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Cisco 7200 Series Port Adapter Hardware Configuration Guidelines

Product Numbers: CISCO7206(=), CISCO7206VXR(=),CISCO7206-DC, CISCO7206-CH, CISCO7204(=), CISCO7204VXR(=), CISCO7204-DC, CISCO7204-CH, CISCO7202(=), RS7206S(=), RS7206VXR-SK(=)

Introduction

This document explains the port adapter hardware configuration guidelines for the 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 the Cisco 7200 series architecture, port adapter bandwidths, 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 the 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 the Cisco 7200 series routers, refer to one of the following publications that shipped with your router:
  - *Cisco 7200 VXR Installation and Configuration Guide*
  - *Cisco 72xx Installation and Configuration 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 the 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, see the "Cisco Connection Online" section on page 16 or the "Documentation CD-ROM" section on page 17, or call 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 company holidays). You can also send e-mail to cs-rep@cisco.com, refer to the *Cisco Information Packet* that shipped with your router, or access Cisco documentation on the World Wide Web at http://www.cisco.com, http://www-china.cisco.com, or http://www-europe.cisco.com.

Cisco 7200 Series Overview

The 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.

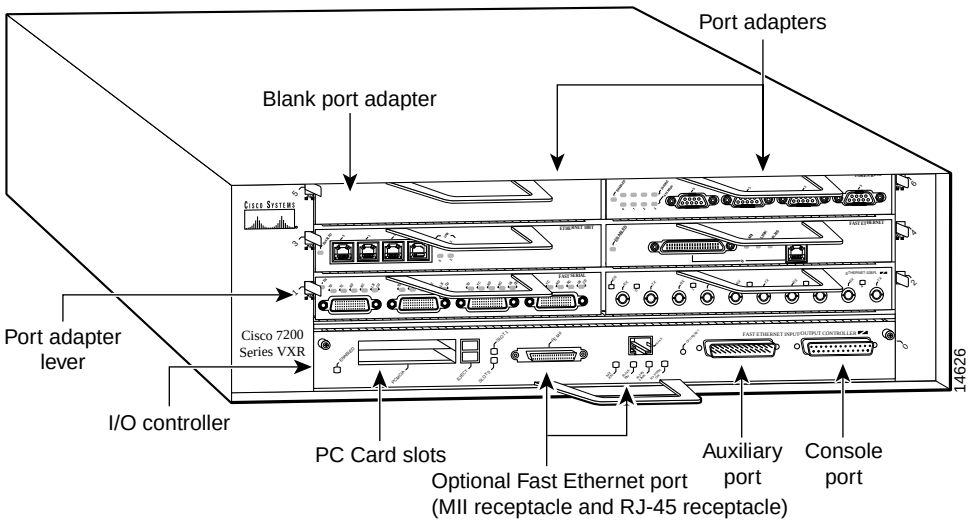
Note For information about the Cisco 7206 and Cisco 7206VXR as router shelves in a Cisco AS5800 Universal Access Server, refer to the Cisco AS5800 Universal Access Server documentation listed in the "For More Information" section on page 2.

The front of the 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 an optional Fast Ethernet port. The Fast Ethernet port provides a 100-Mbps connection to the network. 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.

Note The I/O controller is available with or without a Fast Ethernet port. The I/O controller with a Fast Ethernet port is equipped with an MII receptacle and an RJ-45 receptacle (only one receptacle can be used at a time). Although still supported by Cisco Systems, the I/O controller equipped with a single MII receptacle was discontinued as an orderable product in May 1998.

You can install an I/O controller with or without a Fast Ethernet port in all Cisco 7200 series routers; however, when you install an I/O controller with a Fast Ethernet port in a Cisco 7202, the system software automatically disables the port.

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

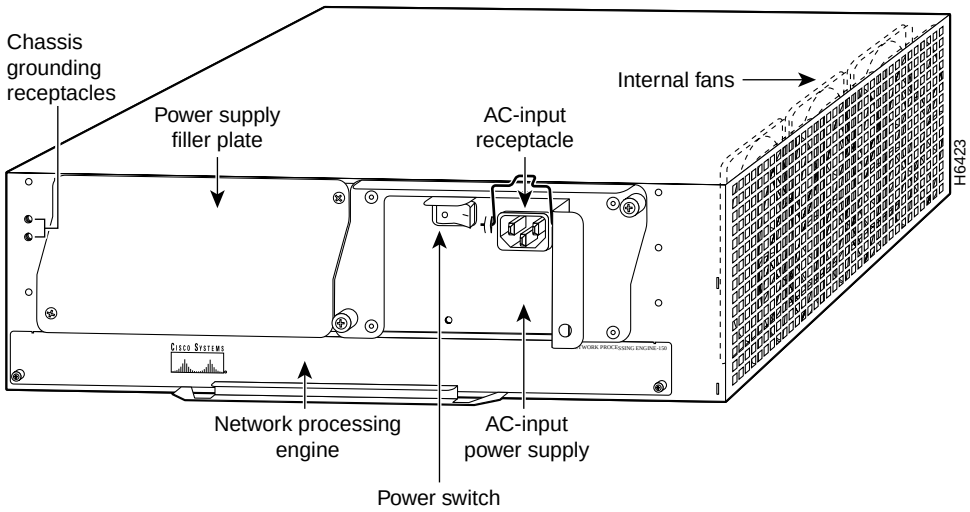


The port adapters installed in Cisco 7200 series routers are of the same type as those installed in other Cisco 7000 family routers. The Cisco 7200 series routers support the online insertion and removal (OIR) of installed port adapters.

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 the Cisco 7200 series routers provides access to a network processing engine and up to two 280W, AC-input or DC-input power supplies (refer to Figure 2).

Figure 2 Cisco 7200 Series Router—Rear View



The network processing engine has no external connectors or LEDs. There is a handle for removing and installing the network processing engine and two captive installation screws for securing it 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 network processing engine slide into their respective chassis slots and connect directly to the router's midplane; there are no internal cables to connect. The midplane distributes DC power from the power supplies to the I/O controller, port adapters, fan tray, and network processing engine.

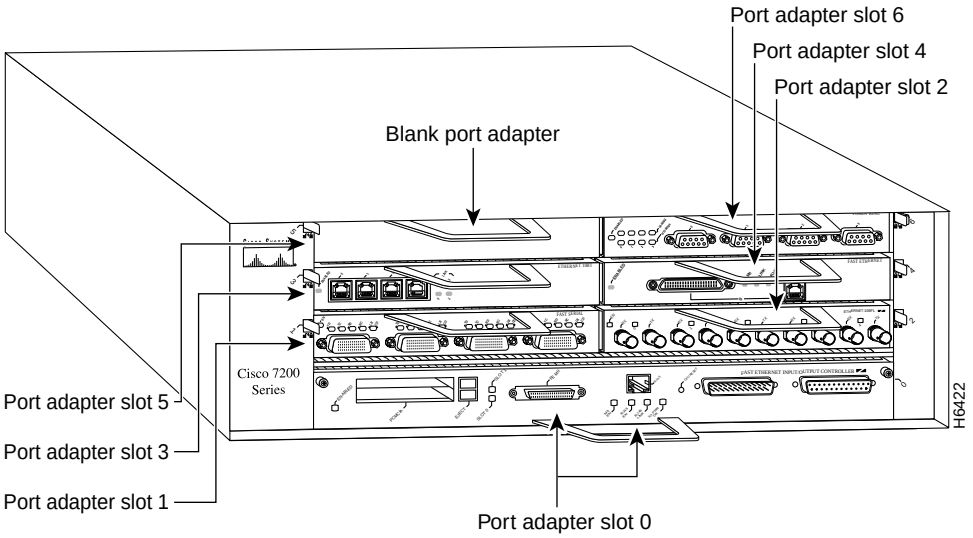
Configuration Guidelines

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 routers' midplane that provide a path to packet I/O memory and the system (routing and switching) processor. The Fast Ethernet port on the I/O controller connects to a third PCI bus, mb0 (through mb1), for packet routing and switching.

In the Cisco 7202 router, bus mb1 is for port adapter slot 1; bus mb2 is for port adapter slot 2. In the Cisco 7204 and Cisco 7204VXR routers, bus mb1 is for the optional Fast Ethernet port on the I/O controller and port adapter slots 1 and 3; bus mb2 is for port adapter slots 2 and 4. In the Cisco 7206 and Cisco 7206VXR routers, bus mb1 is for the optional Fast Ethernet port on the I/O controller and port adapter slots 1, 3, and 5; bus mb2 is for port adapter slots 2, 4, and 6.

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 the 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

For a Cisco 7200 or Cisco 7200 VXR router that has a network processing engine 100 (NPE-100), NPE-150, NPE-175, NPE-200, or NPE-225 installed, high-, medium-, and low- bandwidth adapters in the router should be evenly distributed between bus mb1 and bus mb2. For a Cisco 7200 VXR router that has an NPE-300 installed, the bandwidth points for adapters in the router should be evenly distributed between bus mb1 and bus mb2.

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

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

Table 1 Port and Service Adapter Types, Bandwidths, Bandwidth Points, and Processor Memory Requirements

Port Adapter Type	Product Name	Bandwidth	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				
Channel-Attached					
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]	–	0.15 MB	0.36 MB
Channelized, Multichannel, and ISDN					
1-port channelized T3 dual-wide	PA-CT3/4T1[5]	High	–	0.80 MB	–
2-port channelized E1/Primary Rate Interface (PRI) ISDN	PA-2CE1/PRI-75[5]	Low[4]	–	1.80 MB	1.20 MB (when configured for ISDN)
	PA-2CE1/PRI-120[5]				
2-port channelized T1/PRI ISDN	PA-2CT1/PRI[5]	Low[4]	–	1.80 MB	1.20 MB (when configured for ISDN)
1-port multichannel E3	PA-MC-E3	High	90	3.00 MB	With two interfaces configured for PPP encapsulation
				6.40 MB	With 128 interfaces configured for PPP encapsulation
1-port multichannel T3	PA-MC-T3	High	90	3.00 MB	With two 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]	–	3.50 MB	–

Table 1 Port and Service Adapter Types, Bandwidths, Bandwidth Points, and Processor Memory Requirements (continued)

Port Adapter Type	Product Name	Bandwidth	Bandwidth Points[1]	Processor Memory Required[2]	Additional Requirements
Channelized, Multichannel, and ISDN					
4- and 8-port multichannel DS1/PRI	PA-MC-4T1	Low[4]	–	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]	–	0.40 MB	1.20 MB
	PA-8B-ST			0.80 MB	
Fast Ethernet and Ethernet					
14-port Ethernet switch 10/100 BaseTX	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				
1-port Fast Ethernet 100BaseTX	PA-FE-TX		200	0.10 MB	
1-port Fast Ethernet 100BaseFX	PA-FE-FX				
1-port Fast Ethernet I/O controller	C7200-I/O-FE				
1-port 100VG-AnyLAN	PA-100VG				
1-port dial shelf interconnect[6]	PA-DSIC				
FDDI					
Multimode	PA-FDDI-MM[5]	High	–	0.10 MB	–
Single-mode	PA-FDDI-SM[5]				
Full-duplex multimode FDDI	PA-F/FD-MM[5]				
Full-duplex single-mode FDDI	PA-F/FD-SM[5]				
Packet-over-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					
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+				
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+				

Table 1 Port and Service Adapter Types, Bandwidths, Bandwidth Points, and Processor Memory Requirements (continued)

Port Adapter Type	Product Name	Bandwidth	Bandwidth Points[1]	Processor Memory Required[2]	Additional Requirements
Serial					
4-port E1-G.703/704 serial	PA-4E1G-120	Low[4]	–	0.10 MB	–
	PA-4E1G-75				
8-port synchronous serial (X.21)	PA-8T-X21	Low[4]	–	0.35 MB	–
8-port synchronous serial (V.35)	PA-8T-V35				
8-port synchronous serial (EIA/TIA-232)	PA-8T-232				
4-port synchronous serial	PA-4T	Low[4]	–	0.20 MB	–
4-port synchronous serial, enhanced	PA-4T+				
Service adapters					
Encryption service adapter	SA-Encrypt	Medium	60	0.03	–
Compression service adapter	SA-Comp/1[5]	Low[4]	N/A	0.10	–
	SA-Comp/4[5]				
Token Ring					
4-port Token Ring	PA-4R[5]	Medium	60	0.30 MB	–
4-port Token Ring full-duplex	PA-4R-FDX[5]	High	120	0.30 MB	–
4-port dedicated Token Ring	PA-4R-DTR				

1 Bandwidth points are used when you determine port adapter installation guidelines for a Cisco 7200 VXR router that has an NPE-300 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 installed.
5 This adapter is not supported in the Cisco 7200 VXR routers.
6 For use only in Cisco 7206 or Cisco 7206VXR router shelves in a Cisco AS5800 Universal Access Server.

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.

To ensure that your Cisco 7200 series port adapter configuration is within the router's operating limitations, observe the following guidelines (keeping in mind that the Fast Ethernet port on the I/O controller, if present, is considered a high-bandwidth port adapter):

- For a Cisco 7200 VXR router with an NPE-300 installed:
  - Keep the combined bandwidth point total of PCI bus mb1 (port adapter slot 0, slot 1, slot 3, and slot 5) to 600 or less.
  - Keep the combined bandwidth point total of PCI bus mb2 (port adapter slot 2, slot 4, and slot 6) to 600 or less.

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 bus mb1 and bus mb2 when operating in the router.

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

The dual-width PA-12E/2FE port adapter autoselects bus mb1 or 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 bus mb1 and mb2. Instead, add the bandwidth points for the PA-12E/2FE to the bus that has the most bus bandwidth availability (the bus the PA-12E/2FE will autoselect) after completing the initial calculation.

- For a Cisco 7200 or Cisco 7200 VXR router that has an NPE-225, NPE-200, NPE-175, or NPE-150 installed:
  - Keep the total number of installed high-bandwidth port adapters to three.
  - Keep the total number of installed high-bandwidth and medium-bandwidth port adapters to five.

Note The Cisco 7200 routers and the Cisco 7200 VXR routers support the NPE-225, -200, -175, -150, and -100. However, the NPE-100 is no longer an orderable product as of May 1999.

- For a Cisco 7200 or Cisco 7200 VXR router that has an NPE-100 installed:
  - Keep the total number of installed high-bandwidth port adapters to two.
  - Keep the total number of installed high-bandwidth and medium-bandwidth port adapters to four.
- When installing port adapters, start with high-bandwidth port adapters, then medium-bandwidth port adapters, and finish with low-bandwidth port adapters. In the Cisco 7206 or Cisco 7206VXR, fill port adapter slots in the following order: slot 2, 1, 4, 3, 6, and 5. In the Cisco 7204 or Cisco 7204VXR, fill port adapter slots in the following order: slot 2, 1, 4, and 3. In the Cisco 7202, fill port adapter slot 2 first, then port adapter slot 1.

The system prompts you with error messages if your port adapter configuration exceeds the above 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 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 above 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 Cisco's 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, and NPE-300 use SDRAM DIMMs for main memory, whereas the NPE-100, -150, and -200 use DRAM SIMMs 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 5.

If you need assistance when determining DRAM or SDRAM requirements for your Cisco 7200 series router, contact Cisco's Technical Assistance Center (TAC) at 800 553-2447, 408 526-7209, or tac@cisco.com.

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 4.)

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 2 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 3 lists the processor memory required for each software subset image in Cisco IOS Release 11.3 T and Release 11.3 AA. Table 4 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 2, Table 3, and Table 4 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 5 and Table 6.

Table 5 lists the processor and I/O memory provided by each DRAM option available for the Cisco 7200 series routers. Table 6 lists the processor and I/O memory provided by each SDRAM option available for the Cisco 7200 series routers. The DRAM and SDRAM options available for the 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 5 and Table 6.

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 Cisco IOS software subset image.

Table 7 provides a sample configuration for 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 12.0 T.

Table 2 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 Software Release 11.1 CA and 11.1 CC		Cisco IOS Release 11.2 P	
Subset Image	**Processor Memory Required**	**Subset Image**	**Processor Memory Required**
Network Layer 3 Switching	11.5 MB	Network Layer 3 Switching	11.0 MB
Desktop/IBM	13.5 MB	IP	12.0 MB
		IP Encryption 40	13.0 MB
		IP Encryption 56	13.5 MB
Enterprise	15.0 MB	Desktop/IBM	13.0 MB
		Desktop/IBM Encryption 40	14.0 MB
		Desktop/IBM Encryption 56	14.5 MB
Enterprise/APPN	17.0 MB	Desktop/IBM/APPN	15.0 MB
		Enterprise	14.5 MB
		Enterprise Encryption 40	15.5 MB
		Enterprise Encryption 56	16.0 MB
		Enterprise/APPN	16.5 MB
		Enterprise/APPN Encryption 40	17.5 MB
		Enterprise/APPN Encryption 56	18.0 MB

Table 3 Cisco IOS Software Subset Images and Memory Requirements (Cisco IOS Release 11.3 T and Cisco IOS Release 11.3 AA)

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

Table 4 Cisco IOS Software Subset Images and Memory Requirements (Cisco IOS Release 12.0 T)

Subset Image	Processor Memory Required
Network Layer 3 Switching	22.0 MB
IP	25.0 MB
IP Encryption 40	27.0 MB
IP Encryption 56	28.0 MB
IP/FW	26.0 MB
IP/FW IPSec 56	29.0 MB
IP/FW IPSec 3DES	30.0 MB
Desktop/IBM	26.0 MB
Desktop/IBM Encryption 40	28.0 MB
Desktop/IBM Encryption 56	29.0 MB
Desktop/IBM/FW	27.0 MB
Desktop/IBM/FW IPSec 56	30.0 MB
Desktop/IBM/FW IPSec 3DES	31.0 MB
Enterprise	28.0 MB
Enterprise Encryption 40	30.0 MB
Enterprise Encryption 56	31.0 MB
Enterprise/APPN	30.0 MB
Enterprise/APPN Encryption 40	32.0 MB
Enterprise/APPN Encryption 56	33.0 MB
Enterprise/APPN Starpipes	31.0 MB
Enterprise/APPN Encryption 40 Starpipes	33.0 MB
Enterprise/APPN Encryption 56 Starpipes	34.0 MB
Enterprise/FW	29.0 MB
Enterprise/FW IPSec 56	32.0 MB
Enterprise/FW IPSec 3DES	33.0 MB

Table 5 Cisco 7200 Series DRAM Options (Specific to the NPE-100, NPE-150, and NPE-200)

	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 6 Cisco 7200 Series SDRAM Options (Specific to the NPE-175, NPE-225, and NPE-300)

	NPE-175		NPE-225		NPE-300	
SDRAM Option	Processor Memory	I/O Memory	Processor Memory	I/O Memory	Processor Memory	I/O Memory
32 MB					28 MB	36 MB
64 MB	56 MB	8 MB	56 MB	8 MB	60 MB	36 MB
128 MB	116 MB	12 MB	116 MB	12 MB	120 MB	40 MB
256 MB					248 MB	40 MB

Table 7 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]		
One FDDI multimode full-duplex	0.10 MB[3]		
One high-speed serial	0.10 MB[3]		
One 4-port Token Ring half-duplex	0.30 MB[3]		
Two 2-port T1/PRI ISDN	1.80 MB[3] 1.80 MB[3] 1.20 MB[3, 4]		
One 2-port channelized T1	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.

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