Cisco 7200 Series Port Adapter Hardware Configuration Guidelines

Product Numbers: CISCO7206(=), CISCO7206VXR(=), CISCO7206-DC, CISCO7206-CH, CISCO7204VXR(=), CISCO7204-DC, CISCO7204-CH, RS7206S(=), RS7206VXR-SK(=)

Customer Order Number: DOC-783471=

Introduction

This document explains the port adapter hardware configuration guidelines for Cisco 7200 series routers (which consist of the two-slot Cisco 7202, four-slot Cisco 7204 and Cisco 7204VXR, and the six-slot Cisco 7206 and Cisco 7206VXR). It includes brief explanations of Cisco 7200 series architecture, port adapter bandwidth allocations, and port adapter slot numbering.

Note The Cisco 7206 and the Cisco 7206VXR can be used as router shelves in a Cisco AS5800 Universal Access Server. References to Cisco 7200 series routers in this document include the Cisco 7206 and Cisco 7206VXR router shelves, unless indicated otherwise.

Contents

This document contains the following sections:

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For More Information

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

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

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

- For hardware installation and maintenance information on Cisco 7200 series routers, refer to one of the following online publications:
  - *Cisco 7200 VXR Installation and Configuration Guide*
  - *Cisco 7200 VXR Routers Quick Start Guide*
  - *Cisco 7204 Installation and Configuration Guide*
  - *Cisco 7206 Router Quick Start Guide*
- For hardware installation and maintenance information and software configuration information on the Cisco AS5800 Universal Access Server, refer to the following publications:
  - *Cisco AS5800 Universal Access Server Hardware Installation and Configuration Guide*
  - *Cisco AS5800 Universal Access Server Software Installation and Configuration Guide*
- For international agency compliance, safety, and statutory information for WAN interfaces for Cisco 7200 series routers, refer to the document *Regulatory Compliance and Safety Information for the Cisco 7200 Series Routers*.
- For international agency compliance, safety, and statutory information for WAN interfaces for the Cisco AS5800 Universal Access Server, refer to the document *Cisco AS5800 Universal Access Server Regulatory Compliance and Safety Information*.
- To view Cisco documentation or obtain general information about the documentation, refer to the following sources:
  - "Obtaining Documentation" section on page 18.
  - "Obtaining Technical Assistance" section on page 19.
  - Customer service at 800 553-6387 or 408 526-7208. Customer service hours are 5:00 a.m. to 6:00 p.m. Pacific Time, Monday through Friday (excluding Cisco-observed holidays). You can also send e-mail to cs-rep@cisco.com.
  - *Cisco Information Packet* that shipped with your router.

Cisco 7200 Series Overview

Cisco 7200 series routers (which consist of the two-slot Cisco 7202, four-slot Cisco 7204 and Cisco 7204VXR, and the six-slot Cisco 7206 and Cisco 7206VXR) support multiprotocol, multimedia routing and bridging with a wide variety of protocols and media types. Network interfaces reside on port

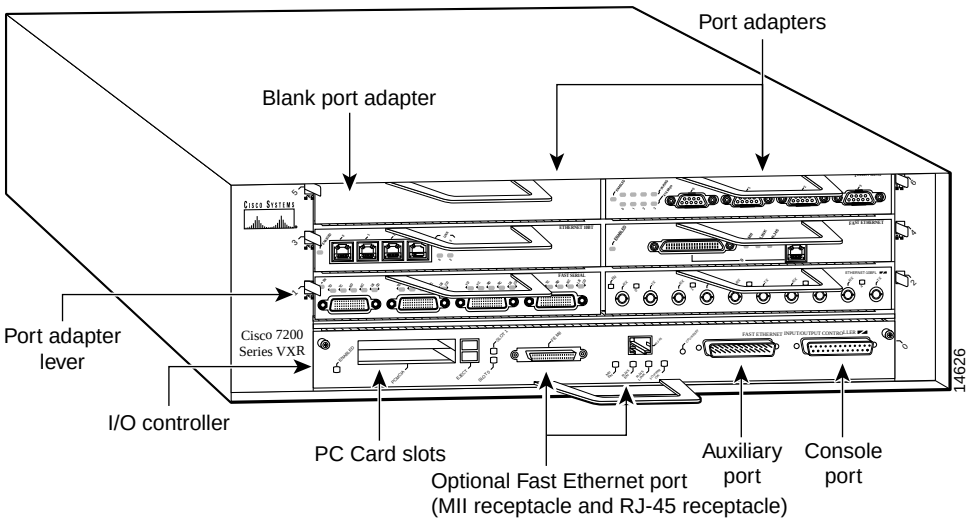
adapters that provide a connection between the routers' Peripheral Component Interconnect (PCI) buses and external networks. Port adapters can be placed in any available port adapter slot, in any desired combination.

Note For information about the Cisco 7206 and Cisco 7206VXR as router shelves in a Cisco AS5800 Universal Access Server, refer to the Cisco AS5800 Universal Access Server documentation listed in the "For More Information" section on page 2.

The front of Cisco 7200 series routers provides access to an input/output (I/O) controller and up to two, four, or six network interface port adapters. The I/O controller has a local console port for connecting a data terminal (or data terminal equipment [DTE]) and an auxiliary port for connecting a modem (or other data communications equipment [DCE]) or other devices for configuring and managing the router; PC Card slots for Flash memory cards or Flash Disks; and optional Ethernet, Fast Ethernet, or Gigabit Ethernet ports.

Figure 1 shows a Cisco 7206VXR with installed port adapters and an I/O controller with a Fast Ethernet port. Not shown are the Cisco 7202, which has two port adapter slots, the Cisco 7204 and Cisco 7204VXR, which have four port adapter slots, and the Cisco 7206, which has six port adapter slots.

Figure 1 Cisco 7200 Series Router—Front View (Cisco 7206VXR Shown)

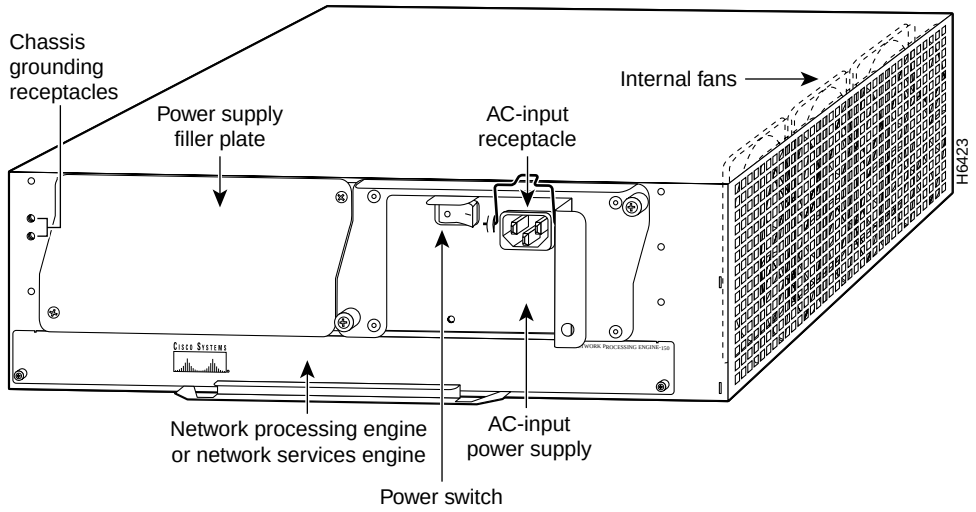


The port adapters installed in Cisco 7200 series routers are of the same type as those installed in other Cisco 7000 family routers. Cisco 7200 series routers support the online insertion and removal (OIR) of installed port adapters.

Note In Figure 1, a blank port adapter is installed in port adapter slot 5. To ensure adequate airflow across the router's internal components, ensure that each port adapter slot is filled with either a port adapter or a blank port adapter.

The rear of Cisco 7200 series routers provides access to a network processing engine (NPE) or network services engine (NSE) and up to two 280W AC-input or DC-input power supplies (see Figure 2).

Figure 2 Cisco 7200 Series Router—Rear View



The NPE and NSE have no external connectors or LEDs. There is a handle for removing and installing the engines and two captive installation

screws for securing them to the chassis.A fully configured Cisco 7200 series router operates with only one installed power supply; however, a second, optional power supply of the same type provides hot-swappable, load-sharing, redundant power. The power supply has the router's main power switch and either an AC-input power receptacle, or three hardwired DC-input power leads (depending on the type of installed power supply). Adjacent to the power supply bays are two chassis grounding receptacles that provide a chassis ground connection for ESD equipment or a two-hole grounding lug (see Figure 2).

Note The Cisco 7200 series routers do not support a mix of installed AC-input and DC-input power supplies. Figure 2 shows the rear of a Cisco 7200 series router configured with a single 280W AC-input power supply. (A power supply filler plate is installed over the second power supply bay.)

Three internal fans draw cooling air into the chassis interior and across internal components to maintain an acceptable operating temperature (see Figure 2). The three fans are enclosed in a tray that is located in the subchassis.

The I/O controller, port adapters, power supplies, and NPE or NSE slide into their respective chassis slots and connect directly to the router midplane; there are no internal cables to connect. The midplane distributes DC power from the power supplies to these modular field-replaceable units.

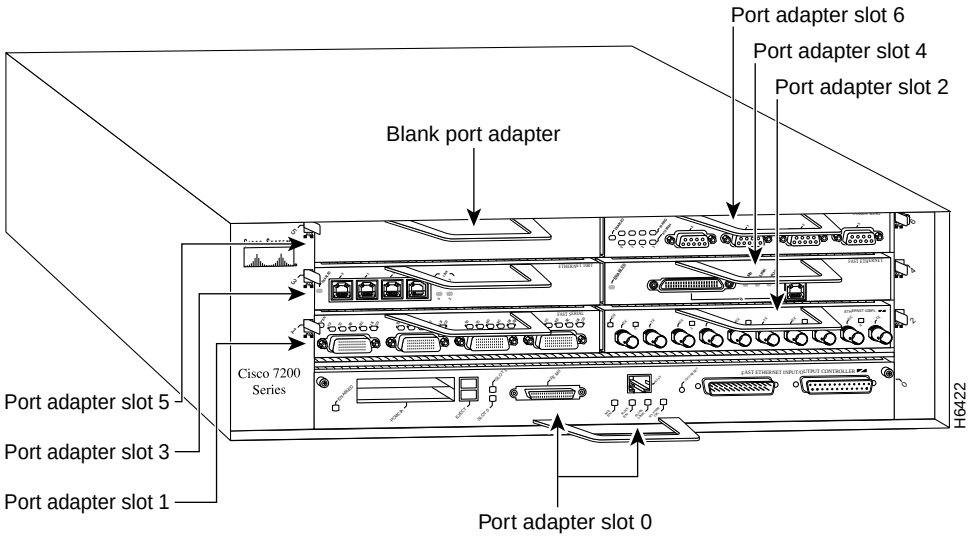
Configuration Guidelines

All port adapters and service adapters installed in Cisco 7200 series routers connect to two Peripheral Component Interconnect (PCI) buses, mb1 and mb2, on the router midplane that provide a path to packet I/O memory and the system (routing and switching) processor. The optional ports on the I/O controllers connect to a third PCI bus, mb0, that connects to one of the PCI buses or to both of the PCI buses, depending on which network processing engine (NPE) or network services engine (NSE) is installed and supported in your system.

In Cisco 7200 series routers, port adapters in odd-numbered slots connect to PCI bus mb1, and port adapters in even-numbered slots connect to PCI bus mb2. (For chassis slot numbering, see Figure 3.) Guidelines for distributing the port adapters evenly between the two buses are given in the "Port Adapter and Service Adapter Types and Installation Guidelines" section on page 5.

Figure 3 shows the port adapter slot numbering for the Cisco 7200 series routers.

Figure 3 Cisco 7200 Series Port Adapter Slot Numbering—Cisco 7206 Shown



The following sections explain port adapter installation guidelines for Cisco 7200 series routers and how to determine main memory (SDRAM or DRAM) requirements for a combination of installed port adapters.

Port Adapter and Service Adapter Types and Installation Guidelines

Cisco 7200 series routers have a data-carrying capacity, referred to as bandwidth, that affects the port adapter distribution in the chassis, as well as the number and types of port adapters you can install. Port adapters should be evenly distributed by bandwidth between PCI bus mb1 and PCI bus mb2.

Cisco 7200 or Cisco 7200 VXR routers with a network processing engine (NPE), NPE-100, NPE-150, NPE-175, NPE-200, or NPE-225, use a high-, medium-, or low-bandwidth designation to determine port adapter distribution and configuration.

Cisco 7200 VXR routers with an NPE-300, NPE-400, or an NSE-1 use bandwidth points to determine port adapter distribution and configuration instead of high-, medium-, or low-bandwidth designations. Bandwidth points are an assigned value related to bandwidth; however, the value is adjusted based on how efficiently the hardware uses the PCI bus.

Note Cisco 7200 VXR routers (Cisco 7204VXR and Cisco 7206VXR) support the NPE-300, NPE-400, and the NSE-1; Cisco 7200 routers (Cisco 7202, Cisco 7204, and Cisco 7206) do not.

Table 1 lists adapter types, bandwidths or bandwidth points, and processor memory requirements.

Table 1 Bandwidths, Bandwidth Points, and Processor Memory Requirements

Port Adapter Type	Product Number	NPE-150 NPE175, NPE-200, NPE-225 ——— Bandwidth	NPE-300, NPE-400, NSE-1 ——— Bandwidth Points[1]	Processor Memory Required[2]	Additional Requirements
ATM					
1-port multimode	PA-A1-OC3MM	High	300	0.10 MB	—[3]
1-port single-mode intermediate reach	PA-A1-OC3SMI				
Circuit emulation services (CES)	PA-A2-4E1XC-OC3SM	High	300	1.20 MB	—
	PA-A2-4E1XC-E3ATM		90		
	PA-A2-4E1YC-OC3SM		300		
	PA-A2-4E1YC-E3ATM		90		
	PA-A2-4T1C-OC3SM		300		
	PA-A2-4T1C-T3ATM		90		
Enhanced	PA-A3-T3	High	90	1.00 MB	—
	PA-A3-E3				
	PA-A3-0C3MM		300	1.00 MB	—
	PA-A3-0C3SMI				
	PA-A3-0C3SML				
Inverse multiplexing over ATM	PA-A3-8T1IMA	Low[4]	24	4.3 MB	—
	PA-A3-8E1IMA		32		—
Channel					
1-port Enterprise System Connection (ESCON) channel	PA-IC-E	High	100	0.05 MB	0.36 MB
1-port parallel channel	PA-1C-P	Low[4]	0	0.15 MB	0.36 MB
Dynamic Packet Transport					
Multimode fiber	PA-SRP-OC12MM	High	150 + 150[5]	0.40 MB	—
Single-mode fiber, intermediate reach	PA-SRP-OC12SI	High	300	0.40 MB	—
Single-mode fiber, long reach	PA-SRP-SML	High	300	0.40 MB	—
Single-mode fiber, extended reach	PA-SRP-SMX	High	300	0.40 MB	—

Table 1 Bandwidths, Bandwidth Points, and Processor Memory Requirements (continued)

Port Adapter Type	Product Number	NPE-150 NPE175, NPE-200, NPE-225 — Bandwidth	NPE-300, NPE-400, NSE-1 — Bandwidth Points[1]	Processor Memory Required[2]	Additional Requirements
Ethernet/Fast Ethernet/Gigabit Ethernet					
2-port Fast Ethernet	PA-2FE	High	400	2.4 MB	—
14-port Ethernet switch 10/100BaseTX	PA-12E/2FE	High	300	0.17 MB	—
8-port Ethernet 10BaseT	PA-8E	Medium	80	0.40 MB	—
5-port Ethernet 10BaseFL	PA-5EFL		50	0.25 MB	—
4-port Ethernet 10BaseT	PA-4E		40		—
2-port Fast Ethernet/ISL 100BaseTX	PA-2FEISL-TX	High	300	0.68 MB	—
2-port Fast Ethernet/ISL 100BaseFX	PA-2FEISL-FX				—
2-port Fast Ethernet/Ethernet I/O controller	C7200-I/O-2FE/E[8]	High	400	0.10 MB	
1-port Fast Ethernet 100BaseTX	PA-FE-TX	High	200	0.10 MB	—
1-port Fast Ethernet 100BaseFX	PA-FE-FX				
1-port Fast Ethernet I/O controller	C7200-I/O-FE[6]				
1-port 100VG-AnyLAN	PA-100VG				
1-port dial shelf interconnect[7]	PA-DSIC				
1-port full-duplex Gigabit Ethernet	PA-GE[8]	High	400	0.24 MB	—
No Ethernet port I/O controller	C7200-I/O	none	0	—	—
1-port Gigabit Ethernet plus Ethernet I/O controller	C7200-I/O-GE+E[8]	High	400	0.11 MB	
Fiber Distributed Data Interface (FDDI)					
Multimode	PA-FDDI-MM[9]	High	Not supported	0.10 MB	—
Single-mode	PA-FDDI-SM[9]				
Full-duplex multimode FDDI	PA-F/FD-MM[9]				
Full-duplex single-mode FDDI	PA-F/FD-SM[9]				
High Speed Serial					
1-port high-speed serial	PA-H (Rev. B)	High	100	0.10 MB	—
2-port high-speed serial	PA-2H (Rev. B)		200		
1-port E3 high-speed serial	PA-E3	High	90	0.07 MB	—
1-port T3 high-speed serial	PA-T3				
1-port T3+ high-speed serial	PA-T3+				

Table 1 Bandwidths, Bandwidth Points, and Processor Memory Requirements (continued)

Port Adapter Type	Product Number	NPE-150 NPE175, NPE-200, NPE-225 — Bandwidth	NPE-300, NPE-400, NSE-1 — Bandwidth Points[1]	Processor Memory Required[2]	Additional Requirements
Multichannel Serial					
1-port channelized T3 dual-width	PA-CT3/4T1[9]	High	Not supported	0.80 MB	—
2-port channelized E1/Primary Rate Interface (PRI) ISDN	PA-2CE1/PRI-75[9]	Low[4]	Not supported	1.80 MB	1.20 MB (when configured for ISDN)
	PA-2CE1/PRI-120[9]				
2-port channelized T1/PRI ISDN	PA-2CT1/PRI[9]	Low[4]	0	1.80 MB	1.20 MB (when configured for ISDN)
8-port multichannel T1/E1 PRI	PA-MC-8TE1+	Low	0	10 MB	
1-port multichannel E3	PA-MC-E3	High	90	3.00 MB	With 2 interfaces configured for PPP encapsulation
				6.40 MB	With 128 interfaces configured for PPP encapsulation
1-port multichannel E1 STM1	PA-MC-STM-1	High	250	10 MB	—
1-port multichannel T3	PA-MC-T3	High	90	3.00 MB	With 2 interfaces configured for PPP encapsulation
				6.40 MB	With 128 interfaces configured for PPP encapsulation

Table 1 Bandwidths, Bandwidth Points, and Processor Memory Requirements (continued)

Port Adapter Type	Product Number	NPE-150 NPE175, NPE-200, NPE-225 — Bandwidth	NPE-300, NPE-400, NSE-1 — Bandwidth Points[1]	Processor Memory Required[2]	Additional Requirements
Multichannel Serial (continued)					
2-port multichannel T3	PA-MC-2T3+	High	180	3.00 MB	With 2 interfaces configured for PPP encapsulation
				6.40 MB	With 128 interfaces configured for PPP encapsulation
8-port multichannel E1/PRI	PA-MC-8E1/120	Low[4]	0	3.50 MB	—
	PA-MC-2E1/120				
4- and 8-port multichannel DS1/PRI	PA-MC-4T1	Low[4]	0	2.50 MB	—
	PA-MC-8T1			3.10 MB	
	PA-MC-8DSX1				
4- and 8-port Basic Rate Interface (BRI) ISDN	PA-4B-U	Low[4]	0	0.40 MB	1.20 MB
8 BRI ISDN	PA-8B-ST	Low	0	1.2 MB	—
SONET					
1-port multimode	PA-POS-OC3-MM	High	300	0.15 MB	—
1-port single-mode intermediate reach	PA-POS-OC3SMI				
1-port single-mode long reach	PA-POS-OC3SML				
Serial					
2-port E3 high-speed serial	PA-2E3	High	180	0.10 MB	—
2-port T3 high-speed serial	PA-2T3				
2-port T3+ high-speed serial	PA-2T3+				
4-port E1-G.703/704 serial	PA-4E1G-120	Low[4]	0	0.10 MB	—
	PA-4E1G-75				
8-port synchronous serial (X.21)	PA-8T-X21	Low[4]	0	0.35 MB	—
8-port synchronous serial (V.35)	PA-8T-V35				
8-port synchronous serial (EIA/TIA-232)	PA-8T-232				

Table 1 Bandwidths, Bandwidth Points, and Processor Memory Requirements (continued)

Port Adapter Type	Product Number	NPE-150 NPE175, NPE-200, NPE-225 — Bandwidth	NPE-300, NPE-400, NSE-1 — Bandwidth Points[1]	Processor Memory Required[2]	Additional Requirements
Serial (continued)					
4-port synchronous serial	PA-4T	Low[4]	0	0.20 MB	—
4-port synchronous serial, enhanced	PA-4T+				
Service					
Data encryption service adapter	SA-Encrypt	Medium	60	0.03 MB	—
Compression service adapter	SA-Comp/1[9]	Low[4]	0	0.10 MB	—
	SA-Comp/4[9]				
Integrated Service Adapter	SA-ISA/DES	High	200	3 MB	—
	SA-ISA/3DES	High	200	3 MB	—
Virtual Private Network acceleration module	SA-VAM	High on NPE-225 Not supported on NPE-150, NPE-175, NPE-200	300	64 MB for 800 tunnels 128 MB for 1600 tunnels 256 MB for 3200 tunnels 512 MB for 5000 tunnels	
Token Ring					
4-port Token Ring half-duplex	PA-4R[9]	Medium	Unsupported	0.30 MB	—
4-port Token Ring full-duplex	PA-4R-FDX[9]	High	Not supported	0.30 MB	—
4-port dedicated Token Ring	PA-4R-DTR		120		
Voice					
2-, 4-, and 8-port multichannel T1/E1	PA-MCX-2TE1	Low	32	10 MB	—
	PA-MCX-4TE1				
	PA-MCX-8TE1	Low	36	10 MB	
	PA-MCX-8TE1+[10]	Low	36	10 MB	—
Single-port low capacity	PA-VXA-1TE1-24+	Low	14	2 MB	—
	PA-VXA-1TE1-30+	Low	14	2 MB	—
2-port moderate capacity	PA-VXB-2TE1	Low	14	2 MB	—
2-port high capacity	PA-VXC-2TE1	Low	24	2 MB	—
Enhanced 2-port moderate capacity	PA-VXB-2TE1+	Low	14	2 MB	—
Enhanced 2-port high capacity	PA-VXC-2TE1+	Low	24	2 MB	—

1. Bandwidth points are used when you determine port adapter installation guidelines for a Cisco 7200 VXR router with an NPE-300, NPE-400 or NSE-1 installed.
2. Processor memory requirements are used when you determine port adapter installation guidelines for a Cisco 7200 router. Processor memory requirements are specific to Cisco IOS Release 11.1 CA, Release 11.1 CC, Release 11.2 P, Release 11.3 T, Release 11.3 AA, and Release 12.0 T.
3. Not applicable.
4. Bandwidth points for low-bandwidth port adapters are not required when you determine port adapter installation guidelines for a Cisco 7200 VXR router that has an NPE-300, NPE-400, or NSE-1 installed.
5. The PA-SRP-OC12 port adapters connect to both PCI buses; therefore, the total bandwidth points (300) are divided equally between the two buses. You must calculate the total bandwidth points by adding 150 bandwidth points to each bus.
6. The Ethernet port on the I/O controller (C7200-I/O-FE) does not operate in a Cisco 7202 router.
7. For use only in Cisco 7206 or Cisco 7206VXR router shelves in a Cisco AS5800 Universal Access Server.
8. The I/O controller with a Gigabit Ethernet port and an Ethernet port (C7200-I/O-GE+E) and the I/O controller with two autosensing Ethernet/Fast Ethernet ports (C7200-I/O-2FE/E) operate only in Cisco 7204VXR and Cisco 7206VXR chassis.
9. This adapter is not supported in Cisco 7200 VXR routers.
10. For use with 7200 VXR only until release of Cisco IOS Release 12.2 (2)T.

Note Cisco 7200 series routers running Cisco IOS Release 11.1 CA, Release 11.1 CC, or Release 11.2 P do not support a combination of installed ISDN PRI and BRI interfaces. Cisco 7200 series routers running Cisco IOS Release 11.3 T, Release 11.3 AA, or Release 12.0 T support a combination of installed ISDN PRI and BRI interfaces.

Cisco IOS software configuration information and release notes are available at: http://www.cisco.com/univercd/cc/td/doc/product/software/index.htm

Guidelines for Installation

To ensure that your Cisco 7200 series port adapter configuration is within the router operating limitations, observe the following guidelines (keeping in mind that a Fast Ethernet port or a Gigabit Ethernet port, if present on the I/O controller, is considered the same as a high-bandwidth port adapter. The I/O controller with no network port consumes 0 bandwidth points):

Table 2 Bandwidth Points Guidelines for the Cisco 7200 VXR with NPE-300, NPE-400, or NSE-1 Installed

		Maximum number of combined bandwidth points	
Router	**NPE**	**PCI Bus mb1—port adapter slot 0, 1, 3, 5**	**PCI Bus mb2—port adapter slot 2, 4, 6**
Cisco 7200 VXR	NPE-300, NPE-400, NSE-1	600 bandwidth points maximum	600 bandwidth points maximum

Table 3 Cisco 7200 or Cisco 7200 VXR and NPE or NSE Guidelines for Installation

Router	NPE	Guidelines for Installation
Cisco 7200 or Cisco 7200 VXR	NPE-150, NPE-175, NPE-200, NPE-225	• Maximum number of high bandwidth point port adapters:3 An I/O controller with a Fast Ethernet port or Gigabit Ethernet port is counted as one high-bandwidth port adapter. • Maximum number of high and medium bandwidth port adapters: 5

Table 3 Cisco 7200 or Cisco 7200 VXR and NPE or NSE Guidelines for Installation (continued)

Router	NPE	Guidelines for Installation
		• Distribute the port adapters as evenly as possible across the slots to balance the load between the two PCI buses. Include the I/O controller in your determination of balance.
Cisco 7200 or Cisco 7200 VXR	NPE-100	• Maximum number of high bandwidth port adapters: 2. • Maximum number of a high bandwidth and medium bandwidth port adapters: 4. • Distribute the port adapters as evenly as possible across the slots to balance the load between the PCI buses. • The I/O controller with the Fast Ethernet port is considered the same as one high-bandwidth port adapter. If the I/0 controller with a Fast Ethernet port is installed, the maximum number of high-bandwidth port adapters you can install is reduced by one.

Table 4 Slot Choice Guidelines

Router	Guidelines
Cisco 7206 or Cisco 7206 VXR	• Install high-bandwidth port adapters first, then medium bandwidth points port adapters, and lastly, low bandwidth port adapters. • Install port adapters in the following order: slot 2, 1, 4, 3, 6, 5.
Cisco 7204 or Cisco 7204 VXR	• Install high-bandwidth port adapters first, then medium bandwidth points port adapters, and lastly, low bandwidth port adapters. • Install port adapters in the following order: slot 2, 1, 4, 3.
Cisco 7202	• Install high-bandwidth port adapters first, then medium bandwidth points port adapters, and lastly, low bandwidth port adapters. • Install port adapters in the following order: slot 2, 1,

Note Dual-width port adapters occupy two horizontally aligned port adapter slots when installed in a Cisco 7200 series router; however, dual-width port adapters do not use both PCI bus mb1 and PCI bus mb2 when operating in the router.

The dual-width PA-A2 port adapter uses only PCI bus mb2 when installed in a Cisco 7200 series router.

The dual-width PA-12E/2FE port adapter autoselects PCI bus mb1 or PCI bus mb2 based on bandwidth availability—the port adapter selects the bus that has the most available bandwidth. Therefore, do not include the bandwidth points for the PA-12E/2FE when calculating the combined bandwidth point total for a combination of installed port adapters in PCI bus mb1 and mb2. Instead, add the bandwidth points for the PA-12E/2FE to the bus that has the most PCI bus bandwidth availability (the bus the PA-12E/2FE will autoselect) after completing the initial calculation.

Error Messages

The system prompts you with error messages if your port adapter configuration exceeds the preceding guidelines. Following are examples of the error messages:

- For a Cisco 7200 or Cisco 7200 VXR router that has an NPE-100, NPE-150, NPE-175, NPE-200, or NPE-225 installed, the following error messages are displayed:

```
%C7200-3-PACONFIG:Exceeds 3 high speed port adapters

%C7200-3-PACONFIG:Exceeds 5 high/medium speed port adapters
```

- For a Cisco 7200 VXR router that has an NPE-300, NPE-400, or NSE-1 installed, the following error messages are displayed:

```
%C7200-3-PACONFIG:Exceeds 600 bandwidth points for slots 0, 1, 3 & 5

%C7200-3-PACONFIG:Exceeds 600 bandwidth points for slots 2, 4 & 6

%C7200-3-PACONFIG:Exceeds 600 bandwidth points on both odd & even numbered slots
```

Note You can use a Cisco 7200 series router with a port adapter configuration that exceeds the preceding guidelines; however, to prevent anomalies from occurring while the router is in use, we strongly recommend restricting the port adapter types installed in the router according to the guidelines listed above. Additionally, your port adapter configuration must be within the above guidelines before the Cisco Technical Assistance Center will troubleshoot anomalies that are occurring in your Cisco 7200 series router.

The following section, "Determining Port Adapter and System Memory Requirements," explains how to determine the main memory required by a Cisco 7200 series router to support a combination of installed port adapters and a Cisco IOS software subset image.

Determining Port Adapter and System Memory Requirements

Depending on the circumstances, you might need to determine the amount of main memory (DRAM or SDRAM) required by your Cisco 7200 series router to support a combination of installed port adapter types and a specific Cisco IOS software subset image.

Note The NPE-175, NPE-225, NPE-300, and NSE-1 use SDRAM DIMMs for main memory, whereas the NPE-100, NPE-150, and NPE-200 use DRAM SIMMs for main memory.

The NPE-400 uses a single SDRAM SODIMM for main memory.

To determine the minimum amount of DRAM or SDRAM required by a Cisco 7200 series router to support a combination of installed port adapter types and a Cisco IOS software subset image, complete the following steps.

Note The steps in this section are general guidelines. The DRAM or SDRAM required by a Cisco 7200 series router to support a combination of installed port adapter types and a Cisco IOS software subset image is influenced by such variables as the features in the software you plan to use and the size of your network.

Complete the steps in this section only if your Cisco 7200 series router has 32 MB of DRAM or SDRAM installed. If your Cisco 7200 series router has 64 MB or more of DRAM or SDRAM installed, you have enough memory to support any combination of installed port adapter types and Cisco IOS software subset images.

For Cisco 7206 and Cisco 7206VXR router shelf memory requirements, refer to the Cisco AS5800 Universal Access Server documentation listed in the "For More Information" section on page 2.

Note The steps in this section assume that the port adapter hardware configuration of your Cisco 7200 series router follows the configuration guidelines explained in the "Configuration Guidelines" section on page 4.

If you need assistance when determining DRAM or SDRAM requirements for your Cisco 7200 series router, contact the Cisco Technical Assistance Center (TAC). See the "Obtaining Technical Assistance" section on page 19 for information on contacting TAC.

Step 1 Add the processor memory requirements for all of the installed port adapter types and the Cisco IOS software subset image. (See Table 1 through Table 7.)

Table 1 lists the processor memory required for the port adapter types available for use in Cisco 7200 series routers. Port adapters available for use in Cisco 7200 series routers require a minimum amount of processor memory to function properly in the routers. The amount of processor memory required by a port adapter depends on the number of interfaces or channels the port adapter provides.

Note Some port adapters require additional processor memory to execute port adapter- specific Cisco IOS software functionality. Table 1 lists additional processor memory required for each port adapter type (where applicable).

Table 5 lists the processor memory required for each software subset image in Cisco IOS Release 11.1 CA, Release 11.1 CC, and Release 11.2 P. Table 6 lists the processor memory required for each software subset image in Cisco IOS Release 11.3 T and Release 11.3 AA. Table 7 lists the processor memory required for each software subset image in Cisco IOS Release 12.0 T. The amount of processor memory listed in Table 5, Table 6, and Table 7 is for the static size of the image and some default data memory the image requires at system startup.

Step 2 Compare the required processor memory identified in Step 1 with the amount of processor memory provided by each DRAM or SDRAM option listed in Table 8, Table 9, Table 10, and Table 11.

Table 8 through Table 11 list the processor and I/O memory provided by each DRAM or SDRAM option available for Cisco 7200 series routers. The DRAM and SDRAM options available for Cisco 7200 series routers are logically divided into processor memory (which is used by the system CPU for instruction and data storage) and I/O memory (which is used for packet buffering). The amount of processor memory available for each DRAM or SDRAM option determines the combination of installed port adapter types that a Cisco 7200 series router can support.

Note For a DRAM or SDRAM option to support the installed port adapter types and Cisco IOS software subset image, the required processor memory identified in Step 1 must not exceed the amount of processor memory provided by the DRAM or SDRAM options listed in Table 8, Table 9, Table 10, and Table 11.

Step 3 Choose a DRAM or SDRAM memory option.

This completes the procedure for determining the minimum amount of DRAM or SDRAM required by a Cisco 7200 series router to support a combination of installed port adapters and the Cisco IOS software subset image.

For a sample configuration of a Cisco 7206 router that has an installed NPE-150, an I/O controller with the Fast Ethernet port, and Cisco IOS software subset images for Release 11.1 CA and Release 12.0 T, see Table 12.

Cisco IOS Software Memory Requirements

This section provides Cisco IOS memory requirements.

Cisco IOS 12.0 and later Cisco IOS releases require 64 MB of memory.

The following tables provide Cisco IOS subset image and memory requirements for 12.0T and earlier releases.

Table 5 Cisco IOS Software Subset Images and Memory Requirements (Cisco IOS Release 11.1 CA, Release 11.1 CC, and Release 11.2 P)

Cisco IOS Release 11.1 CA and 11.1 CC		Cisco IOS Release 11.2 P	
Subset Image	**Processor Memory Required**	**Subset Image**	**Processor Memory Required**
Desktop/IBM	13.5 MB	IP IP Encryption 40 IP Encryption 56	12.0 MB 13.0 MB 13.5 MB
Enterprise	15.0 MB	Desktop/IBM Desktop/IBM Encryption 40 Desktop/IBM Encryption 56	13.0 MB 14.0 MB 14.5 MB
Enterprise/APPN	17.0 MB	Desktop/IBM/APPN	15.0 MB
		Enterprise Enterprise Encryption 40 Enterprise Encryption 56	14.5 MB 15.5 MB 16.0 MB
		Enterprise/APPN Enterprise/APPN Encryption 40 Enterprise/APPN Encryption 56	16.5 MB 17.5 MB 18.0 MB
Network Layer 3 Switching	11.5 MB	Network Layer 3 Switching	11.0 MB

Table 6 Cisco IOS Software Subset Images and Memory Requirements (Cisco IOS Release 11.3 T and Release 11.3 AA)

Cisco IOS Release 11.3 T		Cisco IOS Release 11.3 AA	
Subset Image	**Processor Memory Required**	**Subset Image**	**Processor Memory Required**
Desktop/IBM Desktop/IBM Encryption 40 Desktop/IBM Encryption 56	15.5 MB 16.5 MB 17.0 MB	Cisco AS5800 Series IOS IP Plus	24 MB
Enterprise Enterprise Encryption 40 Enterprise Encryption 56	17.0 MB 18.0 MB 18.5 MB		
Enterprise/APPN Enterprise/APPN Encryption 40 Enterprise/APPN Encryption 56	19.0 MB 20.0 MB 20.5 MB		
IP IP Encryption 40 IP Encryption 56	14.0 MB 14.8 MB 15.5 MB		
IP IP Encryption 40 IP Encryption 56	14.0 MB 14.8 MB 15.5 MB		
Network Layer 3 Switching	12.7 MB		

Table 7 Cisco IOS Software Subset Images and Memory Requirements (Cisco IOS Release 12.0 T)

Subset Image	Processor Memory Required
Desktop/IBM Desktop/IBM Encryption 40 Desktop/IBM Encryption 56	26.0 MB 28.0 MB 29.0 MB
Desktop/IBM/FW Desktop/IBM/FW IPSec 56 Desktop/IBM/FW IPSec 3DES	27.0 MB 30.0 MB 31.0 MB
Enterprise Enterprise Encryption 40 Enterprise Encryption 56	28.0 MB 30.0 MB 31.0 MB
Enterprise/APPN Enterprise/APPN Encryption 40 Enterprise/APPN Encryption 56	30.0 MB 32.0 MB 33.0 MB
Enterprise/APPN Starpipes Enterprise/APPN Encryption 40 Starpipes Enterprise/APPN Encryption 56 Starpipes	31.0 MB 33.0 MB 34.0 MB
Enterprise/FW Enterprise/FW IPSec 56 Enterprise/FW IPSec 3DES	29.0 MB 32.0 MB 33.0 MB

Table 7 Cisco IOS Software Subset Images and Memory Requirements (Cisco IOS Release 12.0 T) (continued)

Subset Image	Processor Memory Required
IP IP Encryption 40 IP Encryption 56	25.0 MB 27.0 MB 28.0 MB
IP/FW IP/FW IPSec 56 IP/FW IPSec 3DES	26.0 MB 29.0 MB 30.0 MB
Network Layer 3 Switching	22.0 MB

Network Processing Engine or Network Services Engine DRAM or SDRAM Memory Requirements

Table 8 NPE-100, NPE-150, and NPE-200 DRAM Options

	NPE-100		NPE-150		NPE-200	
DRAM Option	Processor Memory	I/O Memory	Processor Memory	I/O Memory[1]	Processor Memory	I/O Memory[2]
32 MB	26 MB	6 MB	26 MB	7 MB	26 MB	10 MB
64 MB	56 MB	8 MB	56 MB	9 MB	56 MB	12 MB
128 MB	120 MB	8 MB	120 MB	9 MB	120 MB	12 MB[3]

1. The I/O memory for the NPE-150 DRAM options includes 1 MB of packet SRAM.
2. The I/O memory for the NPE-200 DRAM options includes 4 MB of packet SRAM.
3. For Cisco 7206 router shelf memory requirements, refer to the Cisco AS5800 Universal Access Server documentation listed in the "For More Information" section on page 2.

Table 9 NPE-175, NPE-225, and NSE-1 SDRAM Options

	NPE-175, NPE-225, and NSE-1	
SDRAM Option	Processor Memory	I/O Memory
64 MB[1]	56 MB	8 MB
128 MB	116 MB	12 MB

1. 64-MB SDRAM is not available for the NSE-1.

Table 10 NPE-300 SDRAM Options

SDRAM Option	Processor Memory	I/O Memory
64 MB	28 MB	36 MB
96 MB	60 MB	36 MB
160 MB	120 MB	40 MB
288 MB	248 MB	40 MB

Table 11 NPE-400 SDRAM Options

SDRAM Option	Processor Memory	I/O Memory
128 MB	112 MB	16 MB
256 MB	240 MB	16 MB
512 MB	480 MB	32 MB

Table 12 Sample Configuration (Cisco 7200 Router with an NPE-100, NPE-150, or NPE-200 Installed)

Item	Processor Memory Required		
Cisco IOS software subset image			
Network Layer 3 Switching	11.5 MB[1]	or	22.0 MB[2]
Port adapters			
Fast Ethernet port on the I/O controller	0.10 MB[3]		
1 full-duplex multimode FDDI	0.10 MB[3]		
1 high-speed serial	0.10 MB[3]		
1 4-port Token Ring half-duplex	0.30 MB[3]		
2 2-port channelized T1/PRI ISDN	1.80 MB[3] 1.80 MB[3] 1.20 MB[3, 4]		
1 2-port channelized T1 PRI/ISDN	1.80 MB[3]		
Totals	18.7 MB	or	29.2 MB
Minimum DRAM required	32 MB	or	64 MB

1. Specific to Cisco IOS Release 11.1 CA.
2. Specific to Cisco IOS Release 12.0 T.
3. Specific to Cisco IOS Release 11.1 CA, Release 11.1 CC, Release 11.2 P, Release 11.3 T, Release 11.3 AA, and Release 12.0 T.
4. Additional processor memory required for ISDN functionality.

Obtaining Documentation

The following sections explain how to obtain documentation from Cisco Systems.

World Wide Web

You can access the most current Cisco documentation on the World Wide Web at the following URL:

http://www.cisco.com

Translated documentation is available at the following URL:

http://www.cisco.com/public/countries_languages.shtml

Documentation CD-ROM

Cisco documentation and additional literature are available in a Cisco Documentation CD-ROM package, which is shipped with your product. The Documentation CD-ROM is updated monthly and may be more current than printed documentation. The CD-ROM package is available as a single unit or through an annual subscription.

Ordering Documentation

Cisco documentation is available in the following ways:

- Registered Cisco Direct Customers can order Cisco product documentation from the Networking Products MarketPlace:

  http://www.cisco.com/cgi-bin/order/order_root.pl

- Registered Cisco.com users can order the Documentation CD-ROM through the online Subscription Store:

  http://www.cisco.com/go/subscription

- Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco corporate headquarters (California, USA) at 408 526-7208 or, elsewhere in North America, by calling 800 553-NETS (6387).

Documentation Feedback

If you are reading Cisco product documentation on Cisco.com, you can submit technical comments electronically. Click **Leave Feedback** at the bottom of the Cisco Documentation home page. After you complete the form, print it out and fax it to Cisco at 408 527-0730.

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Obtaining Technical Assistance

Cisco provides Cisco.com as a starting point for all technical assistance. Customers and partners can obtain documentation, troubleshooting tips, and sample configurations from online tools by using the Cisco Technical Assistance Center (TAC) Web Site. Cisco.com registered users have complete access to the technical support resources on the Cisco TAC Web Site.

Cisco.com

Cisco.com is the foundation of a suite of interactive, networked services that provides immediate, open access to Cisco information, networking solutions, services, programs, and resources at any time, from anywhere in the world.

Cisco.com is a highly integrated Internet application and a powerful, easy-to-use tool that provides a broad range of features and services to help you to

- Streamline business processes and improve productivity
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- Register for online skill assessment, training, and certification programs

You can self-register on Cisco.com to obtain customized information and service. To access Cisco.com, go to the following URL:

http://www.cisco.com

Technical Assistance Center

The Cisco TAC is available to all customers who need technical assistance with a Cisco product, technology, or solution. Two types of support are available through the Cisco TAC: the Cisco TAC Web Site and the Cisco TAC Escalation Center.

Inquiries to Cisco TAC are categorized according to the urgency of the issue:

- Priority level 4 (P4)—You need information or assistance concerning Cisco product capabilities, product installation, or basic product configuration.
- Priority level 3 (P3)—Your network performance is degraded. Network functionality is noticeably impaired, but most business operations continue.
- Priority level 2 (P2)—Your production network is severely degraded, affecting significant aspects of business operations. No workaround is available.
- Priority level 1 (P1)—Your production network is down, and a critical impact to business operations will occur if service is not restored quickly. No workaround is available.

Which Cisco TAC resource you choose is based on the priority of the problem and the conditions of service contracts, when applicable.

Cisco TAC Web Site

The Cisco TAC Web Site allows you to resolve P3 and P4 issues yourself, saving both cost and time. The site provides around-the-clock access to online tools, knowledge bases, and software. To access the Cisco TAC Web Site, go to the following URL:

http://www.cisco.com/tac

All customers, partners, and resellers who have a valid Cisco services contract have complete access to the technical support resources on the Cisco TAC Web Site. The Cisco TAC Web Site requires a Cisco.com login ID and password. If you have a valid service contract but do not have a login ID or password, go to the following URL to register:

http://www.cisco.com/register/

If you cannot resolve your technical issues by using the Cisco TAC Web Site, and you are a Cisco.com registered user, you can open a case online by using the TAC Case Open tool at the following URL:

http://www.cisco.com/tac/caseopen

If you have Internet access, it is recommended that you open P3 and P4 cases through the Cisco TAC Web Site.

Cisco TAC Escalation Center

The Cisco TAC Escalation Center addresses issues that are classified as priority level 1 or priority level 2; these classifications are assigned when severe network degradation significantly impacts business operations. When you contact the TAC Escalation Center with a P1 or P2 problem, a Cisco TAC engineer will automatically open a case.

To obtain a directory of toll-free Cisco TAC telephone numbers for your country, go to the following URL:

http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml

Before calling, please check with your network operations center to determine the level of Cisco support services to which your company is entitled; for example, SMARTnet, SMARTnet Onsite, or Network Supported Accounts (NSA). In addition, please have available your service agreement number and your product serial number

This document is to be used in conjunction with the documents listed in the "For More Information" section.