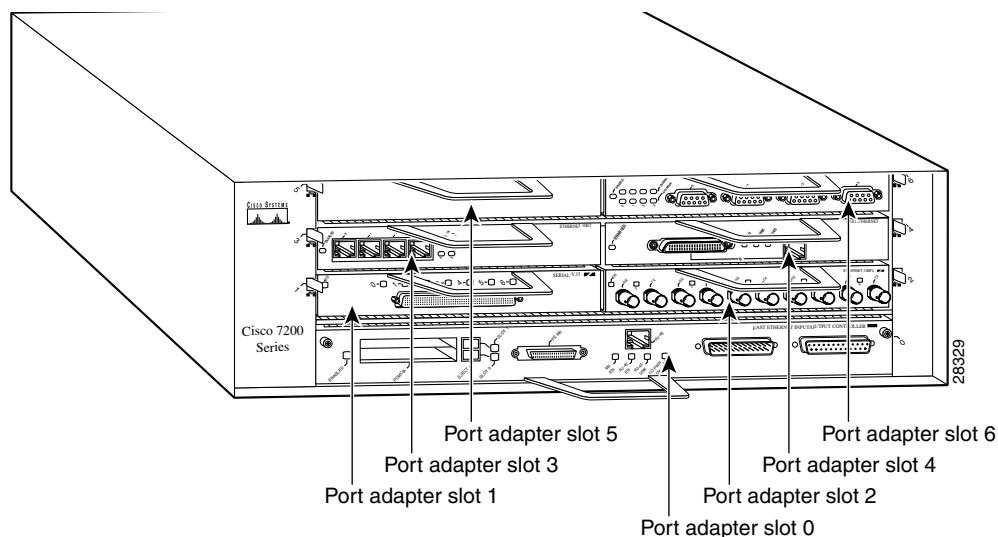
Cisco 7202 routers have two port adapter slots. The slots are numbered from left to right, slot 1 and slot 2. You can place the port adapters in either of the slots (slot 1 or slot 2).

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

Cisco 7206 routers and Cisco 7206VXR routers (including the Cisco 7206 and Cisco 7206VXR as router shelves in a Cisco AS5800 Universal Access Server) have six slots for port adapters, and one slot for an input/output (I/O) controller. The slots are numbered from the lower left to the upper right, beginning with slot 1 and continuing through slot 6. You can place the port adapters in any of the six slots (slot 1 through slot 6). Slot 0 is always reserved for the I/O controller.

Figure 1-13 shows the slot numbering on a Cisco 7206 router.

Figure 1-13 Port Adapter Slots in the Cisco 7206 Router



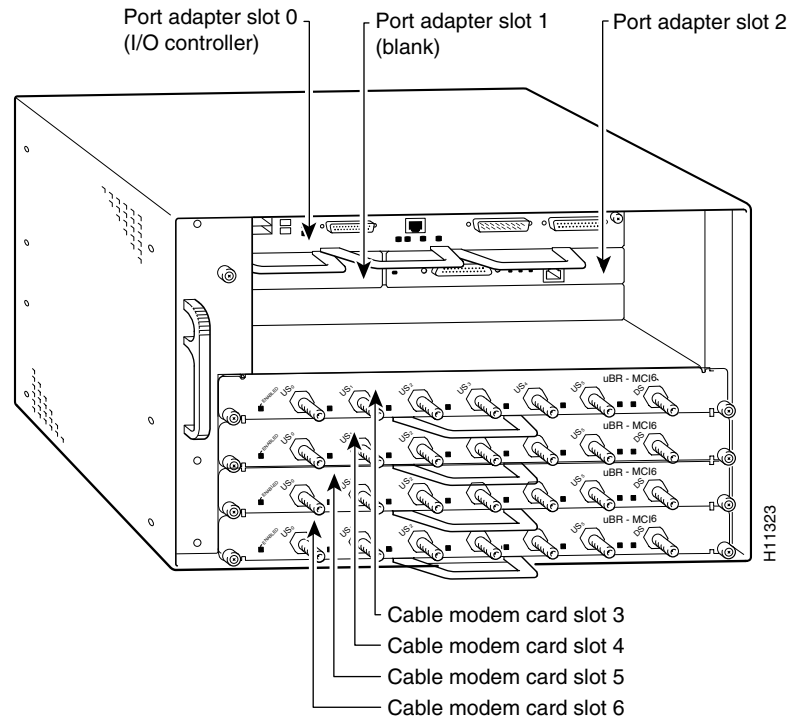
Cisco uBR7200 Series Router Slot Numbering

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

The Cisco uBR7246 router and Cisco uBR7246VXR router have two port adapter slots (slot 1 and slot 2). Slot 0 is always reserved for the I/O controller—if present.

Figure 1-14 shows the slot numbering of port adapters on a Cisco uBR7246 router or Cisco uBR7246VXR router.

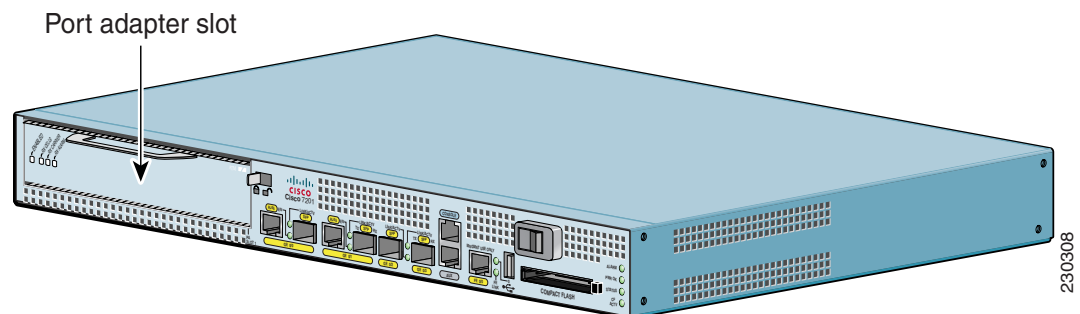
Figure 1-14 Port Adapter Slots in the Cisco uBR7246 and Cisco uBR7246 VXR Routers



Cisco 7201 Router Slot Numbering

Figure 1-15 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.

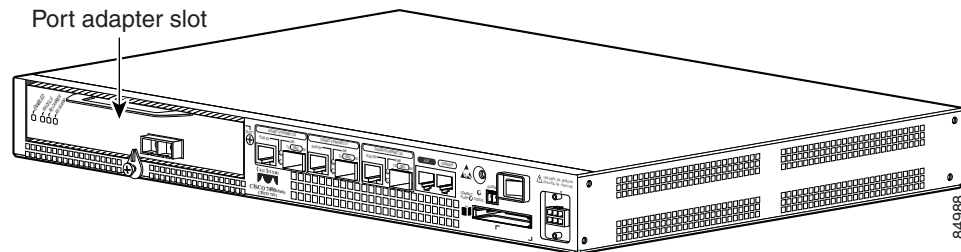
Figure 1-15 Port Adapter Slot in the Cisco 7201 Router



Cisco 7301 Router Slot Numbering

Figure 1-16 shows the front view of a Cisco 7301 router with a port adapter installed. There is only one port adapter slot (slot 1) in a Cisco 7301 router.

Figure 1-16 Port Adapter Slot in the Cisco 7301 Router



Cisco 7304 PCI Port Adapter Carrier Card Slot Numbering

The Cisco 7304 PCI port adapter carrier card installs into Cisco 7304 router module slots 2 through 5. [Figure 1-17](#) 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 1-18](#) 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 1-17 Cisco 7304 PCI Port Adapter Carrier Card—Port Adapter Installed

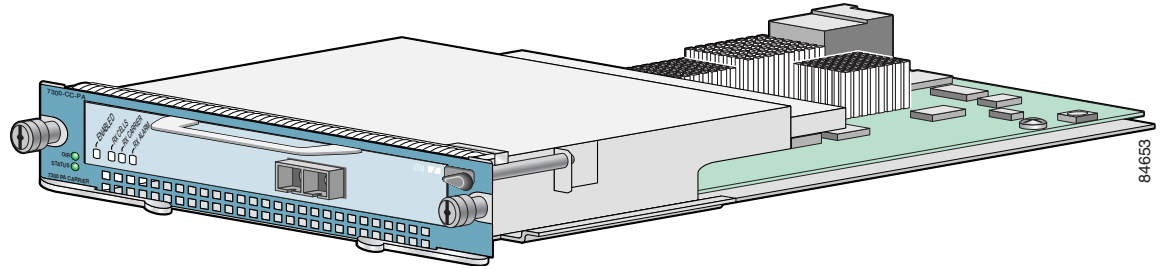
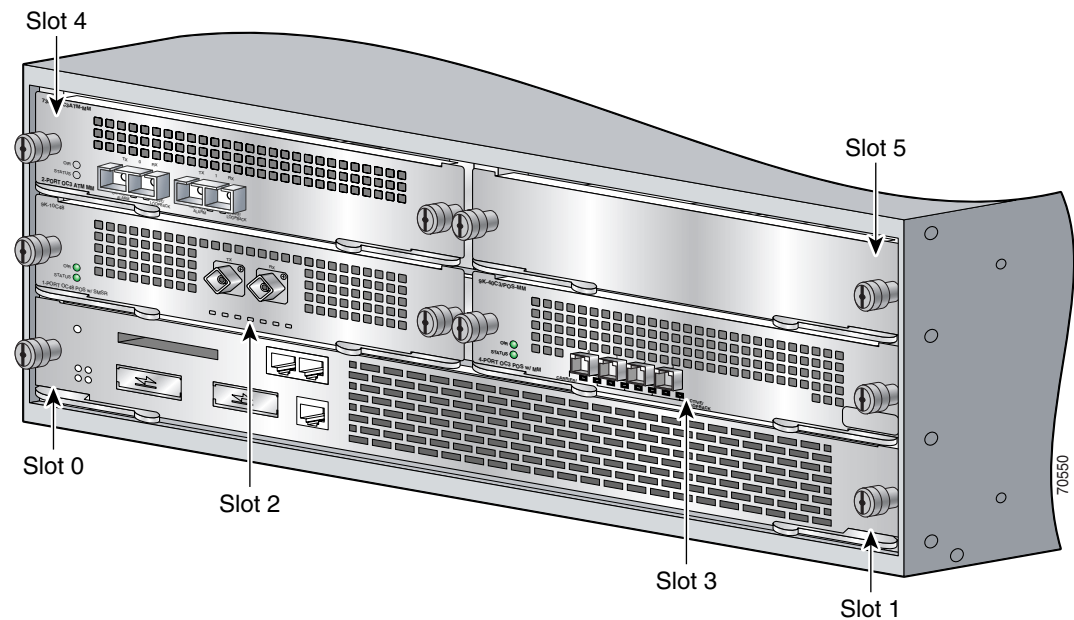


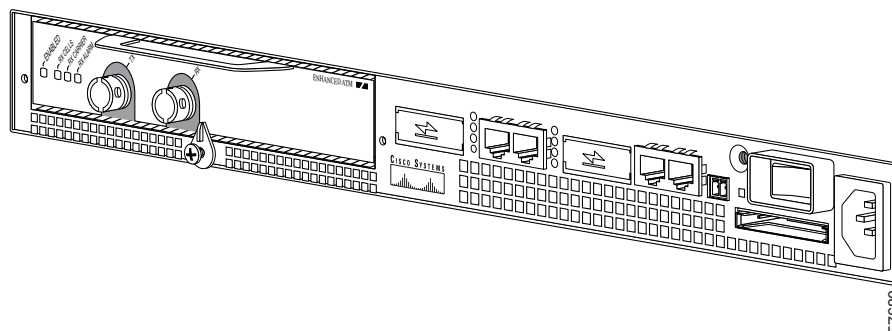
Figure 1-18 Module Slots on the Cisco 7304 Router



Cisco 7401ASR Router Slot Numbering

Figure 1-19 shows the front view of a Cisco 7401ASR router with a port adapter installed. There is only one port adapter slot (slot 1) in a Cisco 7401ASR router.

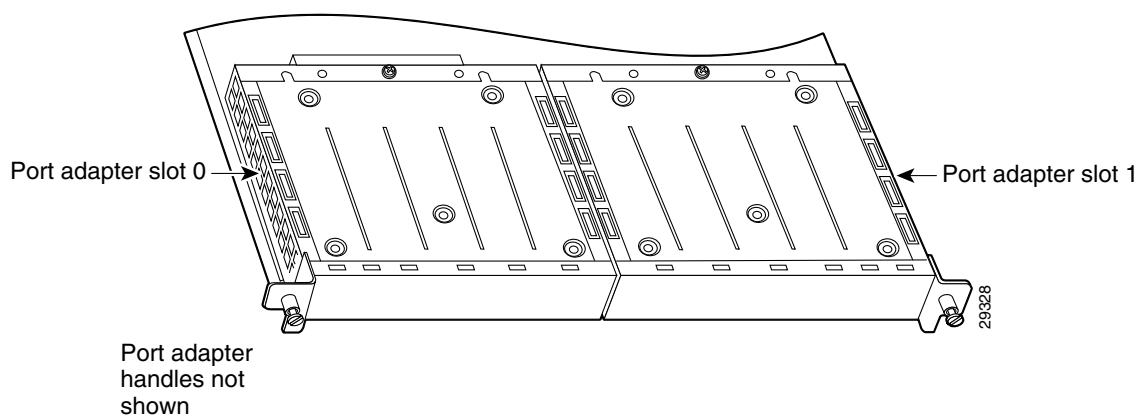
Figure 1-19 Port Adapter Slot in the Cisco 7401ASR Router



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

Port adapters are supported on the VIPs (versatile interface processors) used in Cisco 7000 series and Cisco 7500 series routers. In the Cisco 7010 router and Cisco 7505 router, the VIP motherboard is installed horizontally in the VIP slot. In the Cisco 7507 router and Cisco 7513 router, the VIP motherboard is installed vertically in the VIP slot. A port adapter can be installed in either bay (port adapter slot 0 or 1) on the VIP. The bays are numbered from left to right on the VIP. Figure 1-20 shows the slot numbering on a VIP.

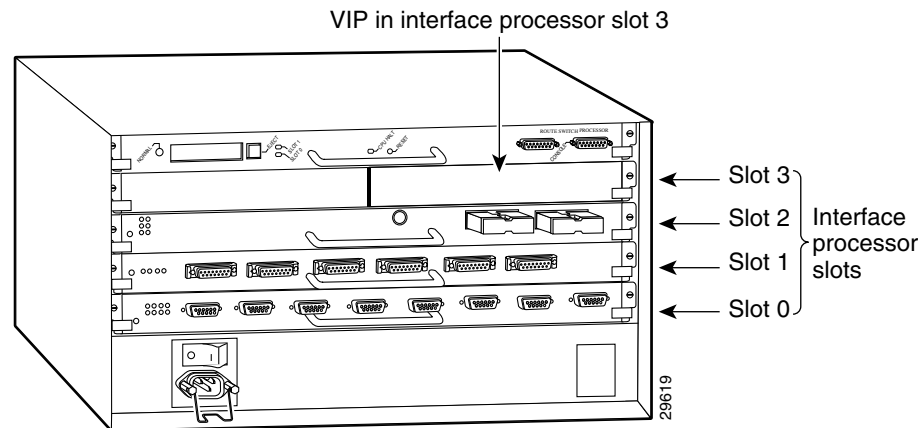
Figure 1-20 VIP Slot Locations—Partial View, Horizontal Orientation



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

Cisco 7505 routers have four slots for port adapters, and one slot for an RSP. The slots are numbered from bottom to top. You can place a port adapter in any of the VIP interface slots (slot 0 through 3). One slot is always reserved for the RSP. [Figure 1-21](#) shows the slot numbering on a Cisco 7505 router.

Figure 1-21 VIP Slots in the Cisco 7505 Router



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

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

Identifying Interface Addresses

This section describes how to identify the interface address of the PA-A3 in supported platforms. Interface addresses specify the actual physical location of each interface on a router or switch.

Interfaces on a PA-A3 installed in a router or switch maintain the same address regardless of whether other port adapters are installed or removed. However, when you move a port adapter to a different slot, the first number in the interface address changes to reflect the new port adapter slot number.

Interfaces on a PA-A3 installed in a VIP or FlexWAN module maintain the same address regardless of whether other interface processors or modules are installed or removed. However, when you move a VIP or FlexWAN module to a different slot, the interface processor or module slot number changes to reflect the new interface processor or module slot.



Note

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

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

- [Catalyst RSM/VIP2 Interface Addresses, page 1-23](#)
- [Catalyst 6000 Family FlexWAN Module Interface Addresses, page 1-23](#)
- [Cisco 7100 Series Routers Interface Addresses, page 1-24](#)
- [Cisco 7200 Series Routers and Cisco 7200 VXR Routers Interface Addresses, page 1-24](#)
- [Cisco 7201 Router Slot Numbering, page 1-17](#)
- [Cisco 7201 Router Interface Addresses, page 1-24](#)
- [Cisco 7301 Router Interface Addresses, page 1-25](#)
- [Cisco 7304 PCI Port Adapter Carrier Card Interface Addresses, page 1-25](#)
- [Cisco 7401ASR Router Interface Addresses, page 1-25](#)
- [Cisco 7000 Series Routers and Cisco 7500 Series Routers VIP Interface Addresses, page 1-25](#)

Table 1-10 summarizes the interface address formats for the supported routers.

Table 1-10 **Identifying Interface Addresses**

| Platform | Interface Address Format | Numbers | Syntax |
|--|--|---|-----------|
| Catalyst RSM/VIP2 in Catalyst 5000 family switches | Port-adapter-slot-number/interface-port-number | Port adapter slot—0 or 1 Interface port—0 | 0 / 0 |
| Catalyst 6000 family FlexWAN module in Catalyst 6000 family switches | Module-slot-number/port-adapter-bay-number/ interface-port-number | Module slot —2 ¹ through 13 (depends on the number of slots in the switch) Port adapter bay—0 or 1 Interface port—0 | 3 / 0 / 0 |
| 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 series routers and Cisco 7200 VXR routers | Port-adapter-slot-number/interface-port-number | Port adapter slot—1 through 6 (depends on the number of slots in the router) ² Interface port—0 | 1 / 0 |
| Cisco 7201 router | Port-adapter-slot-number/interface-port-number | Port adapter slot—always 1 Interface port—0 | 1 / 0 |
| Cisco uBR7223 router | Port-adapter-slot-number/interface-port-number | Port adapter slot—always 1 ² Interface port—0 | 1 / 0 |
| Cisco uBR7246 and Cisco uBR7246 VXR routers | Port-adapter-slot-number/interface-port-number | Port adapter slot—1 or 2 ² Interface port—0 | 1 / 0 |
| Cisco 7301 routers | Port-adapter-slot-number/interface-port-number | Port adapter slot—always 1 Interface port—0 | 1 / 0 |

Table 1-10 **Identifying Interface Addresses (continued)**

| Platform | Interface Address Format | Numbers | Syntax |
|--|--|---|-----------|
| Cisco 7304 PCI Port Adapter Carrier Card in Cisco 7304 routers | Module-slot-number/interface-port-number | Module slot—2 through 5 Interface port—0 | 3 / 0 |
| Cisco 7401ASR router | Port-adapter-slot-number/interface-port-number | Port adapter slot—always 1 Interface port—0 | 1 / 0 |
| VIP in Cisco 7000 series routers or Cisco 7500 series routers | Interface-processor-slot-number/port-adapter-slot-number/interface-port-number | Interface processor slot—0 through 12 (depends on the number of slots in the router) Port adapter slot— or 1 Interface port—0 | 3 / 1 / 0 |

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

Catalyst RSM/VIP2 Interface Addresses

In Catalyst 5000 family switches, the Catalyst RSM/VIP2 can be installed in any slot except the top slots, which contain the supervisor engine modules. The Catalyst RSM/VIP2 in a Catalyst 5000 family switch does not use interface processor slot numbering; therefore, the slots in which it is installed are not numbered. A port adapter can be installed into either port adapter slot 0 or slot 1 on a Catalyst RSM/VIP2. See [Figure 1-9](#).

The interface address is composed of a two-part number in the format *port-adapter-slot number/interface-port number*. See [Table 1-10](#). For example, if the single-port PA-A3 is installed in port adapter slot 1 of a Catalyst RSM/VIP2 in a Catalyst 5000 family switch, the interface address would be 1/0.

Catalyst 6000 Family FlexWAN Module Interface Addresses

In Catalyst 6000 family switches, the Catalyst 6000 family FlexWAN module can be installed in module slots 2 through 13 (depending on the number of slots in the router). Slot 1 is reserved for the supervisor engine. A port adapter can be installed into either port adapter bay 0 or bay 1 on a FlexWAN module. See [Figure 1-10](#).

The interface address is composed of a three-part number in the format *module-number/port-adapter-bay-number/interface-port-number*. See [Table 1-10](#).

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

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

The third number identifies the physical port number on the port adapter. The PA-A3 is a single-port port adapter, therefore the port is always 0.

For example, if the single-port PA-A3 is installed in a FlexWAN module in module slot 3, port adapter bay 0, then the interface address is 3/0/0 (module slot 3, port adapter bay 0, and interface 0).

**Note**

The FlexWAN module physical port address begins with slot 0, which differs from the conventional Catalyst 6000 family port address, which begins with slot 1.

Cisco 7100 Series Routers Interface Addresses

In Cisco 7120 series router, port adapters are installed in port adapter slot 3. See [Figure 1-11](#). In the Cisco 7140 series router, port adapters are installed in port adapter slot 4. 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 1-10](#). For example, if the single-port PA-A3 is installed on a Cisco 7120 router, the interface address would be 3/0. If the single-port PA-A3 is installed on a Cisco 7140 router, the interface address would be 4/0.

Cisco 7200 Series Routers and Cisco 7200 VXR Routers Interface Addresses

In Cisco 7200 series routers and Cisco 7200 VXR routers, port adapter slots are numbered from the lower left to the upper right, beginning with slot 1 and continuing through slot 2 for the Cisco 7202, slot 4 for the Cisco 7204 and Cisco 7204VXR, and slot 6 for the Cisco 7206 and Cisco 7206VXR. 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 1-13](#).

The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See [Table 1-10](#). For example, if the single-port PA-A3 is installed in slot 1 of a Cisco 7200 series router, the interface address would be 1/0.

Cisco uBR7200 Series Routers Interface Addresses

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

In the Cisco uBR7246 router and Cisco uBR7246VXR router, port adapters can be installed in two port adapter slots (slot 1 and slot 2). Slot 0 is always reserved for the I/O controller—if present. See [Figure 1-14](#).

The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See [Table 1-10](#). For example, if the single-port PA-A3 is installed in slot 1 of a Cisco uBR7223 series router, the interface address would be 1/0. If the single-port PA-A3 were installed in slot 2 of a Cisco uBR7246 or Cisco uBR7246VXR router, the interface address would be 2/0.

Cisco 7201 Router Interface Addresses

In the Cisco 7201 router, only one slot accepts port adapters and it is numbered as slot 1. See [Figure 1-15](#).

The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See [Table 1-10](#). For example, if the single-port PA-A3 is installed in a Cisco 7201 router, the interface address would be 1/0.

Cisco 7301 Router Interface Addresses

In the Cisco 7301 router, only one slot accepts port adapters and it is numbered as slot 1. See [Figure 1-16](#).

The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See [Table 1-10](#). For example, if the single-port PA-A3 is installed in a Cisco 7301 router, the interface address would be 1/0.

Cisco 7304 PCI Port Adapter Carrier Card Interface Addresses

In the Cisco 7304 router, port adapters are installed in a Cisco 7304 PCI port adapter carrier card, which installs in Cisco 7304 router module slots 2 through 5. The port adapter slot number is the same as the module slot number. See [Figure 1-17](#) and [Figure 1-18](#).

The interface address is composed of a two-part number in the format *module-slot-number/interface-port-number*. See [Table 1-10](#). For example, if the single-port PA-A3 is installed in the Cisco 7304 PCI port adapter carrier card in Cisco 7304 router module slot 3, the interface address would be 3/0.

Cisco 7401ASR Router Interface Addresses

In the Cisco 7401ASR router, only one slot accepts port adapters and it is numbered as slot 1. See [Figure 1-19](#).

The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See [Table 1-10](#). For example, if the single-port PA-A3 is installed in a Cisco 7401ASR router, the interface address would be 1/0.

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

In Cisco 7000 series routers and Cisco 7500 series routers, port adapters are installed on a versatile interface processor (VIP), which installs in interface processor slots 0 through 12 (depending on the number of slots in the router). The port adapter can be installed in either bay (port adapter slot 0 or 1) on the VIP. See [Figure 1-20](#) and [Figure 1-21](#).

The interface address for the VIP is composed of a three-part number in the format *interface-processor-slot-number/port-adapter-slot-number/interface-port-number*. See [Table 1-10](#).

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

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

The third number identifies the physical port number (interface port number) on the port adapter. The port numbers always begin at 0 and are numbered from left to right. The number of additional ports depends on the number of ports on the port adapter. The PA-A3 is a single-port port adapter, therefore the port is always 0.

For example, if the single-port PA-A3 is installed in a VIP in interface processor slot 3, port adapter slot 1, the interface address would be 3/1/0 (interface processor slot 3, port adapter slot 1, and interface 0).

**Note**

Although the processor slots in the seven-slot Cisco 7000 and Cisco 7507 chassis and the thirteen-slot Cisco 7513 and Cisco 7576 chassis are vertically oriented and those in the five-slot Cisco 7010 and Cisco 7505 chassis are horizontally oriented, all Cisco 7000 series routers and Cisco 7500 series routers use the same method for slot and port numbering.