CHAPTER 1

Overview

This chapter describes the PA-POS-2OC3 port adapter and contains the following sections:

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- SONET/SDH Overview, page 1-2
- Features, page 1-3
- Interface Specifications, page 1-3
- OC-3 Optical Fiber Specifications, page 1-4
- Using Statistics to Estimate Link Loss and Power Budget, page 1-5
- LEDs, page 1-6
- Cables and Connectors, page 1-6
- Port Adapter Slot Locations by Platform, page 1-7
- Identifying Interface Addresses, page 1-20

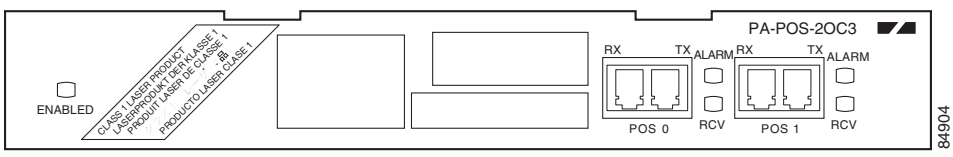
Port Adapter Overview

The PA-POS-2OC3 provides two Packet-over-SONET (POS) ports in a single port adapter slot. The two ports function as either dual independent OC-3c/STM1 ports or a single port with automatic protection switching (APS). The PA-POS-2OC3 is used as a direct connection between the supported router or switch platform and external networks.

The PA-POS-2OC3 fits into a single port adapter slot on the Cisco 7204VXR router, Cisco 7206VXR router, Cisco 7201 router, Cisco 7301 router, Cisco 7304 PCI port adapter carrier card in a Cisco 7304 router, Cisco 7401ASR router, Cisco 7500 series routers (Cisco 7505, Cisco 7507, Cisco 7513), and the Cisco 7600 series routers with FlexWAN or Enhanced FlexWAN.

Note The Cisco 7206VXR router can be used as a router shelf in a Cisco AS5800 universal access server.

Figure 1-1 PA-POS-2OC3 Faceplate



SONET/SDH Overview

The POS specification addresses the use of PPP encapsulation over SONET/Synchronous Digital Hierarchy (SDH) links. SONET is an American National Standards Institute (ANSI) standard (T1.1051988) for optical digital transmission at hierarchical rates from 51.840 Mbps (STS-1) to 2.5 Gbps (STS-48) and greater. SDH is the international standard for optical digital transmission at hierarchical rates from 155.520 Mbps (STM-1) to 2.5 Gbps (STM-16) and greater.

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

SONET is an octet-synchronous multiplex scheme that defines a family of standard rates and formats. The basic rate for POS is that of STS-3c/STM-1, which is 155.520 Mbps. The available information bandwidth is 149.760 Mbps, which is the STS-3c/STM-1 Synchronous Payload Envelope (SPE), the payload portion of the SONET frame into which the octet-oriented user data is mapped. (Octet boundaries are aligned with the SPE octet boundaries.) For the SPE with the Cisco PA-POS-2OC3, section, line, and path overhead are removed.

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

SONET[1]	SDH Equivalent
STS-3c[2]	STM-1[2]
STS-12c	STM-4c
STS-48c	STM-16c

1. ANSI-defined SONET specifications.
2. Supported by the PA-POS-2OC3.

Despite the name, SONET is not limited to optical links. Electrical specifications have been defined for single-mode fiber, multimode fiber, and CATV 75-ohm coaxial cable. The PA-POS-2OC3 allows transmission over single-mode and multimode optical fiber. Transmission rates are integral multiples of 51.840 Mbps, which can be used to carry T3/E3 bit-synchronous signals.

The following transmission multiples are currently specified and commonly used:

- STS-3c—155.520 Mbps (the PA-POS-2OC3 conforms to STS-3c)
- STS-12c—622.080 Mbps
- STS-48c—2,488.320 Mbps

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

- Simpson, W., Editor, *The Point-to-Point Protocol (PPP)*, RFC 1548, Daydreamer, December 1993.
- Simpson, W., Editor, *PPP in HDLC Framing*, RFC 1662, Daydreamer, July 1994.
- Simpson, W, Editor, *PPP Over SONET/SDH*, RFC1619, May 1995.
- *American National Standard for Telecommunications - Digital Hierarchy - Optical Interface Rates and Formats Specification*, ANSI T1.105-1991.
- *American National Standard for Telecommunications - Synchronous Optical Network (SONET) Payload Mappings*, ANSI T1.105.02-1993 draft.

  ITU-T Recommendation G.707, *Synchronous Digital Hierarchy Bit Rates*, June 1992.

Features

The PA-POS-2OC3 features include:

- Dual-port Packet-over-SONET capabilities with a single-width port adapter
- Single Product ID (PA-POS-2OC3), with configuration options for small form-factor pluggable (SFP) optic modules:
  - POM-OC3-MM (short range, multimode fiber)
  - POM-OC3-SMIR (intermediate range, single-mode fiber)
  - POM-OC3-SMLR (long range, single-mode fiber)
- Ability to use a combination of any two of the SFP modules
- Field-replaceable SFP optic modules
- Automatic protection switching (APS)
- Supports network processing and switching engines—NPE-400, NPE-G1, NSE-1 on the Cisco 7200 VXR platform
- Supports versatile interface processors— VIP4-50, VIP4-80, and VIP6-80 on the Cisco 7500 series routers
- Supports Cisco route switch processors—RSP4+, RSP8, and RSP16 on the Cisco 7500 series routers
- Supports the Cisco 7304 PCI port adapter carrier card on the Cisco 7304 router
- Supports the FlexWAN and Enhanced FlexWAN modules for the Cisco 7600 series routers
- Supports online insertion and removal (OIR)
  - For more information, see the "Online Insertion and Removal" section on page 3-2.
- Standards-compliant SONET/SDH interface; SONET/STS-3c and SDH/STM-1 framing and signaling overhead
- Full-duplex operation at 155 Mbps (half-duplex operation is not supported)
- Self-synchronous X^43+1 scrambling and descrambling of packets
- Support for 16- and 32-bit cyclic redundancy checking (CRC-16 and CRC-32)
- Single-mode or multimode fiber-optic cables capability
  - For information on the single-mode and multimode cables to use with the Cisco PA-POS-2OC3 port adapter, see the "Cables and Connectors" section on page 1-6.

Interface Specifications

The physical layer interface for the PA-POS-2OC3 is Optical Carrier-3 (OC-3c), the specification for SONET STS-3c and SDH STM-1 transmission rates), and the PA-POS-2OC3 is designed to comply with Packet-over-SONET specifications. The PA-POS-2OC3 provides two 155.520-Mbps Packet OC-3 network interfaces for all supported platforms.

Each PA-POS-2OC3 has two duplex LC-type receptacles that allow connection to single-mode or multimode optical fiber. (For more information on the optical fiber cables you use with this port adapter, see the "Cables and Connectors" section on page 1-6.)

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

The PA-POS-2OC3 interface is compliant with RFC 1619, *PPP over SONET/SDH*, and RFC 1662, *PPP in HDLC-like Framing*. The PA-POS-2OC3 supports RFC 1619 PPP-over-SONET/SDH encapsulation, and provides support for SNMP agent v1 (RFC 1155-1157), and Management Information Base (MIB) II (RFC 1213).

OC-3 Optical Fiber Specifications

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

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

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

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

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

Table 1-1 OC-3 Optical Parameters

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

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

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

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

Network Management Support

Following is the protocol and MIB support for the Cisco PA-POS-2OC3:

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

Encapsulation Method Support

The following encapsulation methods are supported by the Cisco PA-POS-2OC3:

- RFC 1619 Point-to-Point Protocol over SONET/SDH

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

Using Statistics to Estimate Link Loss and Power Budget

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

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

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

LEDs

The PA-POS-2OC3 faceplate has five LEDs that indicate port adapter and interface status. (See Figure 1-2.)

Figure 1-2 PA-POS-2OC-3 LEDs

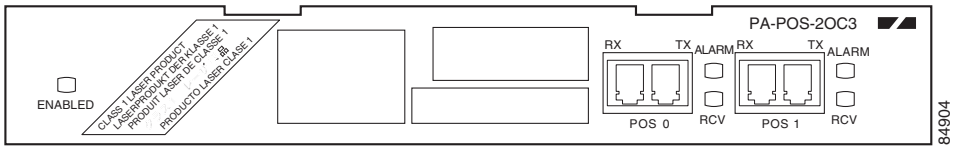


Table 1-2 lists the LEDs colors, status, and function.

Table 1-2 PA-POS-2OC3 LEDs

LED Label	Color	State	Function
ENABLED	Green	On	Enabled for operation
ALARM	Orange	On	There are SONET alarms on the interface
RCV	Green	On	Receive signal is present (a cable is attached and the link is up)
	Green	Blinking	Packets are currently being received

After system initialization, the ENABLED LED comes on to indicate that power is received and that the PA-POS-2OC3 is enabled for operation.

The following conditions must all be met before the PA-POS-2OC3 is enabled:

- The PA-POS-2OC3 is correctly connected and receiving power.
- The host system software supports the PA-POS-2OC3.

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

Cables and Connectors

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

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

The PA-POS-2OC3 provides the following optical fiber options:

- Multimode—155 Mbps, OC-3 optical fiber (SONET STS-3c or SDH STM-1)

  Use a multimode optical fiber that has a core/cladding diameter of 62.5/125 microns.

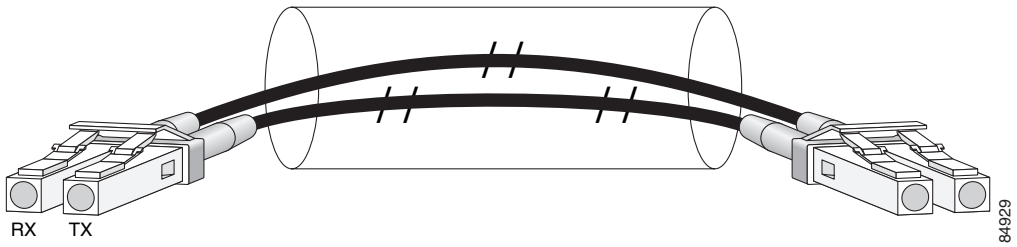
- Single-mode—155 Mbps, OC-3 optical fiber (SONET STS-3c or SDH STM-1)

  Use a single-mode optical fiber that has a modal-field diameter of 8.7 ±0.5 microns. (Nominal diameter is approximately 10/125 microns.)

Note For maximum cable lengths between stations, see Table 1-1 on page 1-4. Single-mode and multimode optical fiber cables for the PA-POS-2OC3 are not available from Cisco Systems; they are available from commercial cable vendors.

The PA-POS-2OC3 has two duplex LC-type receptacles. For SONET/SDH single-mode and multimode optical fiber connections, you can use either a duplex LC-type cable (see Figure 1-3) or two simplex LC-type cables, one for transmit (TX) and one for receive (RX).

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



Note For important laser and LED safety information, see the "Laser and LED Safety" section on page 2-12.

Port Adapter Slot Locations by Platform

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

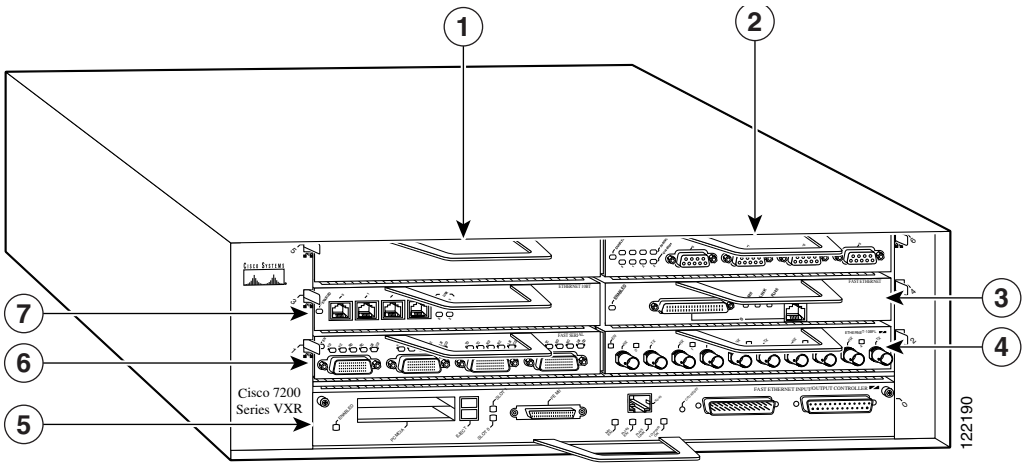
- Cisco 7200 VXR Routers Slot Numbering, page 1-8
- Cisco 7200 VXR Router with the Port Adapter Jacket Card Slot Numbering, page 1-9
- Cisco 7201 Router Slot Numbering, page 1-10
- Cisco 7301 Router Slot Numbering, page 1-10
- Cisco 7304 PCI Port Adapter Carrier Card Slot Numbering, page 1-11
- Cisco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

Cisco 7200 VXR Routers Slot Numbering

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

Cisco 7206VXR routers (including the Cisco 7206VXR routers as router shelves in a Cisco AS5800 Universal Access Server) have six slots for port adapters, and one slot for an input/output (I/O) controller. The slots are numbered from the lower left to the upper right, beginning with slot 1 and continuing through slot 6. You can place a port adapter in any of the six slots (slot 1 through slot 6). Slot 0 is always reserved for the I/O controller. Figure 1-4 shows the slot numbering on a Cisco 7206VXR router.

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

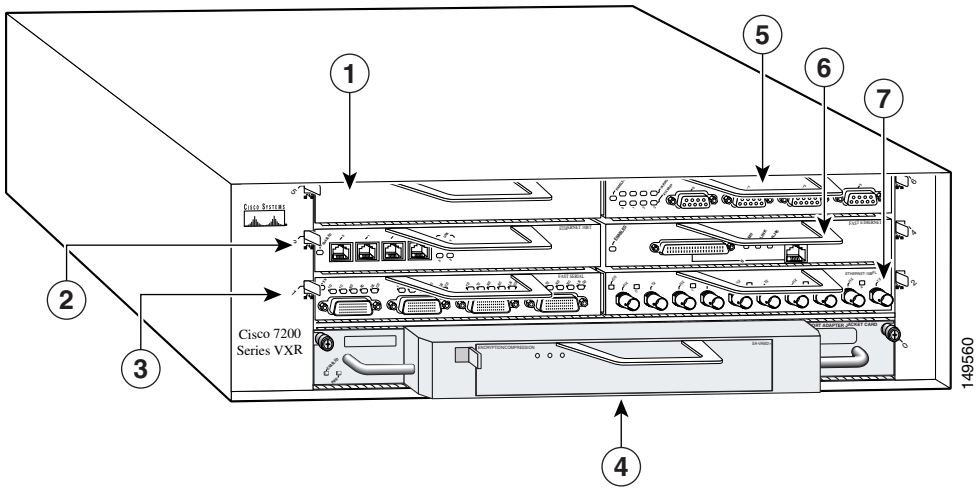


1	Port adapter slot 5 (blank)	**5**	Port adapter slot 0 (Fast Ethernet port)
2	Port adapter slot 6	**6**	Port adapter slot 1
3	Port adapter slot 4	**7**	Port adapter slot 3
4	Port adapter slot 2		

Cisco 7200 VXR Router with the Port Adapter Jacket Card Slot Numbering

With an NPE-G1 or NPE-G2 installed, port adapter slot 0 of the Cisco 7204VXR router or the Cisco 7206VXR router can accept the Port Adapter Jacket Card. When the Port Adapter Jacket Card resides in port adapter slot 0, the port adapter in the Port Adapter Jacket Card is in port adapter slot 5 on the Cisco 7204 VXR router, or port adapter slot 7 on the Cisco 7206 VXR router. Figure 1-5 shows the slot numbering of port adapters on a Cisco 7206 VXR router when a Port Adapter Jacket Card is installed.

Figure 1-5 Port Adapter Slots in Cisco 7206 VXR Router with the Port Adapter Jacket Card

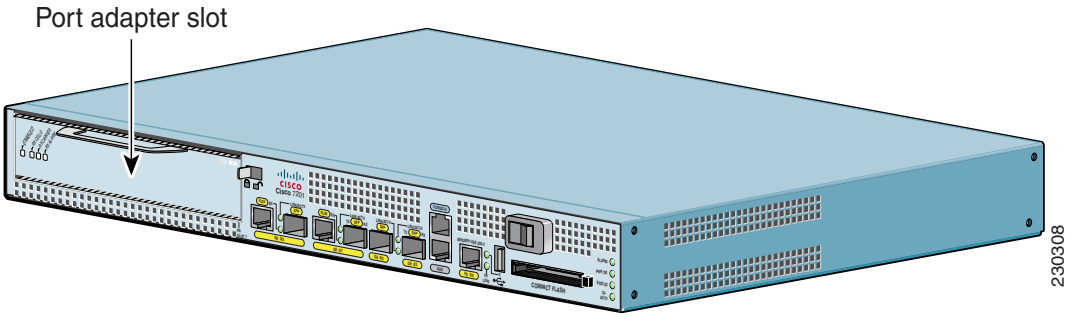


1	Slot 5	**5**	Slot 6
2	Slot 3	**6**	Slot 4
3	Slot 1	**7**	Slot 2
4	Slot 7–port adapter (slot 0–Jacket Card)		

Cisco 7201 Router Slot Numbering

Figure 1-6 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.

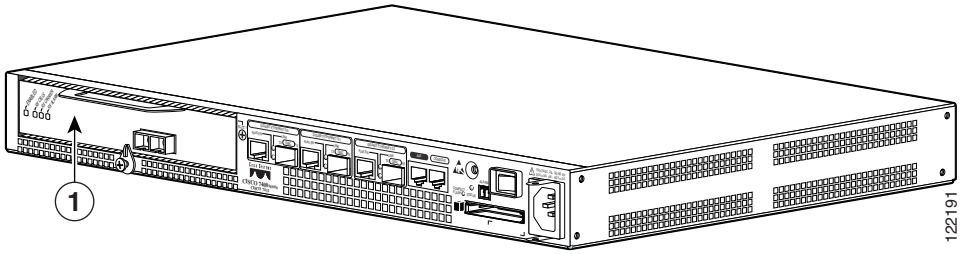
Figure 1-6 Port Adapter Slot in the Cisco 7201 Router



Cisco 7301 Router Slot Numbering

Figure 1-7 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 1-7 Port Adapter Slot in the Cisco 7301 Router

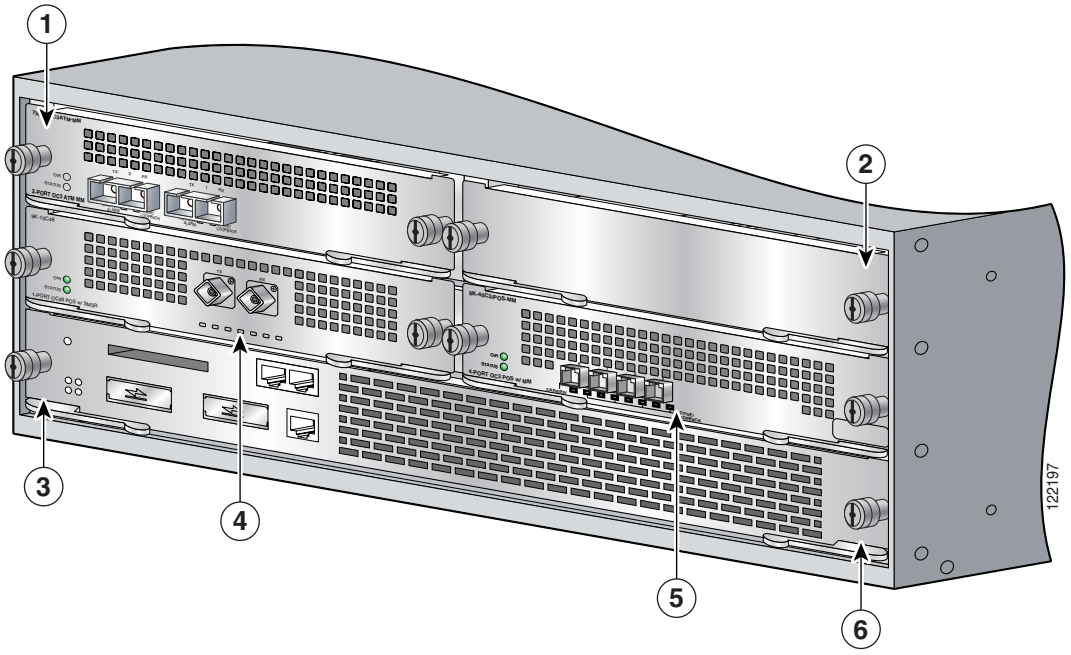


1	Port adapter slot 1		

Cisco 7304 PCI Port Adapter Carrier Card Slot Numbering

Figure 1-8 shows the module slot numbering on a Cisco 7304 router. The Cisco 7304 PCI Port Adapter Carrier Card installs into Cisco 7304 router module slots 2 through 5. The Cisco 7304 PCI Port Adapter Carrier Card accepts one single-width port adapter. 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 1-8 Module Slots on the Cisco 7304 Router

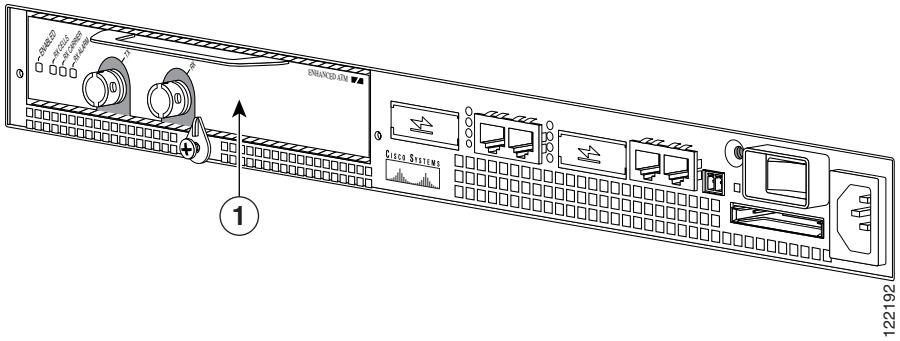


1	PCI carrier card—slot 4	**4**	PCI carrier card—slot 2
2	PCI carrier card—slot 5	**5**	PCI carrier card—slot 3
3	NPE or NSE module—slot 0	**6**	NPE or NSE module—slot 1

Cisco 7401ASR Router Slot Numbering

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

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

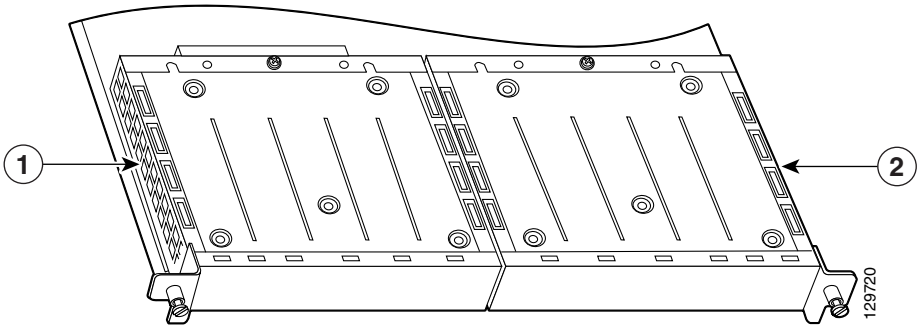


1	Port adapter slot 1		

Cisco 7500 Series Routers with VIP Slot Numbering

The PA-POS-2OC3 is supported on the versatile interface processors VIP4-50, VIP4-80, and VIP6-80 used in Cisco 7500 series routers. In the Cisco 7507 router and Cisco 7513 router, the VIP motherboard is installed vertically. In the Cisco 7505 router, the VIP motherboard is installed horizontally. The port adapter can be installed in either bay (port adapter slot 0 or 1) on the VIP. The bays are numbered from left to right on the VIP. Figure 1-10 shows the slot numbering on a VIP.

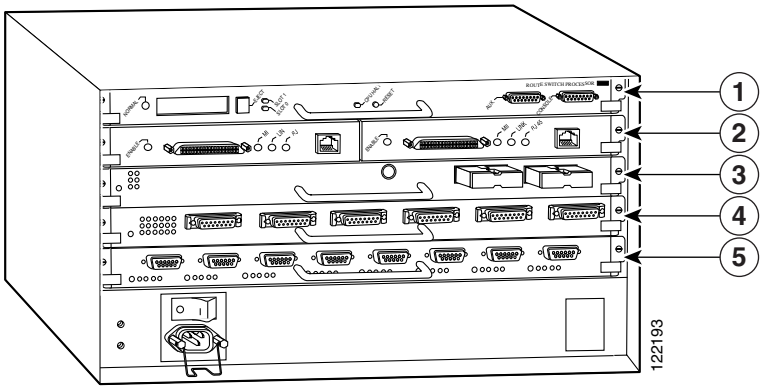
Figure 1-10 VIP Slot Locations



1	VIP port adapter slot 0	**2**	VIP port adapter slot 1

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

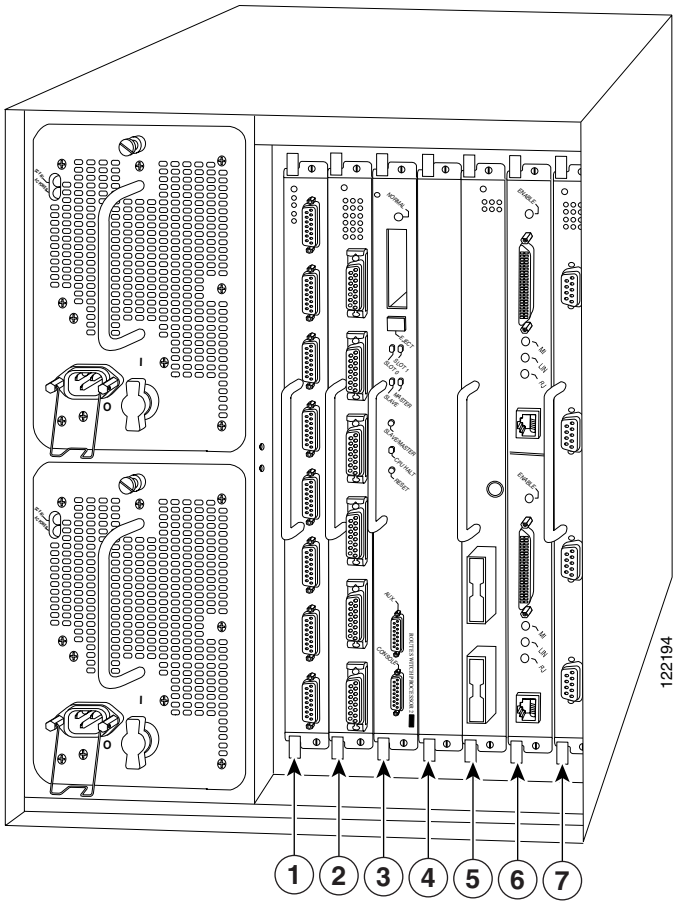
Figure 1-11 VIP Slots in the Cisco 7505 Router



1	RSP	**4**	VIP interface—slot 1
2	VIP interface—slot 3	**5**	VIP interface—slot 0
3	VIP interface—slot 2		

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

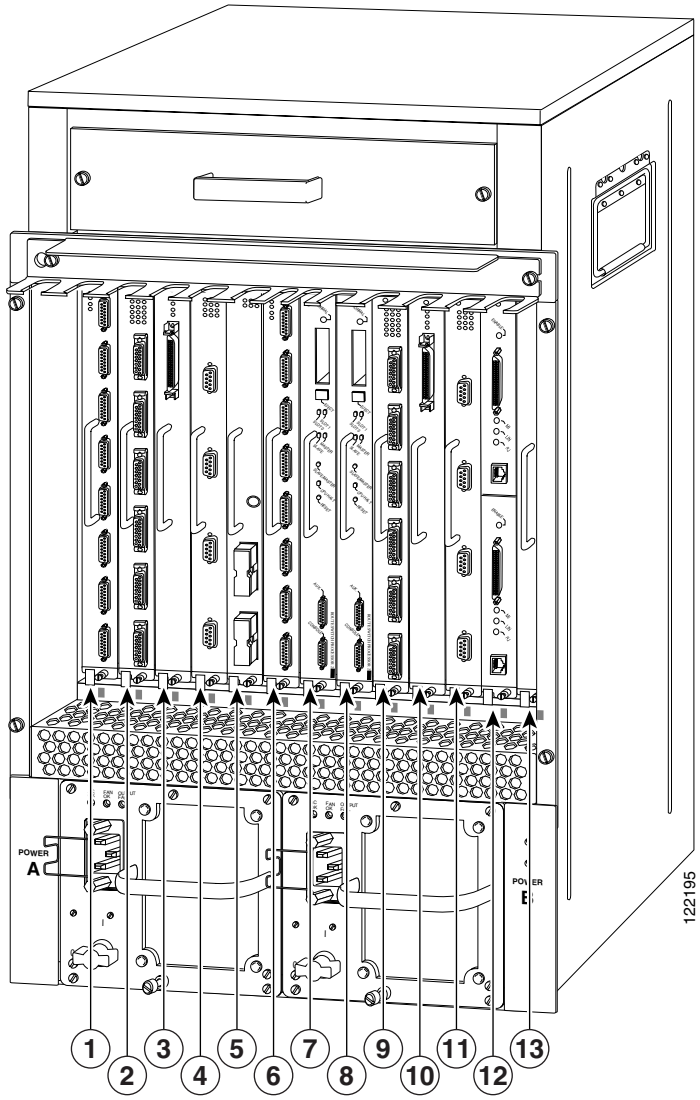
Figure 1-12 VIP Slots in the Cisco 7507 Router



1	VIP interface—slot 0	**5**	VIP interface—slot 4
2	VIP interface—slot 1	**6**	VIP interface—slot 5
3	RSP—slot 2	**7**	VIP interface—slot 6
4	RSP—slot 3		

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. Figure 1-13 shows the slot numbering on a Cisco 7513 router.

Figure 1-13 VIP Slots in the Cisco 7513 Router



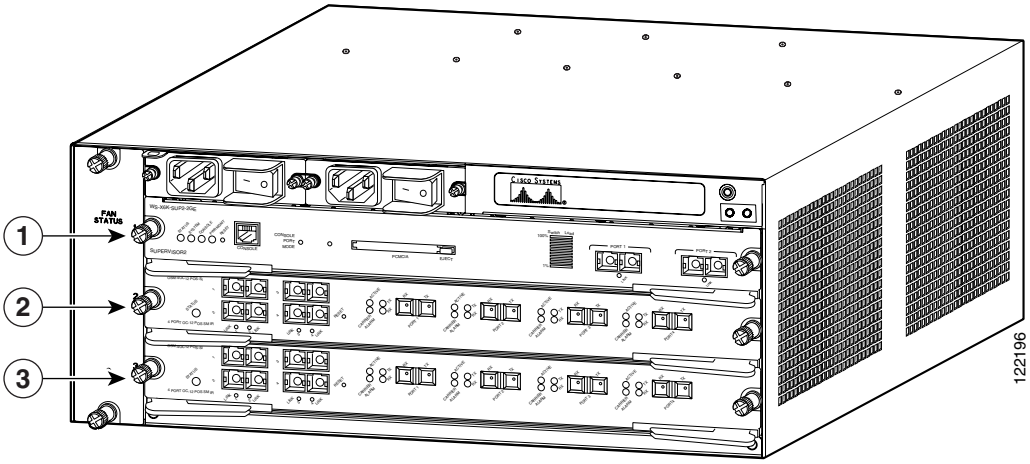
1	VIP interface—slot 0	**8**	RSP—slot 7
2	VIP interface—slot 1	**9**	VIP interface—slot 8
3	VIP interface—slot 2	**10**	VIP interface—slot 9
4	VIP interface—slot 3	**11**	VIP interface—slot 10
5	VIP interface—slot 4	**12**	VIP interface—slot 11
6	VIP interface—slot 5	**13**	VIP interface—slot 12
7	RSP—slot 6		

Cisco 7600 Series Routers with FlexWAN and Enhanced FlexWAN Modules Slot Numbering

The PA-POS-20C3 is supported on a FlexWAN or Enhanced FlexWAN module used in the Cisco 7603 router, Cisco 7606 router, Cisco 7609 router, or Cisco 7613 router. The FlexWAN module can be installed in any slot of a Cisco 7600 series router except slot 1, which is reserved for the supervisor engine. Port adapters can be installed into either port adapter bay 0 or port adapter bay 1 on the FlexWAN module.

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

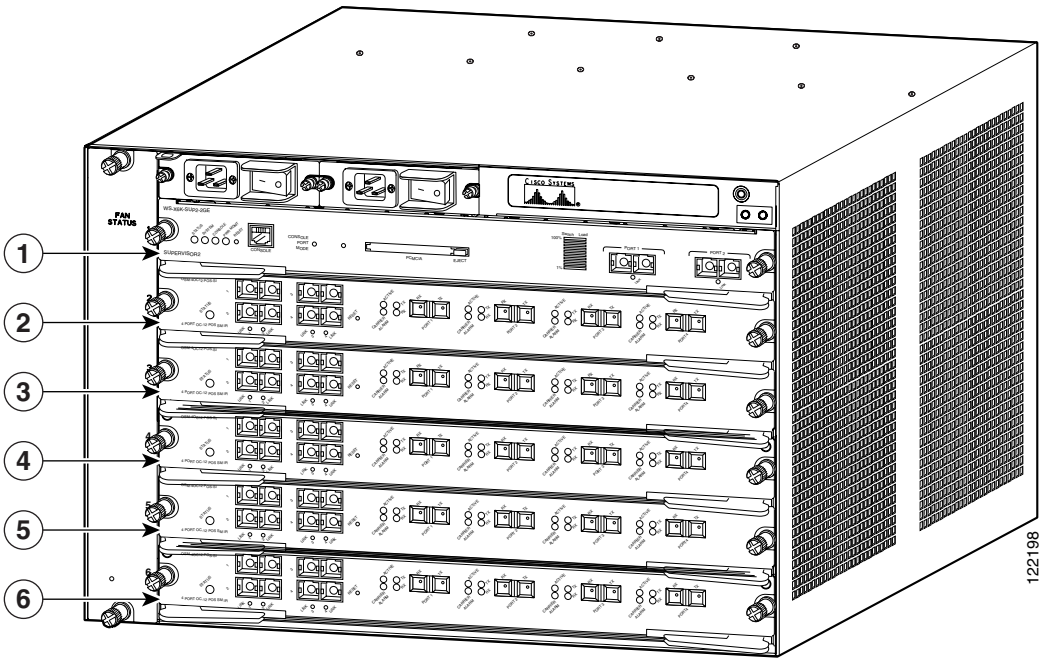
Figure 1-14 FlexWAN and Enhanced FlexWAN Slots in the Cisco 7603 Router



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

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

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

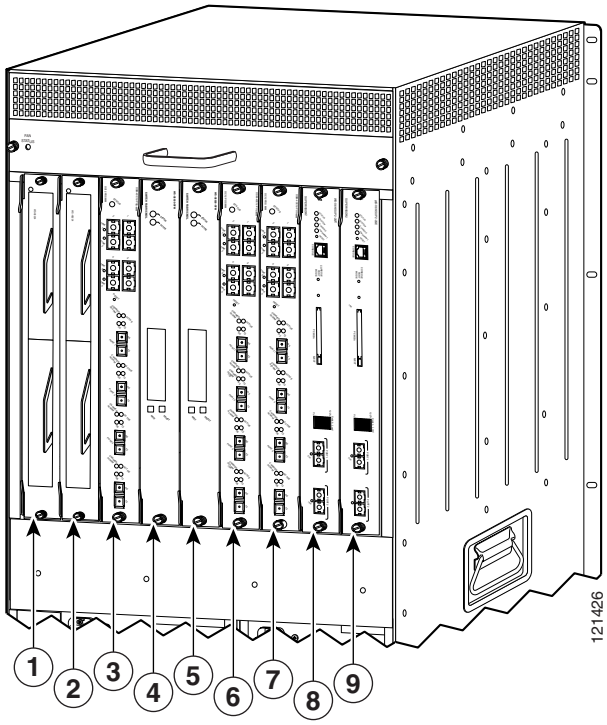


1	Supervisor engine—slot 1	**4**	FlexWAN module—slot 4
2	FlexWAN module—slot 2	**5**	FlexWAN module—slot 5,
3	FlexWAN module—slot 3	**6**	FlexWAN module—slot 6

Note Some of the slots used for the FlexWAN module on the Cisco 7606 router can also be used for other supervisor engines, RSPs, or OSMs. For details, refer to the *Cisco 7600 Series Router Installation Guide* at the following URL:
http://www.cisco.com/en/US/products/hw/routers/ps368/products_installation_guide_book09186a008080269a.html

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

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

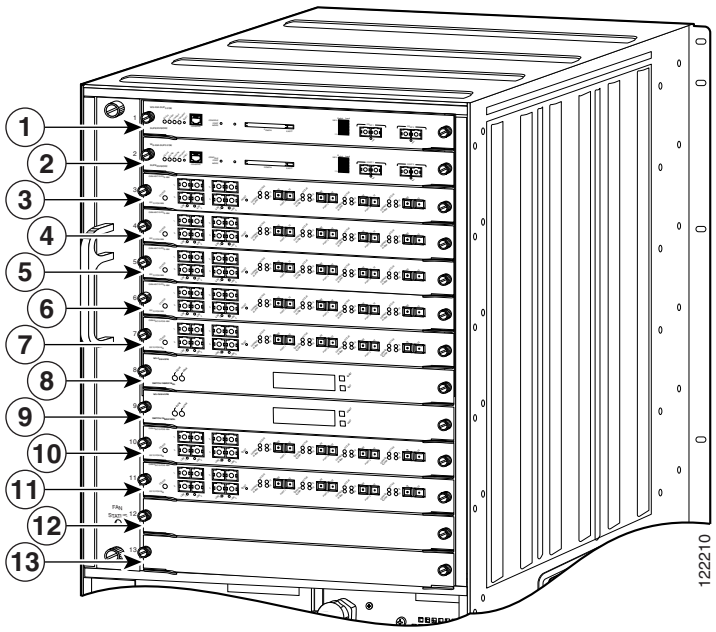


1	FlexWAN module—slot 9	**6**	FlexWAN module—slot 4
2	FlexWAN module—slot 8	**7**	FlexWAN module—slot 3
3	FlexWAN module—slot 7	**8**	FlexWAN module—slot 2
4	FlexWAN module—slot 6	**9**	Supervisor engine—slot 1
5	FlexWAN module—slot 5		

Note Some of the slots used for the FlexWAN module on the Cisco 7609 router can also be used for other supervisor engines, RSPs, or OSMs. For details, refer to the *Cisco 7600 Series Router Installation Guide* at the following URL:
http://www.cisco.com/en/US/products/hw/routers/ps368/products_installation_guide_book09186a008080269a.html

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

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



1	Supervisor engine—slot 1	**8**	FlexWAN module—slot 8
2	FlexWAN module—slot 2	**9**	FlexWAN module—slot 9
3	FlexWAN module—slot 3	**10**	FlexWAN module—slot 10
4	FlexWAN module—slot 4	**11**	FlexWAN module—slot 11
5	FlexWAN module—slot 5	**12**	FlexWAN module—slot 12
6	FlexWAN module—slot 6	**13**	FlexWAN module—slot 13
7	FlexWAN module—slot 7		

Note Some of the slots used for the FlexWAN module on the Cisco 7613 router can also be used for other supervisor engines, RSPs, or OSMs. For details, refer to the *Cisco 7600 Series Router Installation Guide* at the following URL:
http://www.cisco.com/en/US/products/hw/routers/ps368/products_installation_guide_book09186a008080269a.html

Identifying Interface Addresses

This section describes how to identify interface addresses for the PA-POS-2OC3 in supported platforms. Interface addresses specify the actual physical location of each interface on a router or switch.

Interfaces on a PA-POS-2OC3 installed in a router maintain the same address regardless of whether other port adapters are installed or removed. However, when you move a port adapter to a different slot, the first number in the interface address changes to reflect the new port adapter slot number.

Interfaces on a PA-POS-2OC3 installed in a VIP or FlexWAN module maintain the same address regardless of whether other interface processors or modules are installed or removed. However, when you move a VIP or FlexWAN module to a different slot, the interface processor or module slot number changes to reflect the new interface processor or module slot.

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

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

- Cisco 7200 VXR Routers Interface Addresses, page 1-21
- Cisco 7200 VXR Routers with the Port Adapter Jacket Card Interface Addresses, page 1-21
- Cisco 7201 Router Interface Addresses, page 1-22
- Cisco 7301 Router Interface Addresses, page 1-22
- Cisco 7304 PCI Port Adapter Carrier Card Interface Addresses, page 1-22
- Cisco 7401ASR Router Interface Addresses, page 1-22
- Cisco 7500 Series Routers VIP Interface Addresses, page 1-22
- Cisco 7600 Series Routers FlexWAN Module Interface Addresses, page 1-23

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

Table 1-3 Identifying Interface Addresses

Platform	Interface Address Format	Numbers	Syntax
Cisco 7200 VXR routers (7204VXR, 7206VXR)	Port-adapter-slot-number/interface-port-number	Port adapter slot—1 through 6 (depends on the number of slots in the router)[1] Interface port—0 or 1	`1/0`
Port Adapter Jacket Card with the Cisco 7200 VXR routers[2]	Port-adapter-slot-number/interface-port-number	Port adapter slot—1 through 7 (depends on the number of slots in the router)[3] Interface port—0 and 1	`1/0`
Cisco 7201 router	Port-adapter-slot-number/interface-port number	Port adapter slot—always 1 Interface port—0 or 1	`1/0`
Cisco 7301 router	Port-adapter-slot-number/interface-port number	Port adapter slot—always 1 Interface port—0 or 1	`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 or 1	`3/0`

Table 1-3 Identifying Interface Addresses

Platform	Interface Address Format	Numbers	Syntax
Cisco 7401ASR router	Port-adapter-slot-number/interface-port number	Port adapter slot—always 1 Interface port—0 or 1	`1/0`
VIPs in the Cisco 7500 series routers (7505, 7507, 7513)	Interface-processor-slot-number/port-adapter-slot-number/interface-port number	Interface processor slot—0 through 12 (depends on the number of slots in the router) Port adapter slot— 0 or 1 Interface port—0 or 1	`3/1/0`
Cisco 7600 series routers (7603, 7606, 7609, 7613) with FlexWAN or Enhanced FlexWAN	Module-slot-number/port-adapter-bay-number/ interface-port-number	Module slot —2[4] through 13 (depends on the number of slots in the router) Port adapter bay—0 or 1 Interface port—0 or 1	`3/0/0`

1. Port adapter slot 0 is reserved for the Fast Ethernet port on the I/O controller (if present).
2. Port adapter slot 0 can accept the Port Adapter Jacket Card if an NPE-G1 or NPE-G2 are installed, but becomes slot 5 on a Cisco 7204VXR router when a port adapter is installed or slot 7 on a Cisco 7206VXR router when a port adapter is installed.
3. Port adapter slot 0 is reserved for the Fast Ethernet port on the I/O controller (if present).
4. Slot 1 is reserved for the supervisor engine. If a redundant supervisor engine is used, it must go in slot 2; otherwise, slot 2 can be used for other modules.

Cisco 7200 VXR Routers Interface Addresses

In Cisco 7200VXR series routers, port adapter slots are numbered from the lower left to the upper right, beginning with port adapter slot 1 and continuing through port adapter slot 4 for the Cisco 7204VXR, and slot 6 for the Cisco 7206VXR. Port adapters can be installed in any available port adapter slot from 1 through 6 (depending on the number of slots in the router). (Slot 0 is reserved for the I/O controller—if present.) See Figure 1-4

The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See Table 1-3. For example, if a PA-POS-2OC3 is installed in slot 1 and the ports are to be two dual independent ports, the interface addresses would be 1/0 and 1/1.

Cisco 7200 VXR Routers with the Port Adapter Jacket Card Interface Addresses

With an NPE-G1 or NPE-G2 installed, port adapter slot 0 of Cisco 7204VXR router or Cisco 7206VXR router can accept the Port Adapter Jacket Card. When the Port Adapter Jacket Card resides in port adapter slot 0, the port adapter in the Port Adapter Jacket Card is in port adapter slot 5 on the Cisco 7204 VXR router, or port adapter slot 7 on the Cisco 7206 VXR router. See Figure 1-5

The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See Table 1-3. For example, if a PA-POS-2OC3 is installed in a Port Adapter Jacket Card in the slot formerly known as slot 0 on a Cisco 7204VXR router, but now known as slot 5 and the ports are to be two dual independent ports, the interface addresses would be 5/0 and 5/1(slot 5 and interface port 0 and 1). If a PA-POS-2OC3 is installed in a Port Adapter Jacket Card in the slot formerly known as slot 0 on a Cisco 7206VXR router, but now known as slot 7, the interface addresses would be 7/0 and 7/1 (slot 7 and interface port 0 and 1).

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 1-6.

The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See Table 1-3. For example, if a PA-POS-2OC3 is installed in a Cisco 7201 router and the ports are to be two dual independent ports, the interface addresses would be 1/0 and 1/1.

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 1-7.

The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See Table 1-3. For example, if a PA-POS-2OC3 is installed in a Cisco 7301 router and the ports are to be two dual independent ports, the interface addresses would be 1/0 and 1/1.

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 1-8.

The interface address is composed of a two-part number in the format *module-slot-number/interface-port-number*. See Table 1-3. For example, if a PA-POS-2OC3 is installed in the Cisco 7304 PCI port adapter carrier card in Cisco 7304 router module slot 3 and the ports are to be two dual independent ports, the interface addresses would be 3/0 and 3/1.

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 1-9.

The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See Table 1-3. For example, if a PA-POS-2OC3 is installed in a Cisco 7401ASR router and the ports are to be two dual independent ports, the interface addresses would be 1/0 and 1/1.

Cisco 7500 Series Routers VIP Interface Addresses

In Cisco 7500 series routers, port adapters are installed on a versatile interface processor (VIP), which installs in interface processor slots 0 through 12 (depending on the number of slots in the router). The port adapter can be installed in either bay (port adapter slot 0 or 1) on the VIP. See Figure 1-10, Figure 1-11, Figure 1-12, and Figure 1-13.

The interface address for the VIP is composed of a three-part number in the format *interface-processor-slot-number/port-adapter-slot-number/interface-port-number*. See Table 1-3.

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

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

The third number identifies the physical port number (interface port number) on the port adapter. The port numbers always begin at 0 and are numbered from left to right. The number of additional ports depends on the number of ports on the port adapter. The PA-POS-2OC3 is a dual-port port adapter, therefore the port can be 0 or 1.

For example, if a PA-POS-2OC3 is installed in a VIP in interface processor slot 3, port adapter slot 1, and the ports are to be two dual independent ports, the interface addresses would be 3/1/0 and 3/1/1.

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

Cisco 7600 Series Routers FlexWAN Module Interface Addresses

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

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

The first number identifies the module slot of the chassis in which the FlexWAN module is installed (slot 2 through slot 3, 6, 9, or 13 depending on the number of slots in the chassis). These module slots are generally numbered from top to bottom, starting with 1. The Cisco 7609 is the exception with slots numbered right to left, starting with 1.

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

The third number identifies the physical port number on the port adapter. The PA-POS-2OC3 is a dual-port port adapter, therefore the port can be 0 or 1.

For example, if a PA-POS-2OC3 is installed in the FlexWAN module, which is inserted in module slot 3, port adapter bay 0, and the ports are to be two dual independent ports, then the interface addresses of the port adapter would be 3/0/0 and 3/0/1 (module slot 3, port adapter bay 0, and interfaces 0 and 1).