



Cisco 7200 VXR Installation and Configuration Guide

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- Move the equipment farther away from the television or radio.
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Preface

This preface describes who should read the *Cisco 7200 VXR Installation and Configuration Guide*, how it is organized, and its document conventions. It discusses the objectives, audience, and organization of this publication. The following sections are in this preface:

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Document Revision History

The Document Revision History below records technical changes to this document.

Document Version	Date	Change Summary
OL-5013-09	June, 2008	Adding information about SFP-GE-F= module.
OL-5013-08	December, 2006	Adding NPE-G2 CWDM information.
OL-5013-07	May, 2006	Adding the NPE-G2 information.
OL-5013-06	March, 2006	Adding the Port Adapter Jacket Card and new NPE-G1 temperature threshold information.
OL-5013-05	September, 2005	This version removes the MEM-I/O-D-FLD32M and the MEM-I/O-D-FLD48M product identification from the document, as the part is end-of-sale, and adds statement numbers to warnings.

Cisco documentation and additional literature are available in the Product Documentation DVD package, which may have shipped with your product. The Product Documentation DVD is updated regularly and may be more current than printed documentation. See the [“Obtaining Documentation and Submitting a Service Request” section on page 17](#) for more information.

You can access the most current Cisco documentation on the World Wide Web at <http://www.cisco.com>. Translated documentation is available at http://www.cisco.com/public/countries_languages.shtml.

Audience

To use this publication, you should be familiar not only with Cisco router hardware and cabling but also with electronic circuitry and wiring practices. You should also have experience as an electronic or electromechanical technician.

This installation guide explains the initial hardware installation and basic configuration procedures for the Cisco 7200 VXR routers. It contains procedures for unpacking and installing the router hardware, creating a basic software configuration file, and starting up the router. After completing the installation and basic configuration procedures covered in this guide, you will then use the appropriate companion publications to more completely configure your system.

Organization

The major sections of this guide are as follows:

Chapter / Appendix	Title	Description
Chapter 1	Cisco 7200 VXR Product Overview	Describes the physical properties and provides a functional overview of the Cisco 7200 VXR routers.
Chapter 2	Preparing for Installation	Describes safety considerations, tools required, and gives an overview of the installation and procedures you should perform <i>before</i> the actual installation.
Chapter 3	Installing a Cisco 7200 VXR Router	Describes installing the hardware and connecting the external network interface cables.
Chapter 4	Observing System Startup and Performing a Basic Configuration	Describes the procedures for completing a basic system configuration and for checking and saving this configuration to system memory.
Chapter 5	Troubleshooting the Installation	Describes troubleshooting procedures for the hardware installation.
Appendix A	Configuration Register Information	Provides configuration register information.

Document Conventions

Command descriptions use the following conventions:

boldface font	Commands and keywords are in boldface .
<i>italic</i> font	Arguments for which you supply values are in <i>italics</i> .
[]	Elements in square brackets are optional.

{ x y z }	Alternative keywords are grouped in braces and separated by vertical bars.
[x y z]	Optional alternative keywords are grouped in brackets and separated by vertical bars.
string	A nonquoted set of characters. Do not use quotation marks around the string, or the string will include the quotation marks.

Screen examples use the following conventions:

screen font	Terminal sessions and information the system displays are in <i>screen font</i> .
boldface screen font	Information you must enter is in boldface screen font .
<i>italic screen font</i>	Arguments for which you supply values are in <i>italic screen font</i> .
→	This pointer highlights an important line of text in an example.
^	The symbol ^ represents the key labeled Control —for example, the key combination ^D in a screen display means hold down the Control key while you press the D key.
< >	Nonprinting characters, such as passwords, are in angle brackets.
[]	Default responses to system prompts are in square brackets.
!, #	An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line.

Notes, cautionary statements, and safety warnings use these conventions:



Note

Means *reader take note*. Notes contain helpful suggestions or references to materials not contained in this manual.



Caution

Means *reader be careful*. You are capable of doing something that might result in equipment damage or loss of data.

Warning Definition



Warning

IMPORTANT SAFETY INSTRUCTIONS

This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. To see translations of the warnings that appear in this publication, refer to the translated safety warnings that accompanied this device.

Statement 1071

Note: SAVE THESE INSTRUCTIONS

Note: This documentation is to be used in conjunction with the specific product installation guide that shipped with the product. Please refer to the Installation Guide, Configuration Guide, or other enclosed additional documentation for further details.

Waarschuwing

BELANGRIJKE VEILIGHEIDSINSTRUCTIES

Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van de standaard praktijken om ongelukken te voorkomen. Voor een vertaling van de waarschuwingen die in deze publicatie verschijnen, dient u de vertaalde veiligheidswaarschuwingen te raadplegen die bij dit apparaat worden geleverd.

Opmerking BEWAAR DEZE INSTRUCTIES.

Opmerking Deze documentatie dient gebruikt te worden in combinatie met de installatiehandleiding voor het specifieke product die bij het product wordt geleverd. Raadpleeg de installatiehandleiding, configuratiehandleiding of andere verdere ingesloten documentatie voor meer informatie.

Varoitus

TÄRKEITÄ TURVALLISUUTEEN LIITTYVIÄ OHJEITA

Tämä varoitusmerkki merkitsee vaaraa. Olet tilanteessa, joka voi johtaa ruumiinvammaan. Ennen kuin työskentelet minkään laitteiston parissa, ota selvää sähkökytkentöihin liittyvistä vaaroista ja tavanomaisista onnettomuuksien ehkäisykeinoista. Tässä asiakirjassa esitetyjen varoitusten käännökset löydät laitteen mukana toimitetuista ohjeista.

Huomautus SÄILYTÄ NÄMÄ OHJEET

Huomautus Tämä asiakirja on tarkoitettu käytettäväksi yhdessä tuotteen mukana tulleen asennusoppaan kanssa. Katso lisätietoja asennusoppaasta, kokoonpano-oppaasta ja muista mukana toimitetuista asiakirjoista.

Attention IMPORTANTES INFORMATIONS DE SÉCURITÉ

Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant causer des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers posés par les circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents. Pour prendre connaissance des traductions d'avertissements figurant dans cette publication, consultez les consignes de sécurité traduites qui accompagnent cet appareil.

Remarque CONSERVEZ CES INFORMATIONS

Remarque Cette documentation doit être utilisée avec le guide spécifique d'installation du produit qui accompagne ce dernier. Veuillez vous reporter au Guide d'installation, au Guide de configuration, ou à toute autre documentation jointe pour de plus amples renseignements.

Warnung WICHTIGE SICHERHEITSANWEISUNGEN

Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu einer Körperverletzung führen könnte. Bevor Sie mit der Arbeit an irgendeinem Gerät beginnen, seien Sie sich der mit elektrischen Stromkreisen verbundenen Gefahren und der Standardpraktiken zur Vermeidung von Unfällen bewusst. Übersetzungen der in dieser Veröffentlichung enthaltenen Warnhinweise sind im Lieferumfang des Geräts enthalten.

Hinweis BEWAHREN SIE DIESE SICHERHEITSANWEISUNGEN AUF

Hinweis Dieses Handbuch ist zum Gebrauch in Verbindung mit dem Installationshandbuch für Ihr Gerät bestimmt, das dem Gerät beiliegt. Entnehmen Sie bitte alle weiteren Informationen dem Handbuch (Installations- oder Konfigurationshandbuch o. Ä.) für Ihr spezifisches Gerät.

Figyelem FONTOS BIZTONSÁGI ELOÍRÁSOK

Ez a figyelmeztető jel veszélyre utal. Sérülésveszélyt rejtő helyzetben van. Mielott bármely berendezésen munkát végezte, legyen figyelemmel az elektromos áramkörök okozta kockázatokra, és ismerkedjen meg a szokásos balesetvédelmi eljárásokkal. A kiadványban szereplő figyelmeztetések fordítása a készülékhez mellékelt biztonsági figyelmeztetések között található; a fordítás az egyes figyelmeztetések végén látható szám alapján kereshető meg.

ORIZZE MEG EZEKET AZ UTASÍTÁSOKAT!**Avvertenza IMPORTANTI ISTRUZIONI SULLA SICUREZZA**

Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di intervenire su qualsiasi apparecchiatura, occorre essere al corrente dei pericoli relativi ai circuiti elettrici e conoscere le procedure standard per la prevenzione di incidenti. Per le traduzioni delle avvertenze riportate in questo documento, vedere le avvertenze di sicurezza che accompagnano questo dispositivo.

Nota CONSERVARE QUESTE ISTRUZIONI

Nota La presente documentazione va usata congiuntamente alla guida di installazione specifica spedita con il prodotto. Per maggiori informazioni, consultare la Guida all'installazione, la Guida alla configurazione o altra documentazione acclusa.

Advarsel VIKTIGE SIKKERHETSINSTRUKSJONER

Dette varselssymbolet betyr fare. Du befinner deg i en situasjon som kan forårsake personskade. Før du utfører arbeid med utstyret, bør du være oppmerksom på farene som er forbundet med elektriske kretssystemer, og du bør være kjent med vanlig praksis for å unngå ulykker. For å se oversettelser av advarslene i denne publikasjonen, se de oversatte sikkerhetsvarslene som følger med denne enheten.

Merk TA VARE PÅ DISSE INSTRUKSJONENE

Merk Denne dokumentasjonen skal brukes i forbindelse med den spesifikke installasjonsveiledningen som fulgte med produktet. Vennligst se installasjonsveiledningen, konfigureringsveiledningen eller annen vedlagt tilleggsdokumentasjon for detaljer.

Aviso INSTRUÇÕES IMPORTANTES DE SEGURANÇA

Este símbolo de aviso significa perigo. O utilizador encontra-se numa situação que poderá ser causadora de lesões corporais. Antes de iniciar a utilização de qualquer equipamento, tenha em atenção os perigos envolvidos no manuseamento de circuitos eléctricos e familiarize-se com as práticas habituais de prevenção de acidentes. Para ver traduções dos avisos incluídos nesta publicação, consulte os avisos de segurança traduzidos que acompanham este dispositivo.

Nota GUARDE ESTAS INSTRUÇÕES

Nota Esta documentação destina-se a ser utilizada em conjunto com o manual de instalação incluído com o produto específico. Consulte o manual de instalação, o manual de configuração ou outra documentação adicional inclusa, para obter mais informações.

¡Advertencia! INSTRUCCIONES IMPORTANTES DE SEGURIDAD

Este símbolo de aviso indica peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considere los riesgos de la corriente eléctrica y familiarícese con los procedimientos estándar de prevención de accidentes. Vea las traducciones de las advertencias que acompañan a este dispositivo.

Nota GUARDE ESTAS INSTRUCCIONES

Nota Esta documentación está pensada para ser utilizada con la guía de instalación del producto que lo acompaña. Si necesita más detalles, consulte la Guía de instalación, la Guía de configuración o cualquier documentación adicional adjunta.

Varning! VIKTIGA SÄKERHETSANVISNINGAR

Denna varningssignal signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanliga förfaranden för att förebygga olyckor. Se översättningarna av de varningsmeddelanden som finns i denna publikation, och se de översatta säkerhetsvarningarna som medföljer denna anordning.

OBS! SPARA DESSA ANVISNINGAR

OBS! Denna dokumentation ska användas i samband med den specifika produktinstallationshandbok som medföljde produkten. Se installationshandboken, konfigurationshandboken eller annan bifogad ytterligare dokumentation för närmare detaljer.

Предупреждение **ВАЖНЫЕ СВЕДЕНИЯ ПО БЕЗОПАСНОСТИ**

Этот символ предупреждает о наличии опасности. При неправильных действиях возможно получение травм. Перед началом работы с любым оборудованием необходимо ознакомиться с ситуациями, в которых возможно поражение электротоком, и со стандартными действиями для предотвращения несчастных случаев. Переведенный текст предупреждений содержится в соответствующем документе, поставляемом вместе с устройством.

Примечание **СОХРАНЯЙТЕ ЭТУ ИНСТРУКЦИЮ**

Примечание Эта инструкция должна использоваться вместе с руководством по установке конкретного изделия, входящим в комплект поставки. Дополнительные сведения см. в руководстве по установке, руководстве по настройке и другой документации, поставляемой с изделием.

警告 **有关安全的重要说明**

这个警告符号指有危险。您所处的环境可能使身体受伤。操作设备前必须意识到电流的危险性，务必熟悉操作标准，以防发生事故。如果需要了解本说明中出现的警告符号的译文，请参阅本装置所附之安全警告译文。

注意 保存这些说明

注意 本文件应与本产品附带的具体安装说明一并阅读。如欲了解详情，请参阅《安装说明》、《配置说明》或所附的其他文件。

警告 **安全上の重要な注意事項**

「危険」の意味です。人身事故を予防するための注意事項が記述されています。装置の取り扱い作業を行うときは、電気回路の危険性に注意し、一般的な事故防止対策に留意してください。このマニュアルに記載されている警告の各国語版は、装置に付属の「Translated Safety Warnings」を参照してください。

注 これらの注意事項を保管しておいてください。

注 この資料は、製品に付属のインストレーション ガイドと併用してください。詳細は、インストレーション ガイド、コンフィギュレーション ガイド、または添付されているその他のマニュアルを参照してください。

Terms and Acronyms

To fully understand the content of this user guide, you should be familiar with the following terms and acronyms:

- Cache—Memory with fast access and small capacity used to temporarily store recently accessed data; found either incorporated into the processor or near it.
- CWDM GBIC—Coarse Wavelength-Divison Multiplexing Gigabit Interface Converter
- DCE—data communications equipment
- DMA—direct memory access
- DRAM—dynamic random-access memory
- DTE—data terminal equipment

- EPROM—erasable programmable read-only memory
- FRU—field-replaceable unit (router components that do not require replacement by a Cisco-certified service provider)
- GBIC—Gigabit Interface Converter
- Gbps—gigabits per second
- Instruction and data cache—Instructions to the processor and data on which the instructions work.
- Integrated cache—Cache that is built into the processor; sometimes referred to as internal cache. Cache memory that is physically located outside the processor is not integrated, and is sometimes referred to as external cache.
- MB—megabyte
- NVRAM—nonvolatile random-access memory
- OIR—online insertion and removal
- PCI—Peripheral Component Interconnect
- PCMCIA—Personal Computer Memory Card International Association
- Primary, secondary, tertiary cache—Hierarchical cache memory storage based on the proximity of the cache to the core of the processor. Primary cache is closest to the processor core and has the fastest access. Secondary cache has slower access than primary cache, but faster access than tertiary cache.
- RFI—radio frequency interference
- RISC—reduced instruction set computing
- SDRAM—synchronous dynamic random-access memory
- SIMM—single in-line memory module
- SNMP—Simple Network Management Protocol
- SRAM—static random-access memory
- TFTP—Trivial File Transfer Protocol
- Unified cache—Instruction cache and data cache are combined. For example, a processor may have primary cache with separate instruction and data cache memory, but unified secondary cache.

Related Documentation

Your Cisco 7200 VXR router and the Cisco IOS software running on it contain extensive features and functionality, which are documented in the following resources:

- [Cisco 7200 Series Routers Documentation Roadmap](http://www.cisco.com/en/US/products/hw/routers/ps341/products_documentation_roadmap09186a00801c0915.html) at http://www.cisco.com/en/US/products/hw/routers/ps341/products_documentation_roadmap09186a00801c0915.html for a list of all Cisco 7200 series routers documentation and troubleshooting tools and information.
- [Cisco 7200 Series Routers Port Adapter Documentation Roadmap](http://www.cisco.com/en/US/products/hw/routers/ps341/products_documentation_roadmap09186a00801c0a32.html) at http://www.cisco.com/en/US/products/hw/routers/ps341/products_documentation_roadmap09186a00801c0a32.html for a list of all Cisco 7200 series routers-supported port adapter documentation.
- [Cisco 7200 Series Routers Troubleshooting Documentation Roadmap](http://www.cisco.com/en/US/products/hw/routers/ps341/prod_troubleshooting_guide09186a00801c0f65.html) at http://www.cisco.com/en/US/products/hw/routers/ps341/prod_troubleshooting_guide09186a00801c0f65.html for links to troubleshooting tools, utilities, and Tech Notes.

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, submitting a service request, and gathering additional information, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

<http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html>

Subscribe to the *What's New in Cisco Product Documentation* as a Really Simple Syndication (RSS) feed and set content to be delivered directly to your desktop using a reader application. The RSS feeds are a free service and Cisco currently supports RSS Version 2.0.



CHAPTER 1

Cisco 7200 VXR Product Overview

This chapter provides physical and functional overviews of the Cisco 7200 VXR routers. Descriptions and examples of software commands are included when they are necessary for replacing, installing, configuring, or maintaining the router hardware.

The following sections describe router hardware, major components, and functions of hardware-related features:

- [Physical Description, page 1-1](#)
- [Software Requirements, page 1-4](#)
- [Cisco 7204VXR Overview, page 1-4](#)
- [Cisco 7206VXR Overview, page 1-7](#)
- [Field-Replaceable Units, page 1-10](#)
- [Functional Overview, page 1-53](#)



Warning

Before you install, operate, or service the system, read the *Regulatory Compliance and Safety Information for Cisco 7200 Series Routers* publication. This document provides important safety information you should know before working with the system. Statement 200

Physical Description

The Cisco 7200 VXR routers are the newest, multiservice members of the Cisco 7200 series routers. The Cisco 7200 VXR routers include the Cisco 7204VXR (4-slot router) and the Cisco 7206VXR (6-slot router). The Cisco 7200 VXR routers are designed to support gigabit capabilities and to improve data, voice, and video integration in both service provider and enterprise environments.

The Cisco 7200 VXR routers incorporate an integrated Multiservice Interchange (MIX) capability to support future voice applications. MIX interconnections on the midplane provide the ability to switch DS-0 time slots between multichannel T1 or E1 interfaces, much like a digital cross-connect or an add-drop multiplexer. This feature enables the Cisco 7200 VXR routers to switch DS-0 voice channels on a T1 or E1 interface from one voice processing port adapter to another voice processing port adapter. It also enables DS-0s to be switched through the Cisco 7200 VXR routers without any processing, a requirement in certain voice configurations.

The Cisco 7200 VXR routers support the high-speed network processing engine, NPE-G2, and all other available network processing engines. The NPE-G2 provides high-speed performance with the Motorola Freescale 7448 1.67-GHz processor and supports three Gigabit Ethernet interfaces with no additional bandwidth requirements. The NPE-G2 also provides a dedicated Fast Ethernet Management port and two USB ports for data storage and security tokens.

The Cisco 7200 VXR routers also support high-speed network processing engines (NPEs) to provide increased routing and process switching performance.

The Cisco 7200 VXR routers with the NPE-G2, NPE-G1, NPE-400, and NSE-1 installed support both 25-MHz and 50-MHz port adapter operation.

**Note**

For port adapter configuration information, refer to the *Cisco 7200 Series Port Adapter Hardware Configuration Guidelines* publication.

The Cisco 7200 VXR routers accommodate a variety of network interface port adapters and I/O controllers. Because both the NPE-G1 and NPE-G2 contain I/O controller functionality, they can be used without an I/O controller installed. The NPE-G2 and NPE-G1 provide a third PCI bus, which enables the Port Adapter Jacket Card to be installed in the I/O controller slot to allow usage of an additional high-bandwidth-usage port adapter.

A Cisco 7200 VXR router equipped with an NSE-1 or NPE-400 can support up to six high-speed port adapters and can also support higher-speed port adapter interfaces including Gigabit Ethernet and OC-12 ATM. The Cisco 7200 VXR routers also contain bays for up to two AC-input or DC-input power supplies.

The port adapters, I/O controller, and power supplies are the same for all Cisco 7200 VXR routers and are described in the [“Field-Replaceable Units” section on page 1-10](#). The network processing engines and network services engine are router model specific.

The Cisco 7200 VXR routers support the following features:

- Online insertion and removal (OIR)—Allows you to add, replace, or remove port adapters without interrupting the system.

**Note**

The Port Adapter Jacket Card does not support OIR. However, the port adapter installed in the Port Adapter Jacket Card does support OIR.

- Dual hot-swappable, load-sharing power supplies—Provide system power redundancy; if one power supply or power source fails, the other power supply maintains system power without interruption. Also, when one power supply is powered off and removed from the router, the second power supply immediately takes over the router’s power requirements without interrupting normal operation of the router.
- Environmental monitoring and reporting functions—Allow you to maintain normal system operation by resolving adverse environmental conditions prior to loss of operation.
- Downloadable software—Allows you to load new images into flash memory remotely, without having to physically access the router, for fast, reliable upgrades.

See [Table 1-1](#) for the Cisco 7200 VXR physical specifications and power requirements:

Table 1-1 Physical Specifications

Description	Specification
Midplane	Two primary PCI buses, and one secondary PCI bus - With an NPE-G2 or NPE-G1 and an I/O controller installed, the I/O controller does not use bandwidth points, and the NPE-G2 or NPE-G1 does use bandwidth points. The NPE-G2 or NPE-G1 does not use bandwidth points if installed without the I/O controller. - With an NSE-1, NPE-400, or NPE-300 installed: aggregate bandwidth of 900 Mbps¹ - With n NPE-100, NPE-150, or NPE-200 installed: aggregate bandwidth of 600 Mbps Three primary PCI buses—With the NPE-G2 or NPE-G1 installed, no I/O controller, and the Port Adapter Jacket Card installed, three PCI buses are available. Aggregate bandwidth of the PCI buses is 900 Mbps. The third PCI bus goes to the Port Adapter Jacket Card and provides unlimited bandwidth for one port adapter.
Dimensions (H x W x D)	5.25 in. x 16.8 in. x 17 in. (13.34 cm x 42.67 cm x 43.18 cm)
Weight	Chassis fully configured with a network processing engine or network services engine, I/O controller, maximum number of port adapters, 2 power supplies, and a fan tray: ~ 50 lb (22.7 kg)
Heat dissipation	370W (1262 BTU ²)
Chassis fan noise levels—single speed fan	Tested: - Front (I/O controller and port adapter side) 44.2 dB - Back (power supply side) 43.7 dB - Left (fan side) 47.2 dB - Right 44.8 dB Maximum: 65 dB
Airflow	~80 cfm ³
Temperature	32 to 104°F (0 to 40°C) operating; –4 to 149°F (–20 to 65°C) nonoperating
Humidity	10 to 90% noncondensing
Power Specifications	
AC-input voltage rating	100–240 VAC ⁴ wide input with power factor correction
AC-input current rating	5A ⁵ at 100–240 VAC with the chassis fully configured
AC-input frequency rating	50/60 Hz ⁶
AC-input cable	18 AWG ⁷ three-wire cable, with a three-lead IEC-320 receptacle on the power supply end, and a country-dependent plug on the power source end
DC-output power	280W maximum (with either a single or dual power supply configuration)
DC-input voltage rating	–48 VDC⁸ nominal in North America –60 VDC nominal in the European Community

Table 1-1 *Physical Specifications (continued)*

Description	Specification
DC-input current rating	13A at –48 VDC (370W/–48 VDC = 7.7A typical draw)
	8A at –60 VDC (370W/–60 VDC = 6.2A typical draw)
DC-input cable	In accordance with local and national wiring regulations

1. Mbps = megabits per second
2. BTU = British thermal units
3. cfm = cubic feet per minute
4. VAC = volts alternating current
5. A = amperes
6. Hz = hertz
7. AWG = American Wire Gauge
8. VDC = volts direct current

**Note**

For a chassis footprint, additional dimensions, and clearance requirements for the Cisco 7200 VXR routers, see the [“Site Requirement Guidelines”](#) section on page 2-3 in Chapter 2, “Preparing for Installation.”

Software Requirements

Recommended minimum software requirements:

- Cisco IOS Release 12.0(2)XE2 or later releases of 12.0XE
- Cisco IOS Release 12.1(1)E or later releases of 12.1E
- Cisco IOS Release 12.0(5)S or later releases of 12.0S
- Cisco IOS Release 12.0(3)T or later releases of 12.0T
- Cisco IOS Release 12.2(1) or later releases of 12.2
- Cisco IOS Release 12.2(4)B or later releases of 12.2B
- Cisco IOS Release 12.4(7)
- Cisco IOS Release 12.4(4)XD

See [Software Advisor](#) at Cisco.com for supported hardware and software releases.

Cisco 7204VXR Overview

The Cisco 7204VXR supports multiprotocol, multimedia routing and bridging with a wide variety of protocols and port adapter combinations available for Cisco 7200 series routers. In addition, the Cisco 7204VXR midplane provides increased support for multiple high-bandwidth port adapters.

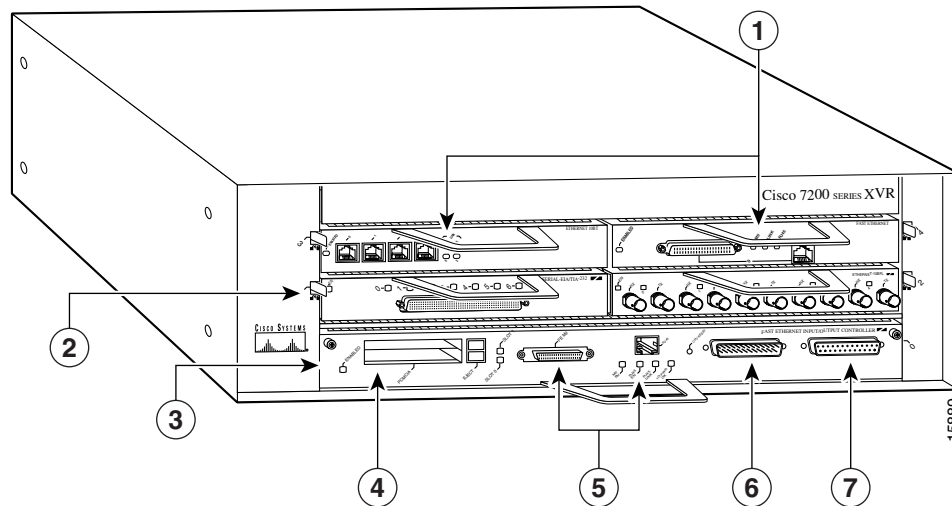
The Cisco 7204VXR has four slots (slot 1 through slot 4) for port adapters, one slot for an input/output (I/O) controller, and one slot for a network processing engine or network services engine. You can place the port adapters in any of the four available slots. (See [Figure 1-1](#).)

With the NPE-G1 or NPE-G2 installed and the Port Adapter Jacket Card installed in the I/O controller slot, an additional port adapter slot is available.

**Note**

If you have difficulty installing a processing engine or I/O controller in the lowest slot of a Cisco 7200 VXR router that is rack-mounted, remove the port adapters, processing engine and I/O controller from the chassis and reinstall them. Install the processing engine and I/O controller in the lowest slots first, then populate the slots above them, in a bottom-to-top order.

Figure 1-1 Cisco 7204VXR Router—Front View

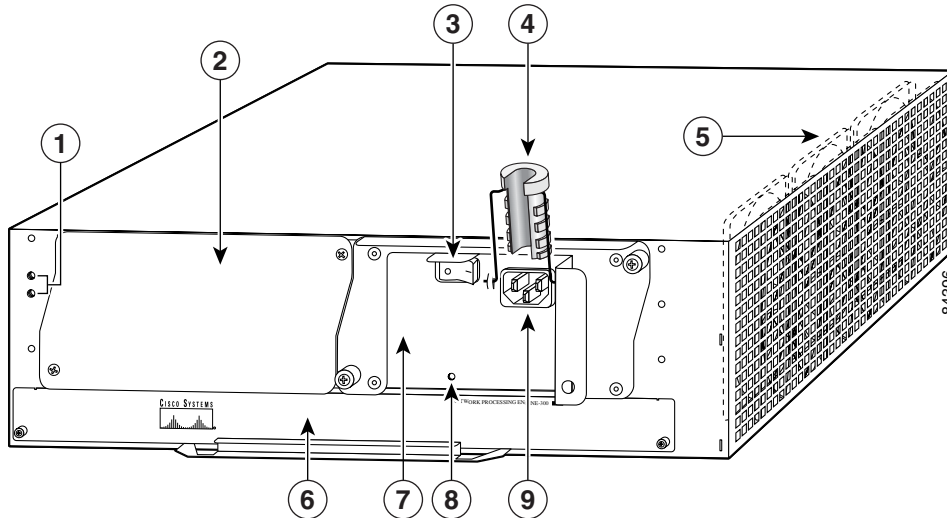


1	Port adapters	5	Optional Fast Ethernet interface (MII port and RJ-45 port)
2	Port adapter lever	6	Auxiliary port
3	I/O controller	7	Console port
4	PC Card slots		

**Note**

In [Figure 1-1](#), a blank port adapter is installed in slot 3. To ensure adequate airflow across the port adapters, each port adapter slot must be filled with either a port adapter or a blank port adapter.

The rear of the Cisco 7204VXR router provides access to the network processing engine or network services engine and up to two power supplies. (See [Figure 1-2](#).)

Figure 1-2 Cisco 7204VXR Router—Rear View

1	Chassis grounding receptacles	6	Network processing engine or network services engine
2	Power supply filler plate	7	AC-input power supply
3	Power switch	8	PWR OK LED
4	AC power cable-retention clip	9	AC power supply receptacle
5	Internal fans		

The NPE-G2 and NPE-G1 have external connectors and status LEDs for the three Gigabit Ethernet interfaces as well as console and auxiliary ports. The network processing engines NPE-100 through NPE-400 or network services engine (NSE-1) have no external connectors or LEDs. There is a handle for removing and installing the network processing engine or network services engine and two captive installation screws for securing it to the chassis.

The Port Adapter Jacket Card is supported in the I/O controller slot.

The Cisco 7204VXR router comes equipped with one 280W AC-input power supply. (A 280W DC-input power supply option is available.) In [Figure 1-2](#), a Cisco 7204VXR router is configured with a single AC-input power supply. (A power supply filler plate is installed over the second power supply bay.) A fully configured Cisco 7204VXR 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.

**Note**

The Cisco 7204VXR does not support a mixture of AC- and DC-input power.

The power supply has the router's main power switch and either an AC-input power receptacle or a hardwired DC-input power cable (depending on the type of installed power supply).

**Caution**

Do not mix power supplies in the Cisco 7204VXR. In dual power supply router configurations, both power supplies *must* be of the same type (two AC-input power supplies or two DC-input power supplies).

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 1-2](#).)

Three internal fans draw cooling air into the chassis and across internal components to maintain an acceptable operating temperature. (See [Figure 1-2](#).) The three fans are enclosed in a tray that is located inside the chassis.

**Caution**

To ensure the proper flow of cooling air across the internal components, make sure blank port adapters are installed in unoccupied port adapter slots, and power supply filler plates are installed in unoccupied power supply bays.

The I/O controller, port adapters, Port Adapter Jacket Card, power supplies, and network processing engine or network services engine slide into their respective chassis slots and connect directly to the routers midplane; there are no internal cables to connect. The midplane distributes power from the power supplies to the I/O controller, port adapters, Port Adapter Jacket Card, fan tray, and network processing engine or network services engine.

The midplane also senses OIR of the port adapters, bridges the PCI buses from the port adapters to packet memory on the network processing engine or network services engine, arbitrates traffic across the PCI buses, and generates the clock signals for the port adapters on each PCI bus.

**Note**

The Port Adapter Jacket Card does not support OIR. However, the port adapter installed in the Port Adapter Jacket Card does support OIR.

The Cisco 7204VXR operates as either a tabletop or a rack-mounted unit. A rack-mount kit is standard equipment included with all Cisco 7200 VXR routers when they are shipped from the factory. The kit provides the hardware needed to mount the router in a standard 19-inch equipment rack or a 2-post rack. Steps for installing the Cisco 7204VXR router in an equipment rack are the same for all Cisco 7200 VXR routers and are explained in Chapter 3, “[Installing a Cisco 7200 VXR Router](#).” If you are not rack-mounting your Cisco 7204VXR, place it on a sturdy tabletop or platform.

A fully configured Cisco 7204VXR, with two installed power supplies and all chassis slots filled, weighs approximately 50 pounds (22.7 kilograms [kg]). For clearance requirements and rack-mount installation considerations, see [Chapter 2, “Preparing for Installation,”](#) the “[Site Requirement Guidelines](#)” section on [page 2-3](#).

Cisco 7206VXR Overview

The Cisco 7206VXR supports multiprotocol, multimedia routing and bridging with a wide variety of protocols and port adapter combinations available for Cisco 7200 series routers. In addition, the Cisco 7206VXR midplane provides increased support for multiple high-bandwidth port adapters.

**Note**

The Cisco 7206VXR is also available as a router shelf in a Cisco AS5800 Universal Access Server. If your Cisco 7206VXR is installed as a router shelf, use this publication in conjunction with the Cisco AS5800 Universal Access Server publications that shipped with the access server.

The Cisco 7206VXR has six slots (slot 1 through slot 6) for port adapters, one slot for an input/output (I/O) controller, and one slot for a network processing engine or network services engine. You can place the port adapters in any of the six available slots.

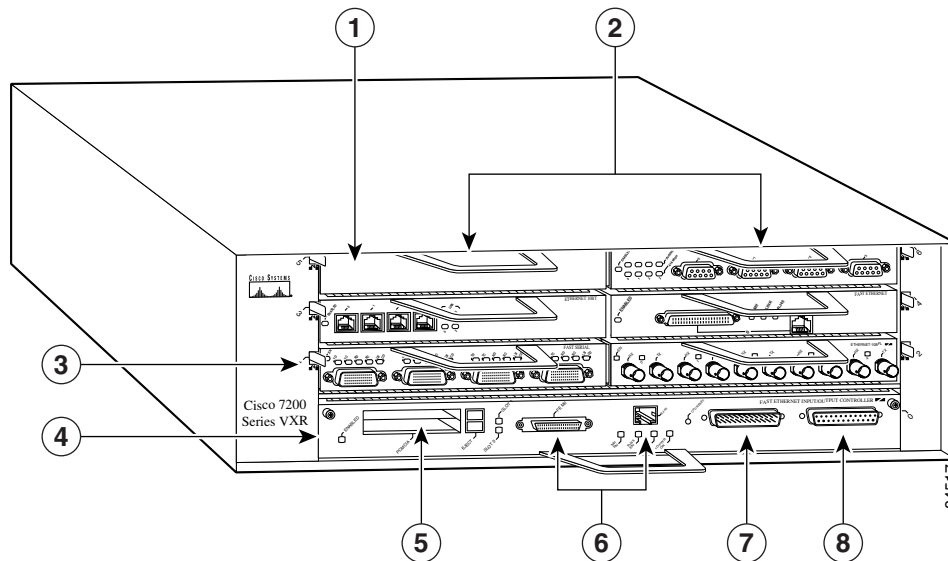
The front of the Cisco 7206VXR provides access to the I/O controller and up to six network interface port adapters. (See [Figure 1-3](#).)

With the NPE-G1 or NPE-G2 installed and the Port Adapter Jacket Card installed in the I/O controller slot, an additional port adapter slot is available.

**Note**

If you have difficulty installing a processing engine or I/O controller in the lowest slot of a Cisco 7200 VXR router that is rack-mounted, remove the port adapters, processing engine and I/O controller from the chassis and reinstall them. Install the processing engine and I/O controller in the lowest slots first, then populate the slots above them, in a bottom-to-top order.

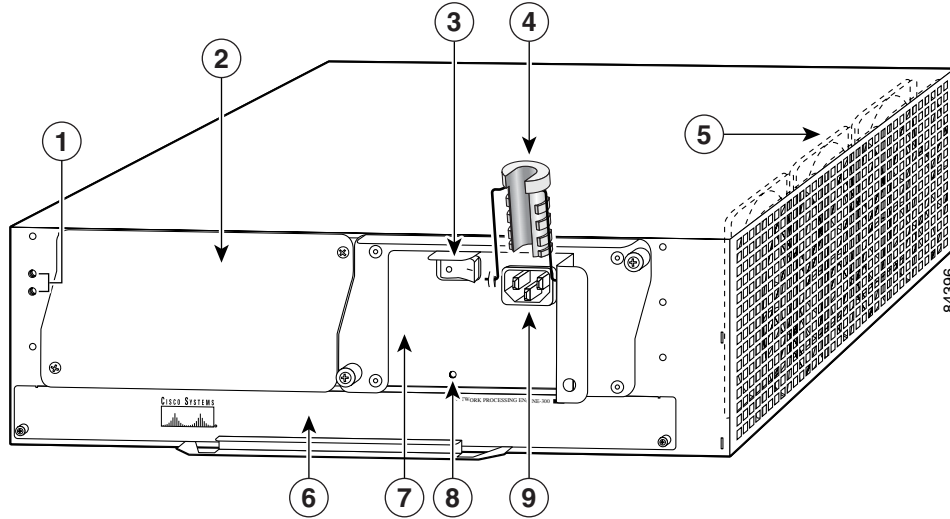
Figure 1-3 Cisco 7206VXR Router—Front View



1	Blank port adapter	5	PC Card slots
2	Port adapters	6	Optional Fast Ethernet interface (MII port and RJ-45 port)
3	Port adapter lever	7	Auxiliary port
4	I/O controller	8	Console port

**Note**

In [Figure 1-3](#), a blank port adapter is installed in slot 5. To ensure adequate airflow across the port adapters, each port adapter slot must be filled with either a port adapter or a blank port adapter.

Figure 1-4 Cisco 7206VXR Router—Rear View

1	Chassis grounding receptacles	6	Network processing engine or network services engine
2	Power supply filler plate	7	AC-input power supply
3	Power switch	8	PWR OK LED
4	AC power cable-retention clip	9	AC power supply receptacle
5	Internal fans		

The rear of the Cisco 7206VXR router provides access to the network processing engine or network services engine and up to two power supplies. (See [Figure 1-4](#).)

The NPE-G2 and NPE-G1 have external connectors and status LEDs for the three Gigabit Ethernet interfaces as well as console and auxiliary ports. The network processing engines NPE-100 through NPE-400 or network services engine (NSE-1) have no external connectors or LEDs. There is a handle for removing and installing the network processing engine or network services engine and two captive installation screws for securing it to the chassis.

The Port Adapter Jacket Card is supported in the I/O controller slot.

The Cisco 7206VXR router comes equipped with one 280W AC-input power supply. (A 280W DC-input power supply option is available.) In [Figure 1-4](#), a Cisco 7206VXR router is configured with a single AC-input power supply. (A power supply filler plate is installed over the second power supply bay.) A fully configured Cisco 7206VXR 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.

**Note**

The Cisco 7206VXR does not support a mixture of AC- and DC-input power.

The power supply has the router's main power switch and either an AC-input power receptacle or a hardwired DC-input power cable (depending on the type of installed power supply).

**Caution**

Do not mix power supplies in the Cisco 7206VXR. In dual power supply router configurations, both power supplies *must* be of the same type (two AC-input power supplies or two DC-input power supplies).

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 1-4](#).)

Three internal fans draw cooling air into the chassis and across the internal components to maintain an acceptable operating temperature. (See [Figure 1-4](#).) The three fans are enclosed in a tray that is located inside the chassis.

**Caution**

To ensure the proper flow of cooling air across the internal components, make sure blank port adapters are installed in unoccupied port adapter slots, and power supply filler plates are installed in unoccupied power supply bays.

The I/O controller, port adapters, Port Adapter Jacket Card, power supplies, and network processing engine or network services 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 power from the power supplies to the I/O controller, port adapters, Port Adapter Jacket Card, fan tray, and network processing engine or network services engine.

The midplane also senses OIR of the port adapters, bridges the PCI buses from the port adapters to packet memory on the network processing engine or network services engine, arbitrates traffic across the PCI buses, and generates the clock signals for the port adapters on each PCI bus.

**Note**

The Port Adapter Jacket Card does not support OIR. However, the port adapter installed in the Port Adapter Jacket Card does support OIR.

The Cisco 7206VXR operates as either a tabletop or a rack-mounted unit. A rack-mount kit is standard equipment included with all Cisco 7200 VXR routers when they are shipped from the factory. The kit provides the hardware needed to mount the router in a standard 19-inch equipment rack or a 2-post rack. Steps for installing the Cisco 7206VXR router in an equipment rack are the same for all Cisco 7200 VXR routers and are explained in Chapter 3, "[Installing a Cisco 7200 VXR Router](#)." If you are not rack-mounting your Cisco 7206VXR, place it on a sturdy tabletop or platform.

A fully configured Cisco 7206VXR, with two installed power supplies and all chassis slots filled, weighs approximately 50 pounds (22.7 kilograms [kg]). For clearance requirements and rack-mount installation considerations, see [Chapter 2, "Preparing for Installation,"](#) the "[Site Requirement Guidelines](#)" section on page 2-3.

Field-Replaceable Units

The Cisco 7200 VXR routers are easy to service; many of their major components are field-replaceable units (FRUs). The following sections describe Cisco 7200 VXR router FRUs:

- [Network Processing Engine or Network Services Engine, page 1-11](#)
- [Input/Output Controller, page 1-32](#)
- [LED Descriptions, page 1-40](#)
- [Port Adapters and Service Adapters, page 1-47](#)
- [Port Adapter Jacket Card, page 1-48](#)
- [Power Supplies, page 1-49](#)
- [Chassis, page 1-51](#)
- [CompactFlash Disks, Flash Disks, and PC Cards, page 1-52](#)

- [Rack-Mount and Cable-Management Kit, page 1-53](#)

**Note**

Replacement instructions for removing and replacing FRUs are contained in separate online documents. For example, if you need to replace an AC power supply in your Cisco 7200 VXR router, refer to the [280-Watt AC-Input Power Supply Replacement Instructions](#) publication. Replacement instructions are available on the Documentation DVD and on Cisco.com.

Network Processing Engine or Network Services Engine

The network processing engine or network services engine maintains and executes the system management functions for Cisco 7200 VXR routers. Also, the network processing engine or network services engine shares the system memory and environmental monitoring functions with the I/O controller.

Because the NPE-G1 and NPE-G2 contain I/O functionality, the Cisco 7200 VXR routers can operate with no I/O controller with an NPE-G1 or NPE-G2 installed. With both an I/O controller and the NPE-G1 or NPE-G2 installed, the NPE-G1 or NPE-G2 enhances the I/O controller functionality.

Cisco 7200 VXR routers support nine versions of the network processing engine: NPE-G2, NPE-G1, NPE-400, NPE-300, NPE-225, NPE-200, NPE-175, NPE-150, and NPE-100. These network processing engines have the same functionality; however, their performance differs because of the microprocessor type and the type of memory for packet data (SRAM and DRAM, or SDRAM) that each network processing engine provides.

Cisco 7200 VXR routers also support the NSE-1, which consists of two modular boards: the processor engine board and the network controller board. The NSE-1 Parallel eXpress Forwarding (PXF) processor works with the Route Processor to provide accelerated packet switching, as well as accelerated IP Layer 3 feature processing.

**Note**

Detailed instructions for removing and replacing the network processing engines or network services engine are contained in the online *Network Processing Engine and Network Services Engine Installation and Configuration* publication. It is available on the Documentation DVD and on Cisco.com.

The network processing engines and network services engine consist of the following components:

- Reduced instruction set computing (RISC) microprocessor
 - The NPE-G2 uses a Motorola Freescale 7448 microprocessor that operates at an internal clock speed of 1.67 GHz.
 - The NPE-G1 uses a BCM 1250 microprocessor that operates at an internal clock speed of 700 MHz.
 - The NSE-1 uses an RM7000 microprocessor that operates at an internal clock speed of 262 MHz.
 - The NPE-400 uses an RM7000 microprocessor that operates at an internal clock speed of 350 MHz.
 - The NPE-300 uses an RM7000 microprocessor that operates at an internal clock speed of 262 MHz.
 - The NPE-225 has an RM5271 microprocessor that operates at an internal clock speed of 262 MHz.
 - The NPE-200 has an R5000 microprocessor that operates at an internal clock speed of 200 MHz.

- The NPE-175 has an RM5270 microprocessor that operates at an internal clock speed of 200 MHz.
 - The NPE-100 and NPE-150 have an R4700 microprocessor that operates at an internal clock speed of 150 MHz.
- System controller
 - The NPE-G2 has one system controller that provides processor access to the three midplane PCI buses, and also holds the system memory and environmental monitoring functions.
 - The NPE-G1 BCM 1250 maintains and executes the system management functions for the Cisco 7200 VXR routers and also holds the system memory and environmental monitoring functions.
 - The NSE-1 has one system controller that provides processor access to the midplane and single I/O controller PCI buses. The system controller also allows port adapters on either of the two midplane PCI buses to access SDRAM.
 - The NPE-400 has one system controller that provides system access.
 - The NPE-300 has two system controllers that provide processor access to the two midplane and single I/O controller PCI buses. The system controller also allows port adapters on either of the two midplane PCI buses to access SDRAM.
 - The NPE-175 and NPE-225 have one system controller that provides processor access to the two midplane and single I/O controller PCI buses. The system controller also allows the port adapters on either of the two midplane PCI buses to access SDRAM.
 - The NPE-100, NPE-150, and NPE-200 have a system controller that uses direct memory access (DMA) to transfer data between DRAM and packet SRAM on the network processing engine.
- Upgradable memory modules
 - The NPE-G2 uses SDRAM for storing all packets received or sent from network interfaces. The SDRAM also stores routing tables and network accounting applications. A single SDRAM memory array in the system allows concurrent access by port adapters and the processor.
 - The NPE-G1 uses SDRAM for storing all packets received or sent from network interfaces. The SDRAM also stores routing tables and network accounting applications. Two independent SDRAM memory arrays in the system allow concurrent access by port adapters and the processor.
 - The NSE-1 uses SDRAM for providing code, data, and packet storage.
 - The NPE-400 uses SDRAM for storing all packets received or sent from network interfaces. The SDRAM memory array in the system allows concurrent access by port adapters and the processor.
 - The NPE-300 uses SDRAM for storing all packets received or sent from network interfaces. The SDRAM also stores routing tables and network accounting applications. Two independent SDRAM memory arrays in the system allow concurrent access by port adapters and the processor.
 - The NPE-175 and NPE-225 use SDRAM for providing code, data, and packet storage.
 - The NPE-100, NPE-150, and NPE-200 use DRAM for storing routing tables, network accounting applications, packets of information in preparation for process switching, and packet buffering for SRAM overflow (except in the NPE-100, which contains no packet SRAM). The standard configuration is 32 MB, with up to 128 MB available through single in-line memory module (SIMM) upgrades.
- Packet SRAM for storing packets of information in preparation for fast switching

The NPE-150 has 1 MB of SRAM and the NPE-200 has 4 MB of SRAM. No other network processing engine or network services engine has SRAM.

- Cache memory
 - The NPE-G2 has two levels of cache: a primary and a secondary cache that are internal to the microprocessor, with the secondary unified cache for data and instruction.
 - The NPE-G1 has two levels of cache: a primary and a secondary cache that are internal to the microprocessor, with the secondary unified cache for data and instruction.
 - The NSE-1 has three levels of cache: a primary and a secondary unified cache that are internal to the microprocessor, and a tertiary 2-MB external cache.
 - The NPE-400 has three levels of cache: a primary and a secondary cache that are internal to the microprocessor, and a tertiary 4-MB external cache that provides additional high-speed storage for data and instructions.
 - The NPE-300 has three levels of cache: a primary and a secondary cache that are internal to the microprocessor, and a tertiary 2-MB external cache that provides additional high-speed storage for data and instructions.
 - The NPE-225 has two levels of cache: a primary cache that is internal to the processor and a secondary 2-MB external cache that provides additional high-speed storage for data and instructions.
 - The NPE-200 has unified cache SRAM that functions as the secondary cache for the microprocessor. (The primary cache is within the microprocessor.)
 - The NPE-175 has two levels of cache: a primary cache that is internal to the processor and a secondary 2-MB external cache that provides additional high-speed storage for data and instructions.
 - The NPE-150 has unified cache SRAM that functions as the secondary cache for the microprocessor. (The primary cache is within the microprocessor.)
 - The NPE-100 has unified cache SRAM that functions as the secondary cache for the microprocessor. (The primary cache is within the microprocessor.)
- Two environmental sensors for monitoring the cooling air as it leaves the chassis
- Boot ROM for storing sufficient code for booting the Cisco IOS software; the NPE-G2, NPE-G1, NSE-1, NPE-400, NPE-300, NPE-225, NPE-200, and NPE-175 have boot ROM.

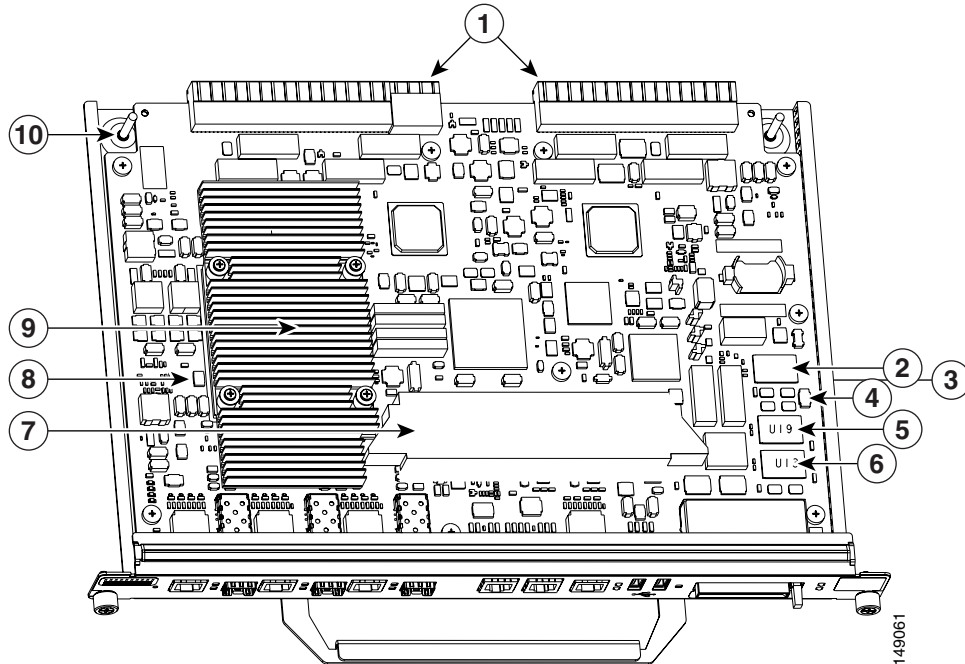
The network processing engines and network services engine perform the following system management functions:

- Sending and receiving routing protocol updates
- Managing tables, caches, and buffers
- Monitoring interface and environmental status
- Providing Simple Network Management Protocol (SNMP) management through the console and Telnet interface
- Accounting for and switching of data traffic
- Booting and reloading images
- Managing port adapters (recognition and initialization during online insertion and removal)

The following figures and memory tables provide information about your NPE or NSE:

- NPE-G2 is represented by [Figure 1-5](#). [Table 1-2](#) lists NPE-G2 memory specifications, and [Table 1-3](#) lists memory configurations.

- NPE-G1 is represented by [Figure 1-6](#). [Table 1-4](#) lists NPE-G1 memory specifications, and [Table 1-5](#) lists memory configurations.
- NSE-1 is represented by [Figure 1-7](#). [Table 1-6](#) lists NSE-1 memory specifications, and [Table 1-7](#) lists memory configurations.
- The NPE-400 is represented by [Figure 1-8](#). [Table 1-8](#) lists NPE-400 memory specifications, and [Table 1-9](#) lists memory configurations.
- NPE-300 is represented by [Figure 1-9](#). [Table 1-10](#) lists NPE-300 memory specifications, and [Table 1-11](#) lists memory configurations.
- NPE-225 is represented by [Figure 1-10](#). [Table 1-12](#) lists NPE-225 memory specifications, and [Table 1-13](#) lists memory configurations.
- NPE-200 is represented by [Figure 1-11](#). [Table 1-14](#) lists NPE-200 memory specifications, and [Table 1-15](#) lists memory configurations.
- NPE-175 is represented by [Figure 1-12](#). [Table 1-16](#) lists NPE-175 memory specifications, and [Table 1-17](#) lists memory configurations.
- NPE-150 is represented by [Figure 1-13](#). [Table 1-18](#) lists NPE-150 memory specifications, and [Table 1-19](#) lists memory configurations.
- NPE-100 is represented by [Figure 1-14](#). [Table 1-20](#) lists NPE-100 memory specifications, and [Table 1-21](#) lists memory configurations.

Figure 1-5 NPE-G2

1	Midplane connectors	6	Flash memory (U13)
2	Boot ROM (U24)	7	DIMM (socket—S1)
3	NVRAM (on bottom of board—U17)	8	Temperature sensor (inlet—U23)
4	Temperature sensor (outlet—U20)	9	Processor (U30)
5	Flash memory (U19)	10	Keying post

Table 1-2 lists the NPE-G2 memory specification, and Table 1-3 lists the factory-installed SDRAM configurations and their product numbers.

Table 1-2 NPE-G2 Memory Specifications

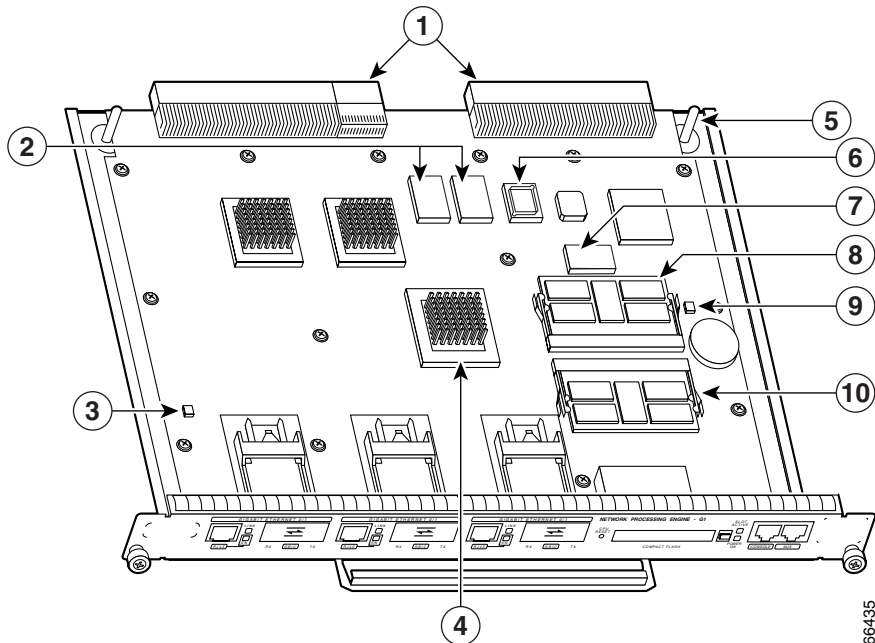
Memory Type	Size	Quantity	Description	Component Location on the NPE-G2 Board
SDRAM	1 GB	1	1-GB DDR SDRAM	S1
Boot ROM	512 KB	1	Reprogrammable Boot ROM for the ROM monitor program	U24
Flash memory (also known as bootflash)	64 MB	1	Contains the default boot helper (boot loader) image	U19 and U13
NVRAM	2 MB	1	Nonvolatile EPROM for the system configuration file	U17

Table 1-2 NPE-G2 Memory Specifications (continued)

Memory Type	Size	Quantity	Description	Component Location on the NPE-G2 Board
Primary cache	32 KB (16 KB instruction, 16 KB data)	—	Motorola Freescale 7448 processor, internal cache	U30
Secondary cache	1 MB	—	Motorola Freescale 7448 secondary cache	U30

Table 1-3 NPE-G2 SDRAM Configuration—Configurable Memory Only

Total SDRAM	SDRAM Bank	Quantity
1 GB	S1	1-GB DIMM

Figure 1-6 NPE-G1

1	Midplane connectors	6	Boot ROM
2	Flash memory	7	NVRAM
3	Temperature sensor	8	DIMM 2
4	Processor	9	Temperature sensor
5	Keying post	10	DIMM 1

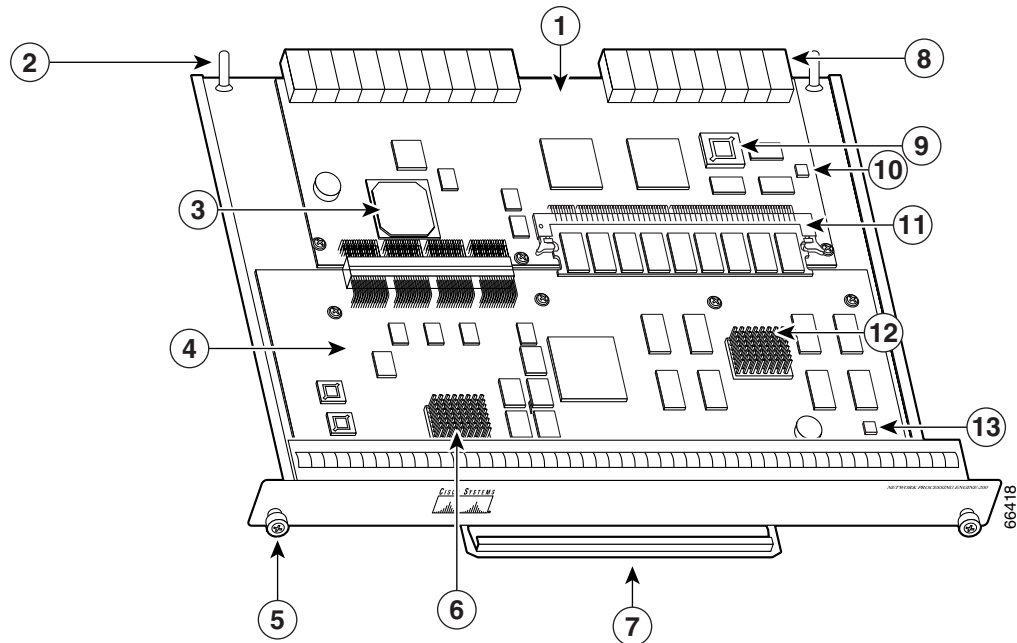
Table 1-4 lists the NPE-G1 memory specification, and Table 1-5 lists the factory-installed SDRAM configurations and their product numbers.

Table 1-4 NPE-G1 Memory Specifications

Memory Type	Size	Quantity	Description	Component Location on the NPE-G1 Board
SDRAM	128 MB, 256 MB, 512 MB	2	128-MB, 256-MB, or 512-MB SODIMMs	J3, J4
Boot ROM	512 KB	1	Reprogrammable Boot ROM for the ROM monitor program	U1
Flash Memory	16 MB	1	Contains the default boot helper (boot loader) image	U25 and U26
NVRAM	512 KB	1	Nonvolatile EPROM for the system configuration file	U7
Primary cache	32 KB (16 KB instruction, 16 KB data)	—	BCM 1250 system, internal cache	U22
Secondary cache	512 KB	—	BCM 1250 system, internal, unified cache	U22

Table 1-5 NPE-G1 SDRAM SODIMM Memory Configurations—Configurable Memory Only

Total SDRAM	SDRAM Bank	Quantity	Product Number
256 MB	J3 and J4	2 128-MB SODIMMs	MEM-NPE-G1-256MB=
512 MB	J3 and J4	2 256-MB SODIMMs	MEM-NPE-G1-512MB=
1 GB	J3 and J4	2 512-MB SODIMMs	MEM-NPE-G1-1GB=

Figure 1-7 NSE-1

1	Network controller board	8	Midplane connectors
2	Keying post	9	Boot ROM (U1)
3	System controller	10	Temperature sensor
4	Processor engine board	11	SDRAM
5	Captive installation screw	12	Parallel eXpress Forwarding engine (PXF processor)
6	RM7000 microprocessor	13	Temperature sensor
7	Handle		

[Table 1-6](#) lists the NSE-1 memory specifications, and [Table 1-7](#) lists the NSE-1 factory-installed SDRAM configurations and their product numbers.

Table 1-6 NSE-1 Memory Specifications

Memory Type	Size	Quantity	Description	Location ¹
SDRAM	128 or 256 MB	1 SDRAM slot	128- or 256-MB DIMM	U15
Boot ROM	512 KB	1	OTP ROM for the ROM monitor program	U1
Primary cache	16 KB (instruction), 16 KB (data)	—	RM7000 processor, primary internal cache	U22

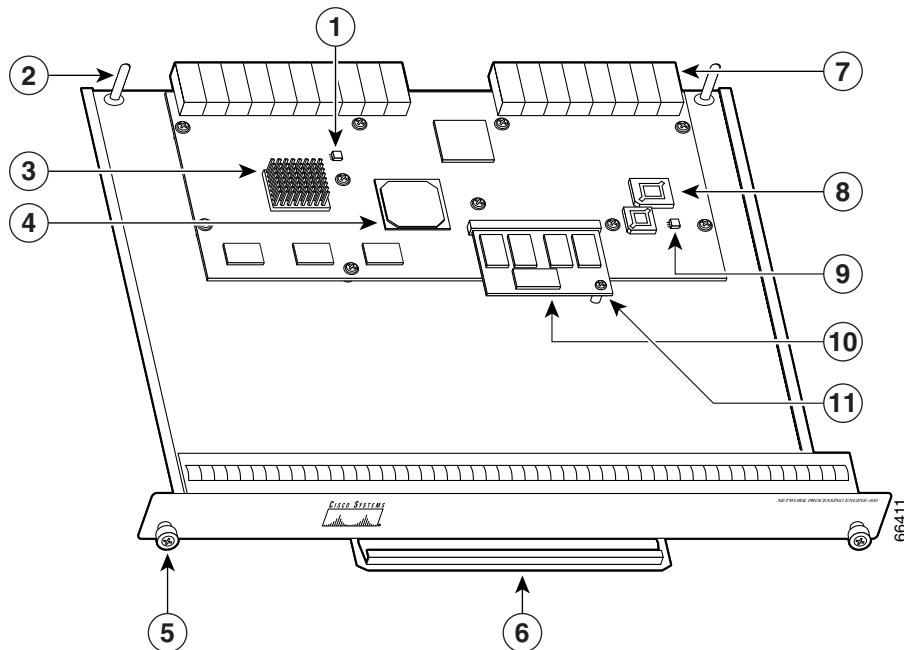
Table 1-6 NSE-1 Memory Specifications (continued)

Memory Type	Size	Quantity	Description	Location ¹
Secondary cache	256 KB	—	RM7000 processor, internal, unified instruction and data cache	U22
Tertiary cache	2 MB (fixed)	—	RM7000 processor, external cache	U7, U9, U12, U14, U17

1. Location on processing engine board. See [Figure 1-7](#).

Table 1-7 NSE-1 SDRAM DIMM Memory Configurations

Total SDRAM	SDRAM Bank	Quantity	Product Number
128 MB	U15	1 128-MB DIMM	MEM-SD-NPE-128MB=
256 MB	U15	1 256-MB DIMM	MEM-SD-NSE-256MB=

Figure 1-8 NPE-400

1	Temperature sensor (U31)	7	Midplane connector
2	Keying post	8	Boot ROM (U7)
3	RM7000 microprocessor	9	Temperature sensor
4	System controller	10	SODIMM (J1)
5	Captive installation screw	11	Standoff and screw
6	Handle		

Table 1-8 lists the NPE-400 memory specifications, and Table 1-9 lists factory-installed SDRAM configurations and their product numbers.

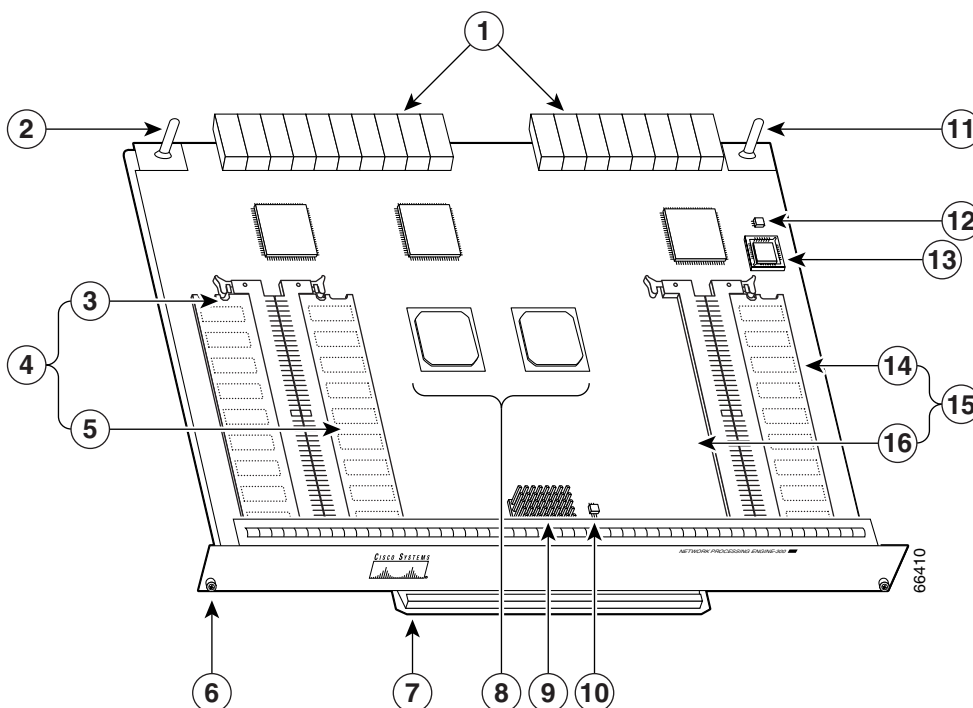
Table 1-8 NPE-400 Memory Specifications

Memory Type	Size	Quantity	Description	Location
SDRAM-configurable	128, 256, or 512 MB	1	128-, 256-, or 512-MB SODIMM	J1
Boot ROM	512 KB	1	OTP ¹ ROM for the ROM monitor program	U7
Primary cache	16 KB (instruction), 16 KB (data)	—	RM7000 processor, integrated cache	U38
Secondary cache	256 KB (fixed)	—	RM7000 processor, unified, internal cache	U38
Tertiary cache	4 MB (fixed)	—	RM7000 processor, external cache	U2, U26, U27, U28, U37

1. OTP = one-time programmable

Table 1-9 NPE-400 SDRAM SODIMM Memory Configurations

Total SDRAM	Bank 1	Quantity	Product Number
128 MB	J1	1 128-MB SODIMM	MEM-NPE-400-128MB=
256 MB	J1	1 256-MB SODIMM	MEM-NPE-400-256MB=
512 MB	J1	1 512 MB SODIMM	MEM-NPE-400-512MB=

Figure 1-9 NPE-300

1	Midplane connectors	9	RM7000 microprocessor
2	Keying post	10	Temperature sensor (U42)
3	DIMM 3 (U44)	11	Keying post
4	Bank 1 (user configurable)	12	Temperature sensor
5	DIMM 2 (U45)	13	Boot ROM (U1)
6	Captive installation screw	14	DIMM 0 (U16)
7	Handle	15	Bank 0 (fixed size)
8	System controllers	16	U15 never populated

Table 1-10 lists the NPE-300 memory specifications, and Table 1-11 lists factory-installed SDRAM configurations and their product numbers.

Table 1-10 NPE-300 Memory Specifications

Memory Type	Size	Quantity	Description	Location ¹
SDRAM	32 to 256 MB	1 configurable ² bank with 2 SDRAM slots	32-, 64-, or 128-MB DIMMs (based on maximum SDRAM required)	Bank 1: U45 and U44 ³
Boot ROM	512 KB	1	OTP ⁴ ROM for the ROM monitor program	Socket U1
Primary cache	16 KB (instruction), 16 KB (data)	—	RM7000 processor, internal cache	U49

Table 1-10 NPE-300 Memory Specifications (continued)

Memory Type	Size	Quantity	Description	Location ¹
Secondary cache	256 KB	—	RM7000 processor, internal, unified instruction and data cache	U49
Tertiary cache	2 MB (fixed)	—	RM7000 processor, external cache	U7, U8, U9, U10, U17

1. Location on processing engine board. See [Figure 1-9](#).
2. Bank 0 is used exclusively for packet memory and is not user configurable.
3. Bank 1 contains the Cisco IOS software, processor memory, and packet memory.
4. OTP = one-time programmable

**Note**

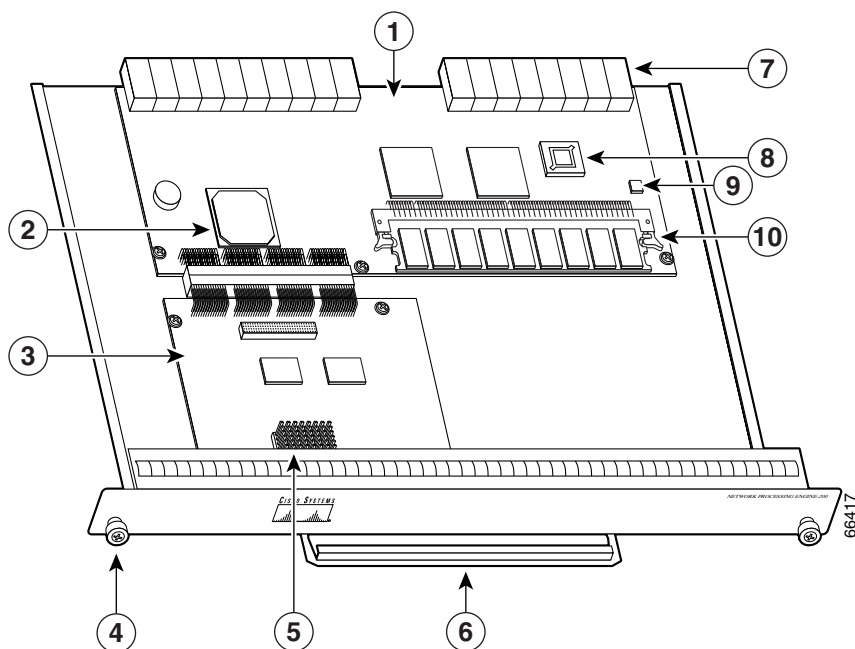
The NPE-300 contains two banks of SDRAM. Both SDRAM banks are used for all packet memory requirements; however, bank 0 is used exclusively for packet memory and is set at a fixed configuration in the factory.

Bank 1 contains two user-configurable SDRAM slots, DIMM slot 2 and DIMM slot 3 (see [Figure 1-9](#)). Both slots in bank 1 can be populated by DIMMs of different sizes; however, the size of the DIMM in slot 2 must be greater than or equal to the size of the DIMM in slot 3, and the size of the DIMM in slot 3 can be zero.

Table 1-11 NPE-300 SDRAM DIMM Memory Configurations

Total SDRAM	SDRAM Bank 1 ¹	Quantity	Product Number ²
32 ³ MB + 32 MB	U45 (DIMM slot 2 only)	1 32-MB DIMM	MEM-SD-NPE-32MB=
32 ³ MB + 64 MB	U45 and U44 or U45	2 32-MB DIMMs	MEM-SD-NPE-32MB=
		1 64-MB DIMM	MEM-SD-NPE-64MB=
32 ³ MB + 128 MB	U45 and U44 or U45	2 64-MB DIMMs	MEM-SD-NPE-64MB=
		1 128-MB DIMM	MEM-SD-NPE-128MB=
32 ³ MB + 256 MB	U45 and U44	2 128-MB DIMMs	MEM-SD-NPE-128MB=

1. There are two user-upgradable SDRAM slots in bank 1. (Bank 0 is used exclusively for packet memory and is set at a fixed configuration in the factory.)
2. These products are also available as SDRAM upgrades. To order an upgrade, add an equal sign (=) after the product number, for example, MEM-SD-NPE-128MB=.
3. This 32 MB is fixed memory in SDRAM bank 0, socket U16. Socket U15 is never populated.

Figure 1-10 NPE-225

1	Network controller board	6	Handle
2	System controller	7	Midplane connectors
3	Processor engine board	8	Boot ROM (U1)
4	Captive installation screw	9	Temperature sensor
5	RM5271 microprocessor	10	SDRAM DIMM (U15)

[Table 1-12](#) lists the NPE-225 memory specifications, and [Table 1-13](#) lists factory-installed SDRAM configurations and their product numbers.

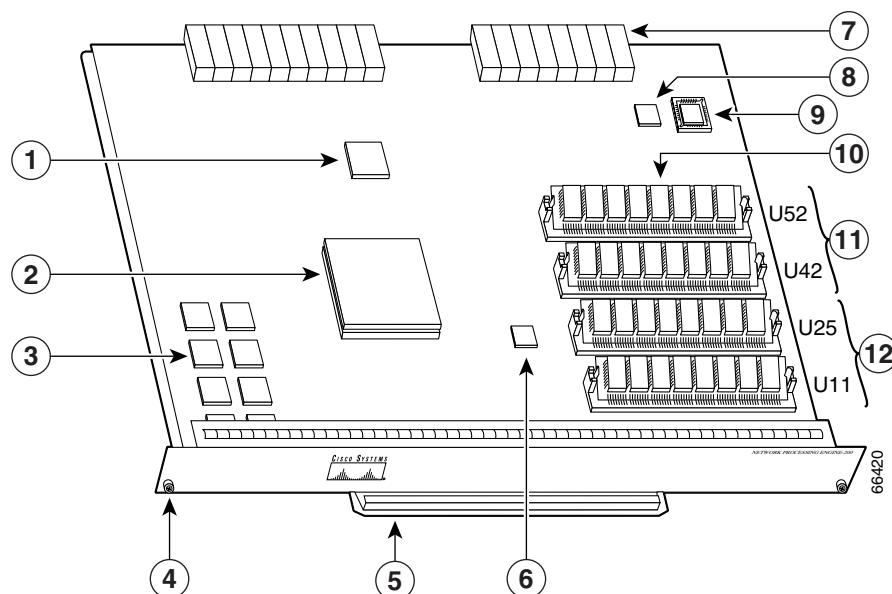
Table 1-12 NPE-225 Memory Specifications

Memory Type	Size	Quantity	Description	Location ¹
SDRAM	64, 128, 256 MB	1 SDRAM slot	64-MB, 128-MB, or 256-MB SDRAM DIMM	U15
Boot ROM	512 KB	—	One-time programmable ROM	U1
Primary cache	16 KB (instruction), 16 KB (data)	—	RM527x processor, internal cache	U4
	32 KB (instruction), 32 KB (data)	—	RM527x processor, internal cache	U4
Secondary cache	2 MB	4 chips, each 512K by 8 bits wide	RM527x processor, unified external cache	U5, U6, U7, U8

1. Location on processing engine board. See [Figure 1-10](#).

Table 1-13 NPE-225 SDRAM DIMM Memory Configurations

Total SDRAM	Bank	Quantity	Product Number
64 MB	U15	1 64-MB DIMM	MEM-SD-NPE-64MB=
128 MB	U15	1 128-MB DIMM	MEM-SD-NPE-128MB=
256 MB	U15	1 256-MB DIMM	MEM-SD-NSE-256MB=

Figure 1-11 NPE-200

1	System controller	7	Midplane connectors
2	R5000 microprocessor	8	Temperature sensor
3	4-MB SRAM (U6, U10, U13, U14, U28, U29, U38, and U39)	9	Boot ROM (U92)
4	Captive installation screw	10	DRAM SIMMs
5	Handle	11	Bank 1
6	Temperature sensor	12	Bank 2

[Table 1-14](#) lists the NPE-200 memory specifications, and [Table 1-15](#) lists factory-installed DRAM configurations and their product numbers.

Table 1-14 NPE-200 Memory Specifications

Memory Type	Size	Quantity	Description	Location ¹
DRAM	32 to 128 MB	2 to 4	16- or 32-MB SIMMs (based on maximum DRAM required)	Bank 0: U11 and U25 Bank 1: U42 and U52
SRAM	4 MB	8	8 chips, each being 512K words x 8 bits wide	U6, U10, U13, U14, U28, U29, U38, and U39
Boot ROM ²	256 KB	1	EPROM for the ROM monitor program	U92

Table 1-14 NPE-200 Memory Specifications (continued)

Memory Type	Size	Quantity	Description	Location ¹
Primary cache	—	—	R5000 processor, internal cache	U44
Secondary cache	512 KB	4	R5000 processor, unified external cache	U16, U9, U109, and U107

1. Location on processing engine board. See [Figure 1-11](#).

2. ROM = read-only memory

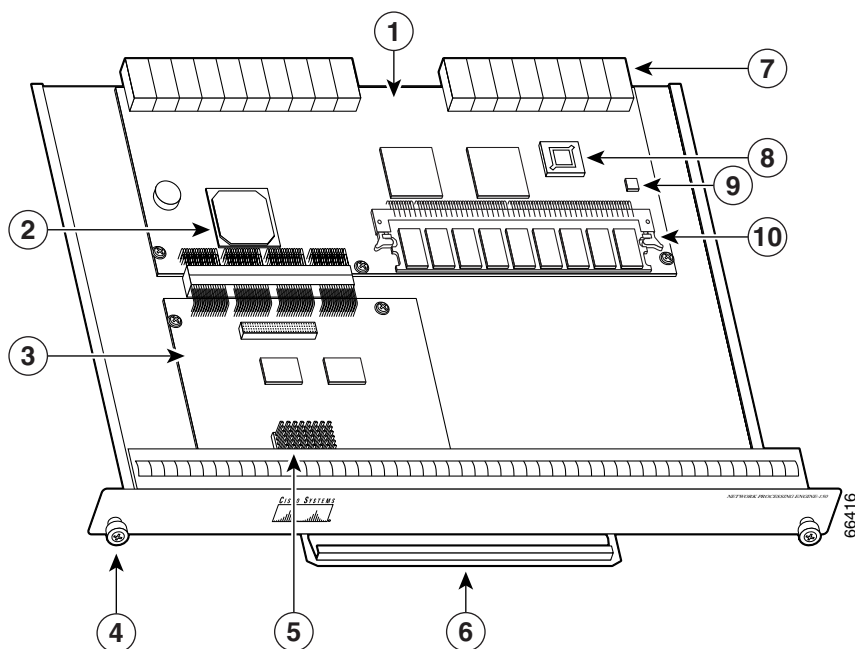
**Note**

To prevent DRAM errors in the NPE-100, NPE-150, or NPE-200, and to ensure that your system initializes correctly at startup, DRAM bank 0 (socket U18 and U25, or U11 and U25) *must* contain no fewer than two SIMMs of the same type. You may also install two SIMMs of the same type in bank 1 (socket U4 and U12, or U42 and U52); however, bank 0 must always contain the two largest size SIMMs.

Table 1-15 NPE-200 DRAM SIMM Memory Configurations

Total DRAM	DRAM Bank 0	Quantity	DRAM Bank 1	Quantity	Product Number ¹
32 MB	U11 and U25	2 16-MB SIMMs	U42 and U52	—	MEM-NPE-32MB=
64 MB	U11 and U25	2 32-MB SIMMs	U42 and U52	—	MEM-NPE-64MB=
128 MB	U11 and U25	2 32-MB SIMMs	U42 and U52	2 32-MB SIMMs	MEM-NPE-128MB=

1. These products are also available as DRAM upgrades. For example to upgrade a network processing engine from 32 MB to 64 MB of DRAM, order product number MEM-NPE-64MB=.

Figure 1-12 NPE-175

1	Network controller board	6	Handle
2	System controller	7	Midplane connectors
3	Processor engine board	8	Boot ROM (U1)
4	Captive installation screw	9	Temperature sensor
5	RM5270 microprocessor	10	SDRAM DIMM (U15)

[Table 1-16](#) lists the NPE-175 memory specifications, and [Table 1-17](#) lists memory configurations.

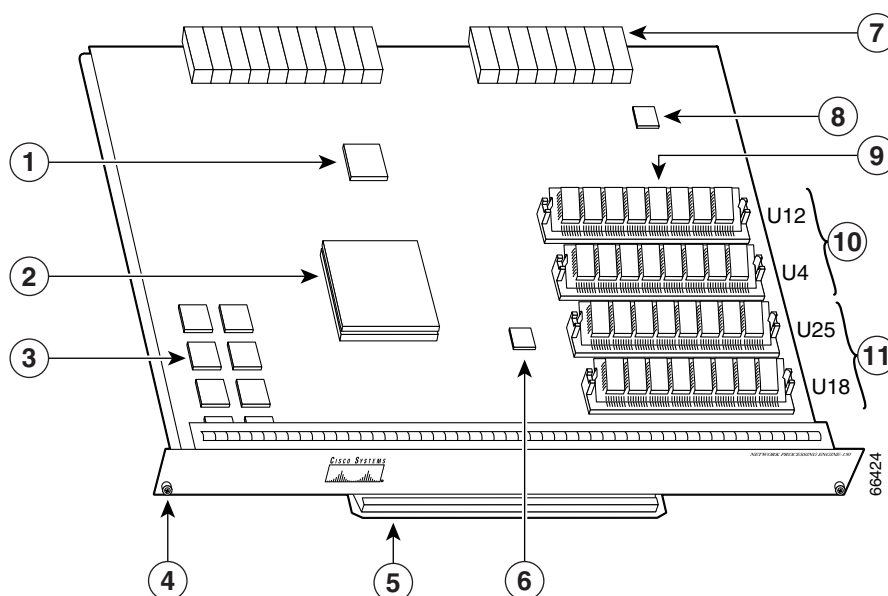
Table 1-16 NPE-175 Memory Specifications

Memory Type	Size	Quantity	Description	Location ¹
SDRAM	64 or 128 MB	1 SDRAM slot	DIMM	U15
Boot ROM	512 KB	—	One-time programmable ROM	U1
Primary cache	16 KB (instruction), 16 KB (data)	—	RM527x processor, internal cache	U4
	32 KB (instruction), 32 KB (data)	—	RM527x processor, internal cache	U4
Secondary cache	2 MB	4 chips, each 512K by 8 bits wide	RM527x processor, unified external cache	U5, U6, U7, U8

1. Location on processing engine board. See [Figure 1-12](#).

Table 1-17 NPE-175 SDRAM DIMM Memory Configurations

Total SDRAM	SDRAM Bank	Quantity	Product Number
64 MB	U15	1 64-MB DIMM	MEM-SD-NPE-64MB=
128 MB	U15	1 128-MB DIMM	MEM-SD-NPE-128MB=

Figure 1-13 NPE-150

1	System controller	7	Midplane connectors
2	R4700 microprocessor	8	Temperature sensor
3	1-MB SRAM (U700 through U703, U800 through U803)	9	DRAM SIMMs
4	Captive installation screw	10	Bank 1
5	Handle	11	Bank 0
6	Temperature sensor		

Table 1-18 lists the NPE-150 memory specifications, and Table 1-19 lists memory configurations.

Table 1-18 NPE-150 Memory Specifications

Memory Type	Size	Quantity	Description	Location ¹
DRAM	32 to 128 MB	2 to 4	16- or 32-MB SIMMs (based on maximum DRAM required)	Bank 0: U18 and U25 Bank 1: U4 and U12
SRAM	1 MB	8	8 chips, each being 128K words x 9 bits wide	U700 through U703 U800 through U803
Boot ROM	The NPE-150 uses the boot ROM present on the I/O controller.			
Primary cache	—	—	R4700 processor, internal cache	U201
Secondary cache	512 KB	4	R4700 processor, unified external cache	U2, U10, U14, and U26

1. Location on processing engine board. See Figure 1-13.

**Note**

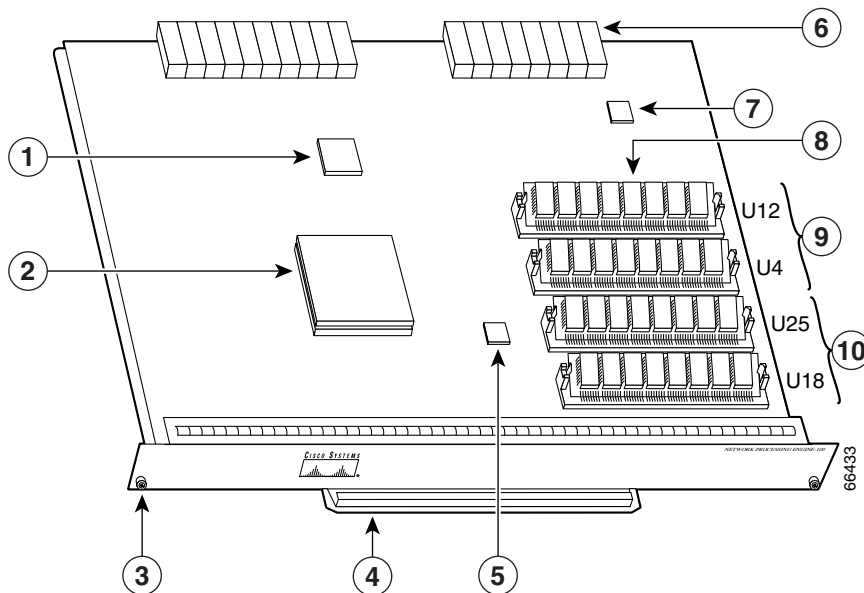
To prevent DRAM errors in the NPE-100, NPE-150, or NPE-200, and to ensure that your system initializes correctly at startup, DRAM bank 0 (socket U18 and U25, or U11 and U25) *must* contain no fewer than two SIMMs of the same type. You may also install two SIMMs of the same type in bank 1 (socket U4 and U12, or U42 and U52); however, bank 0 must always contain the two largest size SIMMs.

Table 1-19 NPE-150 DRAM SIMM Memory Configurations

Total DRAM	DRAM Bank 0	Quantity	DRAM Bank 1	Quantity	Product Number ¹
32 MB	U18 and U25	2 16-MB SIMMs	U4 and U12	—	MEM-NPE-32MB=
64 MB	U18 and U25	2 32-MB SIMMs	U4 and U12	—	MEM-NPE-64MB=
128 MB	U18 and U25	2 32-MB SIMMs	U4 and U12	2 32-MB SIMMs	MEM-NPE-128MB=

1. These products are also available as DRAM upgrades. For example, to upgrade a network processing engine from 32 MB to 64 MB of DRAM, order product number MEM-NPE-64MB=.

Figure 1-14 NPE-100



1	System controller	6	Midplane connectors
2	R4700 microprocessor	7	Temperature sensor
3	Captive installation screw	8	DRAM SIMMs
4	Handle	9	Bank 1
5	Temperature sensor	10	Bank 0

Table 1-20 lists the NPE-100 network processing engine memory specifications, and Table 1-21 lists memory configurations.

Table 1-20 NPE-100 Memory Specifications

Memory Type	Size	Quantity	Description	Location ¹
DRAM	32 to 128 MB	2 to 4	16- or 32-MB SIMMs (based on maximum DRAM required)	Bank 0: U18 and U25 Bank 1: U4 and U12
Boot ROM	The NPE-100 uses boot ROM present on the I/O controller.			
Primary cache	—	—	R4700 processor, internal cache	U201
Secondary cache	512 KB	4	R4700 processor, unified, external cache	U2, U10, U14, and U26

1. Location on processing engine board. See [Figure 1-14](#).

**Note**

To prevent DRAM errors in the NPE-100, NPE-150, or NPE-200, and to ensure that your system initializes correctly at startup, DRAM bank 0 (socket U18 and U25, or U11 and U25) *must* contain no fewer than two SIMMs of the same type. You may also install two SIMMs of the same type in bank 1 (socket U4 and U12, or U42 and U52); however, bank 0 must always contain the two largest size SIMMs.

Table 1-21 NPE-100 DRAM SIMM Memory Configurations

Total DRAM	DRAM Bank 0	Quantity	DRAM Bank 1	Quantity	Product Number ¹
32 MB	U18 and U25	2 16-MB SIMMs	U4 and U12	—	MEM-NPE-32MB
64 MB	U18 and U25	2 32-MB SIMMs	U4 and U12	—	MEM-NPE-64MB
128 MB	U18 and U25	2 32-MB SIMMs	U4 and U12	2 32-MB SIMMs	MEM-NPE-128MB

1. These products are also available as DRAM upgrades. For example, to upgrade a network processing engine from 32 MB to 64 MB of DRAM, order product number MEM-NPE-64MB=.

Determining Memory Configuration

To determine the memory configuration of your Cisco 7200 VXR router, use the **show version** command. The following example shows an NPE-G1 installed in a Cisco 7206VXR router:

```
Router# show version
Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-JS-M),
Released Version 12.2(20011220:181136) [biff]
Copyright (c) 1986-2001 by cisco Systems, Inc.
Compiled Fri 21-Dec-01 05:58 by
Image text-base:0x600089B8, data-base:0x6196E000

ROM: System Bootstrap, Version 12.2(20011219:132854)

(display text omitted)

cisco 7206VXR (NPE-G1) processor (revision 0x00) with 245760K/16384K bytes of memory.
Processor board ID 13250983
```

BCM12500 CPU at 500Mhz, Implementation 1, Rev 0.1, 512KB L2 Cache
6 slot VXR midplane, Version 2.0

Input/Output Controller

This section describes five different models of I/O controllers. These models are distinguished from one another by their Ethernet interface options. [Table 1-22](#) lists the I/O controllers by product number and describes their differences.



Note

For a description of the configuration commands you need to configure the different interfaces on your I/O controller, refer to the *Input/Output Controller Replacement Instructions* document.

Table 1-22 I/O Controller Descriptions

Product Number	Description
C7200-I/O-GE+E	1 Gigabit Ethernet and 1 Ethernet port; equipped with a GBIC receptacle for 1000 megabits per second (Mbps) operation and an RJ-45 receptacle for 10-Mbps operation. (See Figure 1-15 .)
C7200-I/O-2FE/E	2 autosensing Ethernet/Fast Ethernet ports; equipped with 2 RJ-45 receptacles for 10/100-Mbps operation. (See Figure 1-16 .)
C7200-I/O-FE ¹	1 Fast Ethernet port; equipped with an MII receptacle and an RJ-45 receptacle for use at 100 Mbps full-duplex or half-duplex operation. Only 1 receptacle can be configured for use at a time. (See Figure 1-17 and Figure 1-18 .)
C7200-I/O	Has no Fast Ethernet port. (See Figure 1-19 and Figure 1-20 .)
C7200-I/O-FE-MII ²	1 Fast Ethernet port; equipped with a single MII receptacle. (See Figure 1-21 .)

1. The Product Number C7200-I/O-FE does not specify MII because both an MII and an RJ-45 receptacle are included.
2. The I/O controller with the Product Number C7200-I/O-FE-MII has a single MII Fast Ethernet receptacle only. Although still supported by Cisco, this I/O controller with a single MII receptacle is no longer an orderable product as of May 1998.

You can also identify your I/O controller model from a terminal by using the **show diag slot 0** command. (See the “[Viewing Your System Configuration](#)” section on [page 4-20](#).)

The I/O controllers consist of the following components and options:

- Ethernet, Fast Ethernet, or Gigabit Ethernet interface options
- Dual channels for local console and auxiliary ports

The console port has full data communications equipment (DCE) functionality and the auxiliary port has full data terminal equipment (DTE) functionality.

- NVRAM for storing the system configuration and environmental monitoring logs



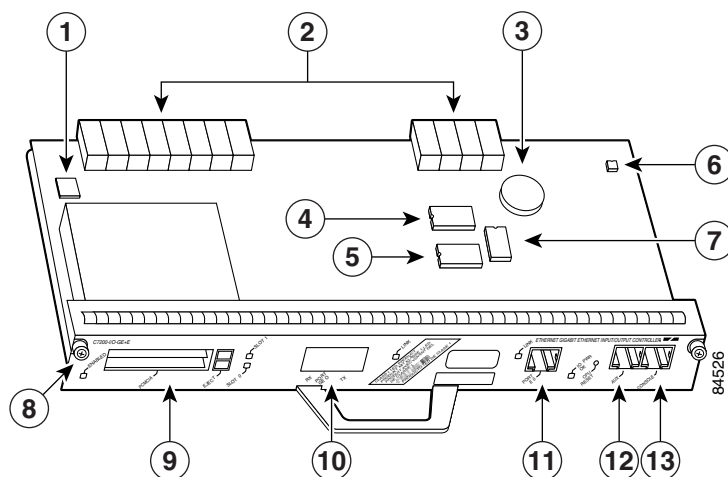
Note

NVRAM uses lithium batteries to maintain its contents when disconnected from power. Some I/O controllers use a static RAM (SRAM) component with an external lithium battery to provide the same functionality as the NVRAM.

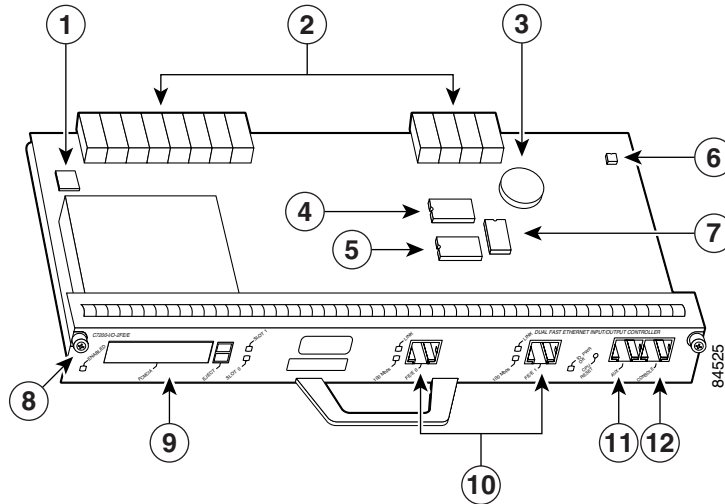
- Two PC Card (PCMCIA) slots that hold Flash Disks or PC Cards for storing the default Cisco IOS software image

- Flash memory for storing the boot helper image
- Boot ROM for storing sufficient code for booting the Cisco IOS software
- Two environmental sensors for monitoring the cooling air as it enters and leaves the chassis

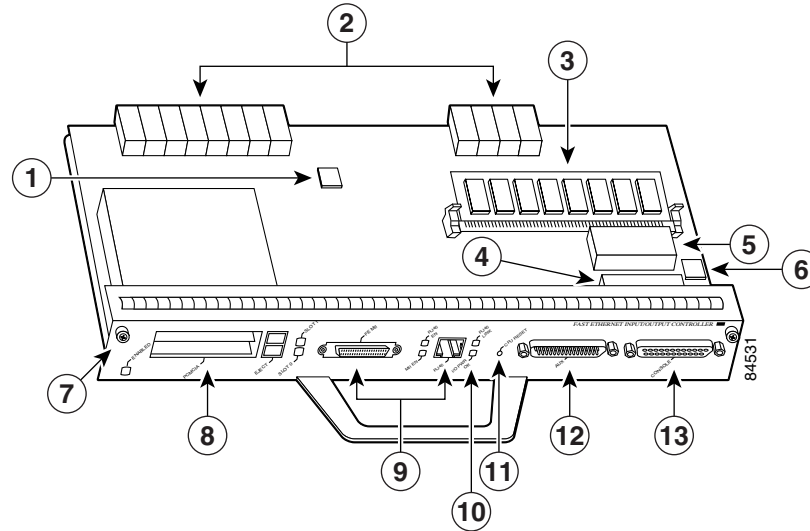
Figure 1-15 C7200-I/O-GE+E—With GBIC Gigabit Ethernet and RJ-45 Ethernet Receptacles



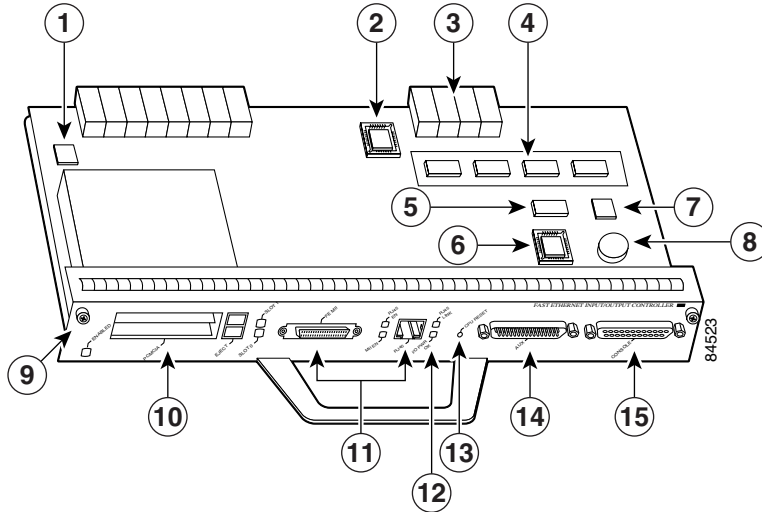
1	Temperature sensor	8	Captive installation screw
2	Midplane connectors	9	PC Card slots
3	Battery for SRAM	10	Gigabit Ethernet GBIC port
4	8-MB Flash memory (soldered) (U13)	11	Ethernet RJ-45 port
5	8-MB Flash memory (soldered), (U25)	12	Auxiliary port
6	Temperature sensor	13	Console port
7	SRAM (U19)		

Figure 1-16 C7200-I/O-2FE/E—With Two RJ-45 Ethernet/Fast Ethernet Receptacles

1	Temperature sensor	7	SRAM (U19)
2	Midplane connectors	8	Captive installation screw
3	Battery for SRAM	9	PC Card slots
4	8-MB Flash memory (soldered) (U15)	10	RJ-45 Fast Ethernet ports
5	8-MB Flash memory (soldered) (U25)	11	Auxiliary port
6	Temperature sensor	12	Console port

Figure 1-17 C7200-I/O-FE— With MII and RJ-45 Fast Ethernet Receptacles (Version 1)

1	Temperature sensor	8	PC Card slots
2	Midplane connectors	9	Optional Fast Ethernet interface (MII port and RJ-45 port)
3	Flash SIMM (U99)	10	LEDs
4	Boot ROM (U20)	11	CPU reset button
5	NVRAM (U41)	12	Auxiliary port
6	Temperature sensor	13	Console port
7	Captive installation screw		

Figure 1-18 C7200-I/O-FE—With MII and RJ-45 Fast Ethernet Receptacles (Version 2)

1	Temperature sensor	9	Captive installation screw
2	FPGA configuration PROM (U9)	10	PC Card slots
3	Midplane connectors	11	Optional Fast Ethernet interface (MII port and RJ-45 port)
4	4-MB Flash memory (soldered) (U10–U13)	12	LEDs
5	SRAM (U14)	13	CPU reset button
6	Boot EPROM (U4)	14	Auxiliary port
7	Temperature sensor	15	Console port
8	Battery for SRAM		

**Note**

Your I/O controller with the MII and RJ-45 Fast Ethernet receptacles (C7200-I/O-FE) might look like [Figure 1-17](#), or it might look like [Figure 1-18](#). There is no functional difference between these two I/O controllers with the Fast Ethernet port.

**Note**

In [Figure 1-17](#), the NVRAM is replaced by an SRAM component (U14) that is made to act like the NVRAM by the addition of some external components, one of which is the button-type lithium battery labeled “Battery for SRAM.”

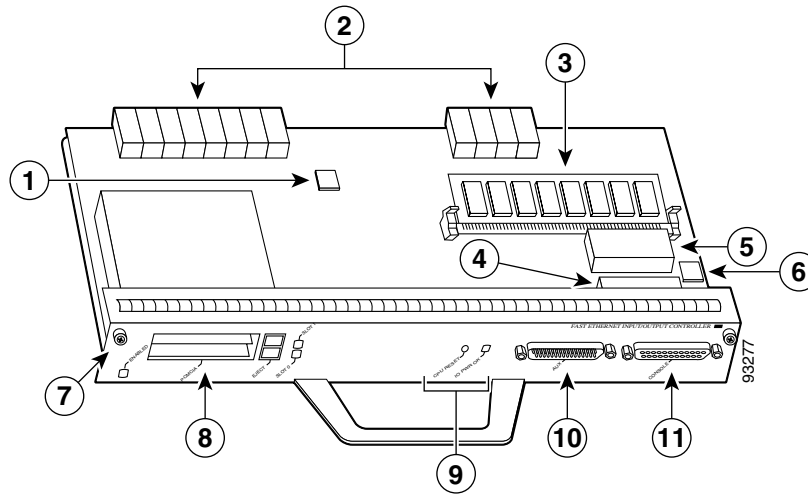
**Note**

Your I/O controller without the Fast Ethernet port (C7200-I/O) might look like [Figure 1-19](#), or it might look like [Figure 1-20](#). There is no functional difference between these two I/O controllers without the Fast Ethernet port.

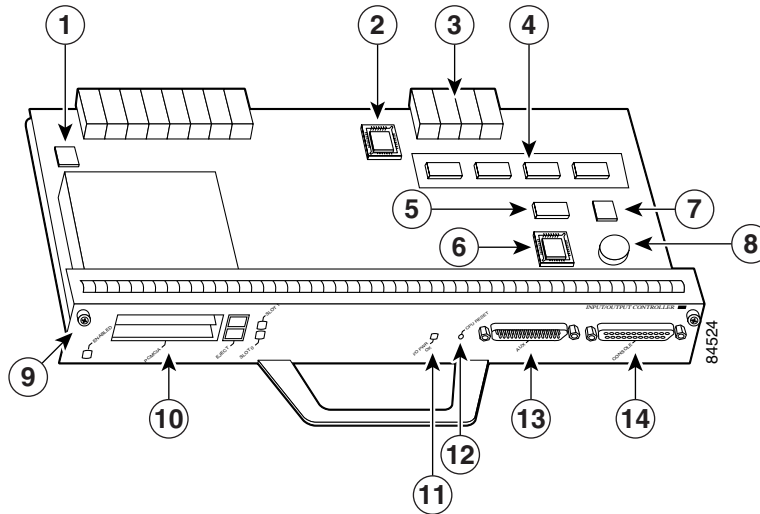
**Note**

In [Figure 1-20](#), the NVRAM is replaced by an SRAM component (U14) that is made to act like the NVRAM by the addition of some external components, one of which is the button-type lithium battery labeled “Battery for SRAM.”

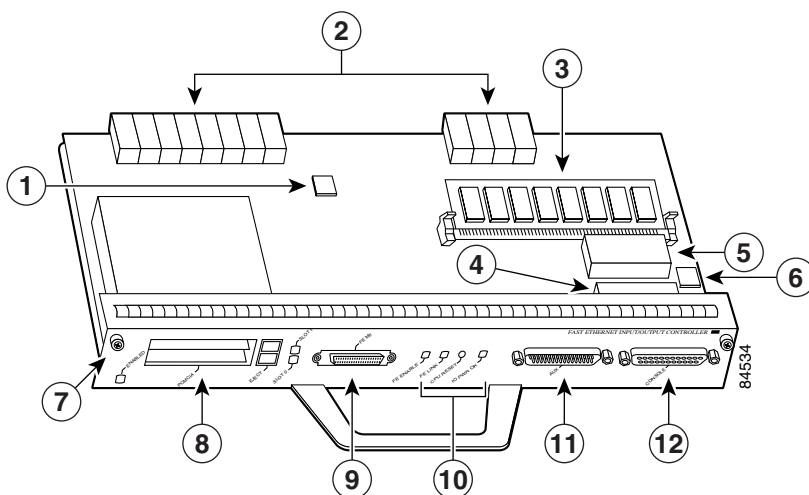
Figure 1-19 C7200-I/O—Without Fast Ethernet Port (Version 1)



1	Temperature sensor	7	Captive installation screw
2	Midplane connectors	8	PC Card slots
3	Flash SIMM (U99)	9	LED and CPU reset button
4	Boot ROM (U20)	10	Auxiliary port
5	NVRAM (U41)	11	Console port
6	Temperature sensor		

Figure 1-20 C7200-I/O—Without Fast Ethernet Port (Version 2)

1	Temperature sensor	8	Battery for SRAM
2	FPGA configuration PROM (U9)	9	Captive installation screw
3	Midplane connectors	10	PC Card slots
4	4-MB Flash memory (soldered) (U10–U13)	11	LED
5	SRAM (U14)	12	CPU reset button
6	Boot EPROM (U4)	13	Auxiliary port
7	Temperature sensor	14	Console port

Figure 1-21 C7200-I/O-FE-MII—With Single MII Fast Ethernet Receptacle

1	Temperature sensor	7	Captive installation screw
2	Midplane connectors	8	PC Card slots
3	Flash SIMM (U99)	9	Optional Fast Ethernet interface (MII connector)
4	Boot ROM (U20)	10	LEDs and CPU reset button
5	NVRAM (U41)	11	Auxiliary port
6	Temperature sensor	12	Console port

**Note**

C7200-I/O-FE-MII, although still supported by Cisco, was discontinued as an orderable product in May 1998.

Table 1-23 lists the I/O controller memory components.

Table 1-23 I/O Controller Memory Components

Type	Size	Quantity	Memory Description	Model	Location
Boot ROM ¹	256 KB	1	32-pin DIP-type	C7200-I/O-FE-MII	U20
			32-pin DIP-type or 32-pin PLCC-type	C7200-I/O-FE, C7200-I/O	U20 or U4
Flash memory	4 MB	1	Contains the default boot helper image	C7200-I/O-FE-MII	U99
				C7200-I/O-FE, C7200-I/O	U99 or U10, U11, U12, and U13 (soldered) ²
	8 MB	1		C7200-I/O-GE+E, C7200-I/O-2FE/E	U13 and U25 (soldered) ²
Flash memory card	16 or 20 MB	Up to 2	Contains the default Cisco IOS image	All models	PC Card slot 0 and slot 1
Flash Disk	32, 48, or 128 MB	Up to 2			
NVRAM	128 KB	1	Nonvolatile EPROM for the system configuration file	C7200-I/O-FE-MII	U41
				C7200-I/O-FE, C7200-I/O	U41 or U14 (soldered) ³
				C7200-I/O-GE+E, C7200-I/O-2FE/E	U19 (soldered) ³

1. The C7200-I/O-GE+E and C7200-I/O-2FE/E do not have a boot ROM component.
2. Some I/O controllers have no Flash SIMM but use a permanently soldered 4-MB or 8-MB flash memory chip instead. (For the location of the 4-MB Flash memory chip, see [Figure 1-18](#) and [Figure 1-20](#). For the location of the 8-MB flash memory chip, see [Figure 1-15](#) and [Figure 1-16](#).)
3. The NVRAM on some I/O controllers is replaced by a 32-pin nonsocketed SRAM component that is soldered onto the card. The SRAM component is made to act like the NVRAM by the addition of some external components, one of which is a 1-inch (2.54-cm) button-type lithium battery.

LED Descriptions

All I/O controllers have LEDs, and the NPE-G1 and NPE-G2 also have interfaces that have LEDs.

The I/O controller faceplate contains LEDs that indicate system and port status; two additional LEDs indicate the status of the Flash Disk or flash memory cards installed in either PC Card slot. A CPU reset button is located next to the IO POWER OK LED or next to the auxiliary port on the I/O controller faceplate. The CPU reset button resets the entire system.

The NPE-G2 and NPE-G1 faceplate contains LEDs that indicate system and port status. The RJ-45 and GBIC or SFP ports share the same LINK LED because only one of these ports per interface (0/1, 0/2, or 0/3) can be used at any one time. The ENABLE LED is on if the RJ-45 port is in use. The POWER ON LED on the NPE-G1 or the PWR OK LED on the NPE-G2 is on when the system is powered on, whether

or not an I/O controller is in the system with the NPE-G1 or NPE-G2. The SLOT ACTIVE LED is on if there is a CompactFlash Disk in the NPE-G1. The CF ACTV LED is on if there is a CompactFlash Disk in the NPE-G2.

**Caution**

To prevent system errors and problems, use the CPU reset button only at the direction of your service representative.

[Table 1-24](#) lists LEDs common to all models of I/O controllers and describes their functions. [Table 1-25](#) lists LEDs on the NPE-G2. [Figure 1-21](#) lists the LEDs on the NPE-G1.

**Note**

LEDs are either on or off. The LED state (on or off), not the color, determines the status of connection. However, most LEDs are green when on, with the exception of the IO POWER OK LED, which is amber when in the on state. However, with the introduction of the NPE-G2, flashing LEDs are also indicative of activity.

Table 1-24 I/O Controller LEDs

LED	Color	Function
ENABLED	Green	Indicates that the network processing engine or network services engine and the I/O controller are enabled for operation by the system; however, it does not mean that the Fast Ethernet port on the I/O controller is functional or enabled. This LED goes on during a successful router boot and remains on during normal operation of the router.
IO POWER OK	Amber	Indicates that the I/O controller is on and receiving DC power from the router midplane. This LED comes on during a successful router boot and remains on during normal operation of the router.
Slot 0 Slot 1	Green	These LEDs indicate which PC Card slot is in use by coming on when either slot is being accessed by the system. These LEDs remain off during normal operation of the router.

NPE-G2 LEDs

Table 1-25 NPE-G2 LEDs

LED Label	LED	Color	Status in the Power Up State
LINK ACTV (Interfaces 0/1, 0/2, 0/3)	RJ-45 and SFP ports	Solid green	Link with no activity.
		Flashing green	Link with activity.
		Off	No link.
EN (Enable) (Interfaces 0/1, 0/2, 0/3)	RJ-45 ports only	Solid green	RJ-45 port is selected.
		Off	SFP port is selected.
FE LINK	Fast Ethernet Management port	Solid green	Link with no activity.
		Flashing green	Link with activity.
		Off	No link.

Table 1-25 NPE-G2 LEDs (continued)

LED Label	LED	Color	Status in the Power Up State
USB	USB ports	Flashing green	Activity.
		Off	No activity.
CF ACTV	CompactFlash Disk	Flashing green	Activity.
		Off	No activity.
SYST STAT	System status	Solid green	Cisco IOS has successfully booted.
		Flashing yellow	ROMmon is loading.
		Solid yellow	ROMmon has successfully booted.
		Flashing green	Cisco IOS is loading.
PWR OK	Power	Green	The NPE-G2 has powered on.
		Off	No activity.

NPE-G1 LEDs

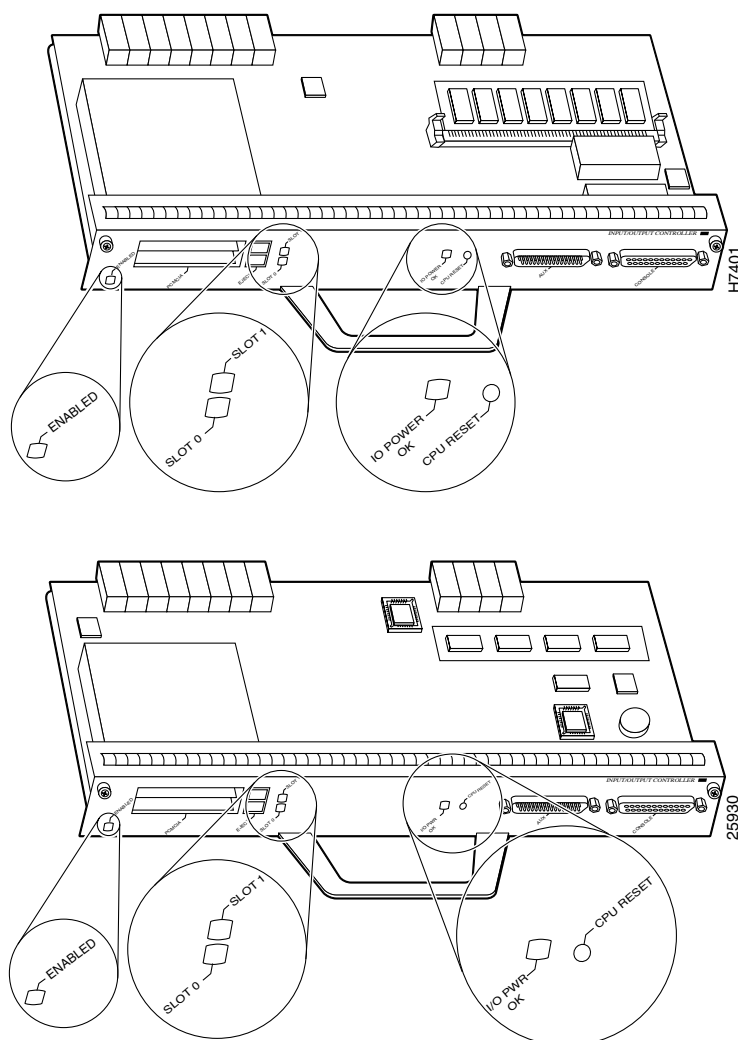
Table 1-26 NPE-G1 LEDs

LED Label	LED	Color	LED Status in the Power Up State	LED Flashes when There Is Traffic
LINK, 0/1, 0/2, 0/3	RJ-45 and GBIC ports	Green	On, indicating that a link has been established.	No
EN (Enable), 0/1, 0/2, 0/3	RJ-45 ports only	Green	On, if the RJ-45 port is selected. Off, if the GBIC port is selected.	—
SLOT ACTIVE	CompactFlash Disk	Green	On when the slot is being used.	—
POWER ON	Power	Green	On and stays on.	No

Input/Output Controller C7200-I/O LEDs

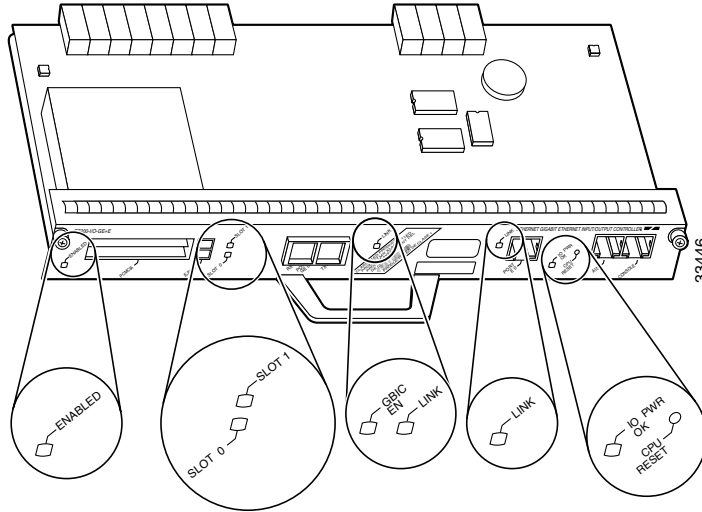
Figure 1-22 shows the LEDs on the I/O controller model with no Ethernet ports (C7200-I/O). This I/O controller has no port-specific LEDs. Table 1-24 describes the LEDs on this I/O controller.

Figure 1-22 C7200-I/O LEDs and CPU Reset Button



Input/Output Controller C7200-I/O-GE+E LEDs

Figure 1-23 shows the LEDs on the I/O controller with the Gigabit Ethernet port and the Ethernet port (C7200-I/O-GE+E), and Table 1-27 lists the LEDs specific to this I/O controller model. Also see Table 1-24 for LEDs common to all I/O controllers.

Figure 1-23 C7200-I/O-GE+E LEDs and CPU Reset Button**Table 1-27 C7200-I/O-GE+E I/O Controller LEDs**

LED	Color	Function
LINK	Green	Indicates that the Ethernet RJ-45 receptacle has established a valid link with the network. This LED remains off during normal operation of the router unless there is an incoming carrier signal.

Input/Output Controller C7200-I/O-2FE/E LEDs

Figure 1-24 shows the LEDs on the I/O controller with the two autosensing 10/100-Mbps RJ-45 receptacles (C7200-I/O-2FE/E), and Table 1-28 lists the LEDs specific to this I/O controller model. Also see Table 1-24 for LEDs common to all I/O controllers.

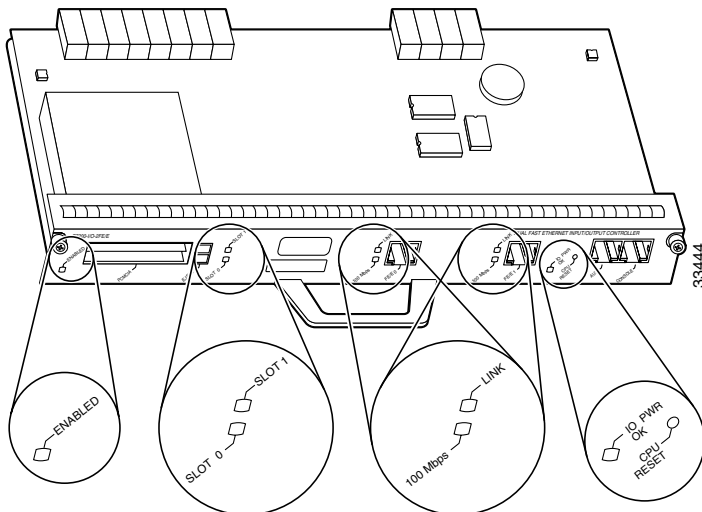
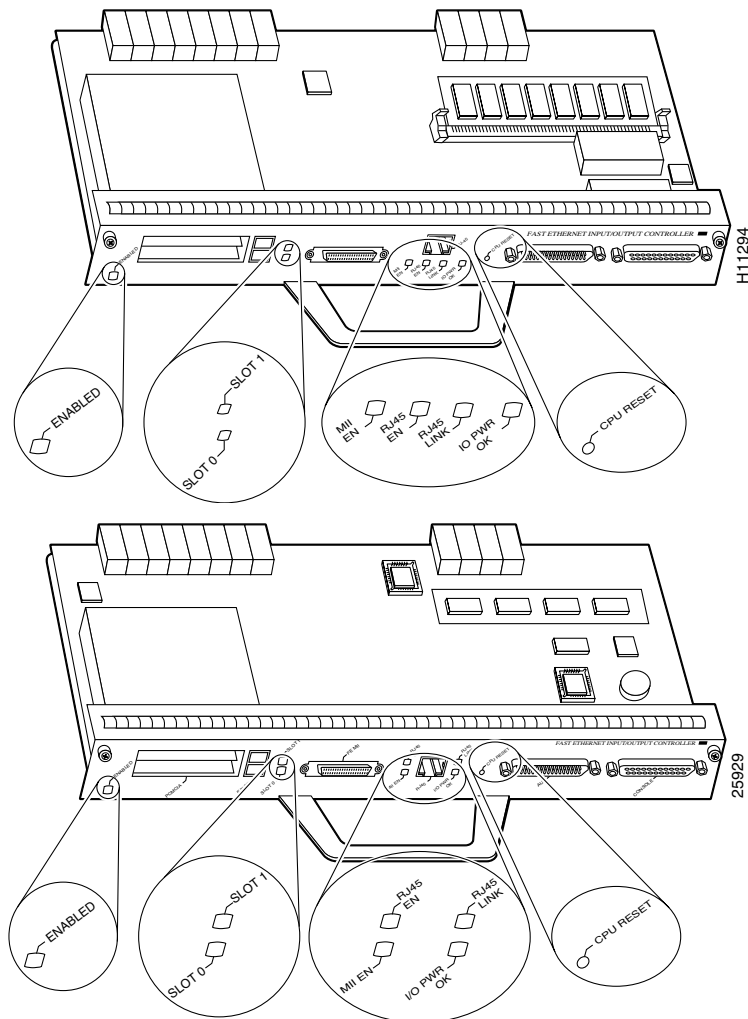
Figure 1-24 C7200-I/O-2FE/E LEDs and CPU Reset Button

Table 1-28 C7200-I/O-2FE/E I/O Controller LEDs

LED	Color	Function
100 Mbps	Green	Indicates that the port is configured for 100-Mbps operation (speed 100), or if configured for autonegotiation (speed auto), the port has detected a valid link at 100 Mbps. Note If the port is configured for 10-Mbps operation, or if it is configured for autonegotiation and the port has detected a valid link at 10 Mbps, the LED remains off.
LINK	Green	Indicates that the Ethernet/Fast Ethernet RJ-45 receptacle has established a valid link with the network. This LED remains off during normal operation of the router unless there is an incoming carrier signal.

Input/Output Controller C7200-I/O-FE LEDs

[Figure 1-25](#) shows the LEDs on the I/O controller with the Fast Ethernet port that is equipped with an MII receptacle and an RJ-45 receptacle (C7200-I/O-FE), and [Table 1-29](#) lists the LEDs specific to this I/O controller model. Also see [Table 1-24](#) for LEDs common to all I/O controllers.

Figure 1-25 C7200-I/O-FE LEDs and CPU Reset Button**Table 1-29 C7200-I/O-FE I/O Controller LEDs**

LED	Color	Function
MII EN	Green	Indicates that the Fast Ethernet MII receptacle is initialized and enabled by the system, and is configured for operation. This LED comes on after the I/O controller has been enabled and the MII receptacle has been configured as the media type for the Fast Ethernet port (the RJ-45 receptacle is the default media type for the Fast Ethernet port). This LED remains on during normal operation of the router.
RJ45 EN	Green	Indicates that the Fast Ethernet RJ-45 receptacle (the default media type for the Fast Ethernet port) is initialized and enabled by the system. This LED comes on after the I/O controller has been enabled and remains on during normal operation of the router.
RJ45 LINK	Green	Indicates that the Fast Ethernet RJ-45 receptacle has established a valid link with the network. This LED remains off during normal operation of the router unless there is an incoming carrier signal.

**Note**

An MII LINK LED is not provided on this I/O controller because the LED is provided on external transceivers that are required for connecting to the MII receptacle on the I/O controller. See [Chapter 3, “Installing a Cisco 7200 VXR Router,”](#) the “[Connecting to the I/O Controller Ethernet and Fast Ethernet Ports](#)” section on page 3-30 for Fast Ethernet MII connection requirements.

Input/Output Controller C7200-I/O-FE-MII LEDs

[Figure 1-26](#) shows the LEDs on the I/O controller with the Fast Ethernet port equipped with a single MII receptacle (C7200-I/O-FE-MII), and [Table 1-30](#) lists the LEDs specific to this I/O controller model. Also see [Table 1-24](#) for LEDs common to all I/O controllers.

Figure 1-26 C7200-I/O-FE-MII LEDs and CPU Reset Button

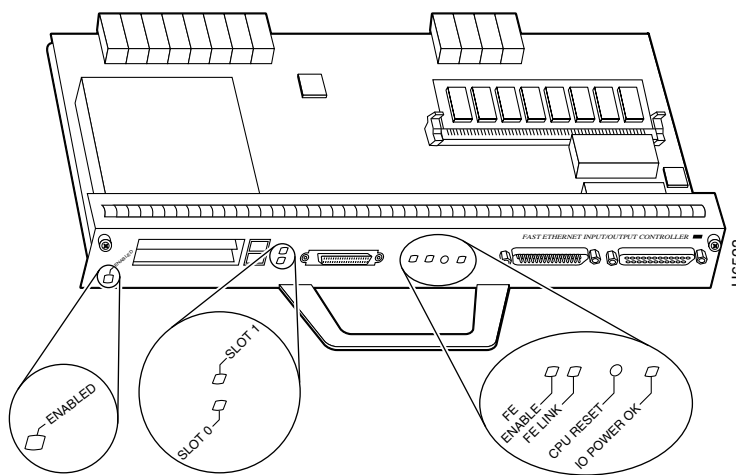


Table 1-30 C7200-I/O-FE-MII I/O Controller LEDs

LED	Color	Function
FE ENABLE	Green	Indicates that the Fast Ethernet port is initialized and enabled for operation by the system. This LED comes on after the I/O controller has been enabled and remains on during normal operation of the router.
FE LINK	Green	Indicates that the Fast Ethernet port has established a valid link with the network. This LED remains off during normal operation of the router unless there is an incoming carrier signal.

Port Adapters and Service Adapters

The port adapters and service adapters installed in the Cisco 7200 VXR routers are of the same type as those installed on the second-generation Versatile Interface Processors (VIPs) in the Cisco 7500 series routers, in Cisco 7000 series routers with the Cisco 7000 series Route Switch Processor (RSP7000) and Cisco 7000 series Chassis Interface (RSP7000CI), in the Cisco AS5800 Universal Access Server, and in the Cisco uBR7246 universal broadband router.


Note

The port adapters installed in the Cisco 7200 VXR routers support OIR. For an explanation of OIR, see the [“Online Insertion and Removal” section on page 1-57](#).

All port adapters and service adapters connect to two Peripheral Component Interconnect (PCI) buses on the router midplane. The PCI buses provide a path to packet I/O memory and the system (route/switch) processor. The Fast Ethernet port on the I/O controller connects to a third PCI bus for packet routing and switching. The port or service adapters either provide such services as compression or encryption, or they provide network interfaces to connect the router to external networks.


Note

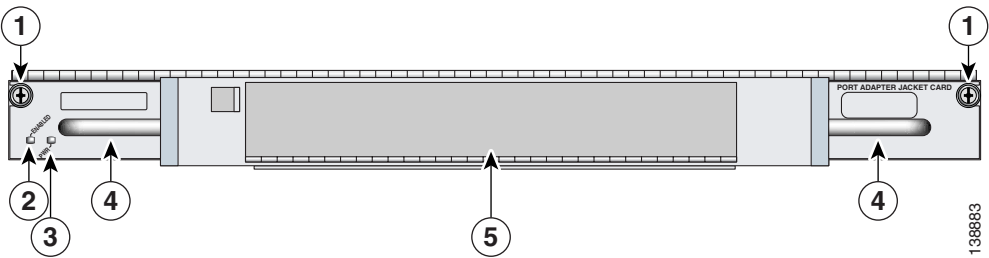
Detailed instructions for removing, replacing, and configuring the port adapter types supported on the Cisco 7200 VXR routers are contained in the configuration note for the port adapter. For example, if you plan to replace a 4-port Ethernet port adapter in your Cisco 7200 VXR router, refer to the configuration note *PA-4E Ethernet 10BaseT Port Adapter Installation and Configuration*. The configuration note is available on the Documentation DVD and on Cisco.com.


Caution

To ensure adequate airflow across the router’s port adapters, a port adapter or a blank port adapter must be installed in each port adapter slot.

Port Adapter Jacket Card

Figure 1-27 Port Adapter Jacket Card



1	Captive installation screw	4	Handle
2	ENABLE LED	5	Port adapter slot
3	PWR (power) LED		

The Port Adapter Jacket Card, see [Figure 1-27](#), is used in a Cisco 7200 VXR router only with an NPE-G1 or NPE-G2 installed and with no I/O controller. The NPE-G1 has I/O controller functionality, so no I/O controller is needed. The Port Adapter Jacket Card installs in the I/O controller slot, and provides for an additional port adapter slot. The Port Adapter Jacket Card works from a third PCI bus, which provides additional bandwidth and virtually unlimited bandwidth points to the single port adapter slot. For more information, see the [Port Adapter Jacket Card Installation Guide](#).

Power Supplies

The Cisco 7200 VXR routers come equipped with one 280W AC-input power supply. (A 280W DC-input power supply is available as an option.) You must order the second power supply separately. A second power supply, although not required, allows load sharing and increased system availability.

**Note**

The Cisco 7200 VXR power supplies are the same as in all Cisco 7200 series routers.

**Caution**

The DC return connection to this system is to remain isolated from the system frame and chassis (DC-I).

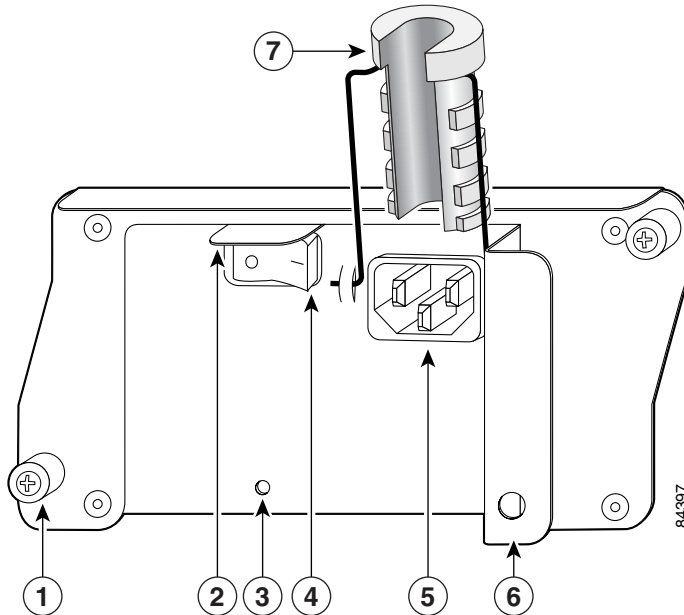
**Caution**

Do not mix power supplies in Cisco 7200 VXR routers. In dual power supply configurations, both power supplies *must* be of the same type (two AC-input power supplies or two DC-input power supplies).

**Note**

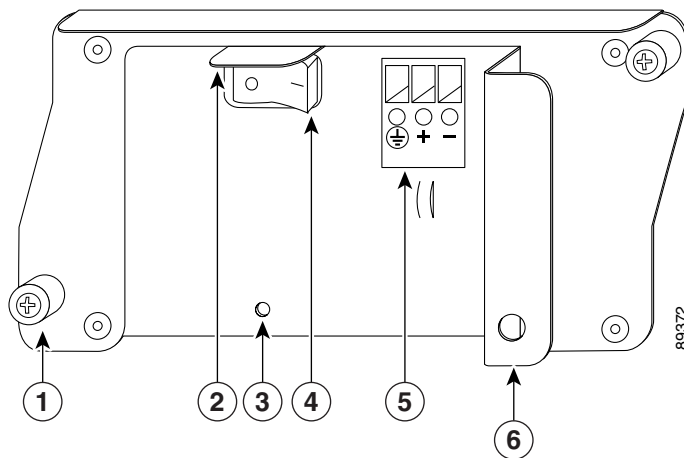
Detailed instructions for handling and replacing the Cisco 7200 series power supplies are contained in the configuration notes *280-Watt AC-Input Power Supply Replacement Instructions* and *280-Watt DC-Input Power Supply Replacement Instructions*. These configuration notes are available on the Documentation DVD and on Cisco.com.

A handle on the AC and DC power supplies provides a grip point for removing and replacing the power supply. (Figure 1-28 shows the faceplate of the AC-input power supply. Figure 1-29 shows the faceplate of the DC-input power supply.) Two captive installation screws secure the power supply to the chassis and seat the power supply in the router midplane. A power OK LED indicates that the power supply is delivering +5 VDC to the router midplane.

Figure 1-28 Cisco 7200 Series AC-Input Power Supply

1	Captive installation screw	5	AC-input receptacle
2	Power switch guard	6	Handle
3	OK LED	7	Power cable- retention clip
4	Power switch		

The AC-input power supply has a receptacle for an AC-input power cable. A modular power cable connects the AC-input power supply to the site AC power source. A cable-retention clip secures the power cable to the AC-input power supply.

Figure 1-29 Cisco 7200 Series DC-Input Power Supply

1	Captive installation screw	4	Power switch
2	Power switch guard	5	DC-input receptacle
3	OK LED	6	Handle

The DC-input power supply has DC-input power leads that are hardwired to a DC-input terminal block. A cable tie is shipped with each DC-input power supply to secure the leads to the power supply faceplate and provide strain relief for the leads.

**Caution**

To ensure adequate airflow across the router power supplies, a power supply or a power supply filler plate must be installed in each power supply bay. [Figure 1-4](#) shows a Cisco 7206VXR with an installed power supply filler plate.

[Table 1-1](#) lists the AC-input and DC-input power supply system power specifications, including input voltage and operating current ratings.

**Note**

Each AC-input power supply operating at 120 VAC requires a minimum of 5A service. We recommend powering the Cisco 7206VXR from a 15A receptacle at the power source.

**Note**

Each DC-input power supply operating at –24 VDC in North America requires a minimum of 19A service. Each DC-input power supply operating at –48 VDC in North America requires a minimum of 13A service. Each DC-input power supply operating at –60 VDC in the European Community requires a minimum of 8A service.

This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that a listed and certified fuse or circuit breaker, 20A minimum 60 VDC, is used on all current-carrying conductors. Site wiring and circuit breakers need to be sized to accommodate the maximum values for safety reasons.

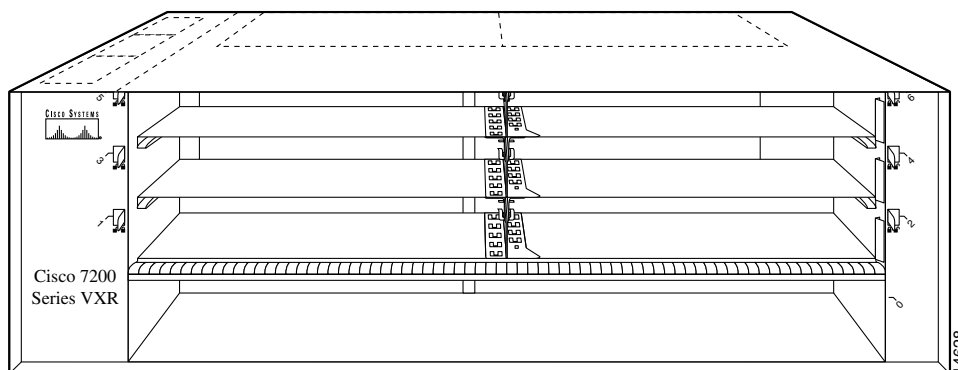
The power OK LED goes off and the power supply shuts itself down when the internal DC voltages exceed allowable tolerances or the internal temperature of the power supply exceeds allowable tolerances. The power supply remains in a shutdown state until it is disconnected and reconnected to the source power, and then restarted with the power switch. The power switch turns the power supply on and starts the system. For a description of power supply shutdown conditions and thresholds, see the [“Environmental Monitoring and Reporting Functions”](#) section on page 1-59.

Chassis

The Cisco 7200 VXR chassis, shown in [Figure 1-30](#), has four or six slots for the port adapters (depending on your chassis model), one slot for the I/O controller, and one bay for the subchassis. The subchassis assembly contains the midplane, the fan tray, two power supply bays, and one slot for the network processing engine. The replacement chassis includes the subchassis assembly and one power supply.

**Note**

To replace the chassis, you must remove and replace all the port adapters, the I/O controller, and the network processing engine or network services engine; therefore, when replacing the chassis, refer to the configuration notes that explain how to remove and replace these units. The configuration notes are available on the Documentation DVD and on Cisco.com.

Figure 1-30 Cisco 7200 VXR Chassis—7206VXR Shown

CompactFlash Disks, Flash Disks, and PC Cards

The Cisco 7206VXR supports up to two installed Flash Disks or two PC Cards, also called flash memory cards. The NPE-G1 supports one CompactFlash Disk, as does the NPE-G2.



Note

To avoid potential problems when you install spare Flash Disks or PC Cards in your Cisco 7206VXR, we recommend that you reformat all your Flash Disks or PC Cards on a Cisco 7206VXR that is running the Cisco IOS release recommended for your system (see [Table 1-31](#), [Table 1-32](#), and [Table 1-33](#)) during your regularly scheduled service times. The online document *Memory Replacement Instructions for the Network Processing Engine or Network Services Engine and Input/Output Controller* explains how to reformat a PC Card.

With Flash memory (Flash Disks, PC Cards, and the Flash SIMM on the I/O controller, or the CompactFlash Disk on the NPE-G1) you can remotely load and store multiple system and boot helper images. You can download a new image over the network, and then add the new image to Flash memory or replace existing files. You can also transfer images between Flash Disks or PC Cards and the onboard Flash memory SIMM. You can then boot the router either manually or automatically from any of the stored images. Flash memory can also function as a TFTP server to allow other routers to boot remotely from stored images or copy them into their own flash memory.



Note

For procedures that explain the use of the Flash Disk or CompactFlash Disk, refer to the online *Using the Flash Disk* document.

For procedures that explain how to replace the main, Flash, and ROM monitor memory, refer to the *Memory Replacement Instructions for the Network Processing Engine or Network Services Engine and Input/Output Controller* document. This document is available on the Documentation DVD and on Cisco.com.

For NPE-G2 and NPE-G1 pre-installation information, which requires copying the running configuration from the I/O controller to a Flash Disk or TFTP server before inserting the NPE-G1 into the Cisco 7200 VXR router, see the [Network Processing Engine and Network Services Engine Installation and Configuration](#) document at http://www.cisco.com/en/US/products/hw/routers/ps341/products_installation_guide_book09186a0080551c34.html.

See [Table 1-31](#), [Table 1-32](#), and [Table 1-33](#) for the factory-installed flash memory card options and their product numbers, the Flash Disk memory options and their product numbers, and the CompactFlash Disk memory options and their product numbers.

Table 1-31 Flash Memory Card Options

Memory Size	Product Number ¹
16 MB	MEM-I/O-FLC16M=
20 MB	MEM-I/O-FLC20M=

1. These products are also available as flash memory card upgrades. To order an upgrade, add an equal sign (=) after the product number, for example, MEM-I/O-FLC16M=.

Table 1-32 Flash Disk Options

Memory Size	Product Number ¹
64 MB	MEM-I/O-FLD64M=
128 MB	MEM-I/O-FLD128M=

1. These products are also available as Flash Disk upgrades. To order an upgrade, add an equal sign (=) after the product number, for example, MEM-I/O-FLD128M=.

Table 1-33 CompactFlash Disk Options

Memory Size	Product Number
64 MB	MEM-COMP-FLD64M=
128 MB	MEM-COMP-FLD128M=
256 MB	MEM-NPE-G2-FLD256=

Rack-Mount and Cable-Management Kit

The rack-mount and cable-management kit for the Cisco 7200 VXR routers consists of rack-mount and cable-management brackets that are designed for mounting your router in 19-inch, four-post or two-post equipment racks and for relieving strain on port adapter interface cables that are installed on port adapters in the router. The kit is shipped with each Cisco 7200 VXR router and is also available as a single FRU.

For detailed instructions about how to install the rack-mount and cable-management brackets on your Cisco 7200 VXR router, see [Chapter 3, “Installing a Cisco 7200 VXR Router,”](#) the “[Rack-Mounting a Cisco 7200 VXR Router](#)” section on [page 3-2](#) and the “[General Tabletop or Workbench Installation](#)” section on [page 3-14](#).

Functional Overview

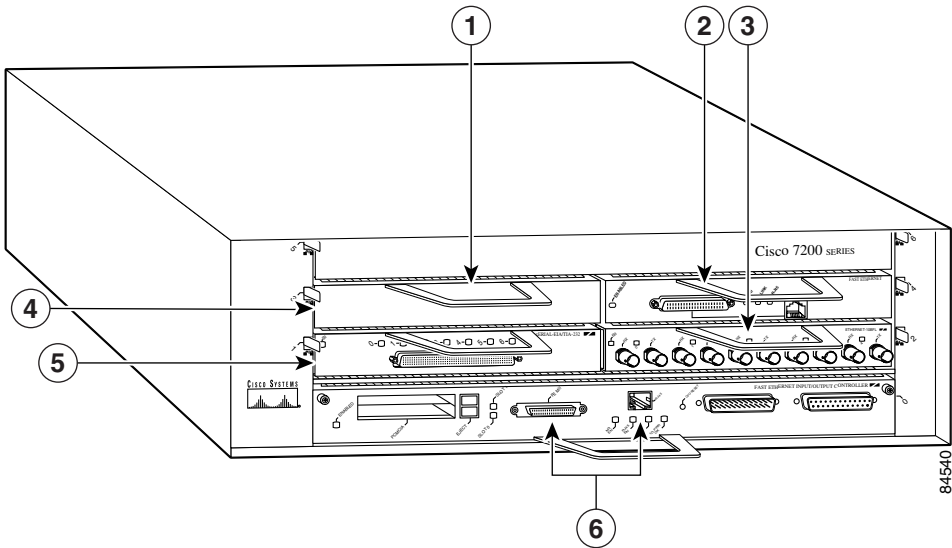
This section provides a functional overview of the Cisco 7200 VXR routers. It describes the numbering and addressing scheme of the port adapters for the router, the environmental monitoring and reporting functions, and online insertion and removal (OIR). These descriptions help you become familiar with the capabilities of the Cisco 7200 VXR routers.

Chassis Slot and Logical Interface Numbering

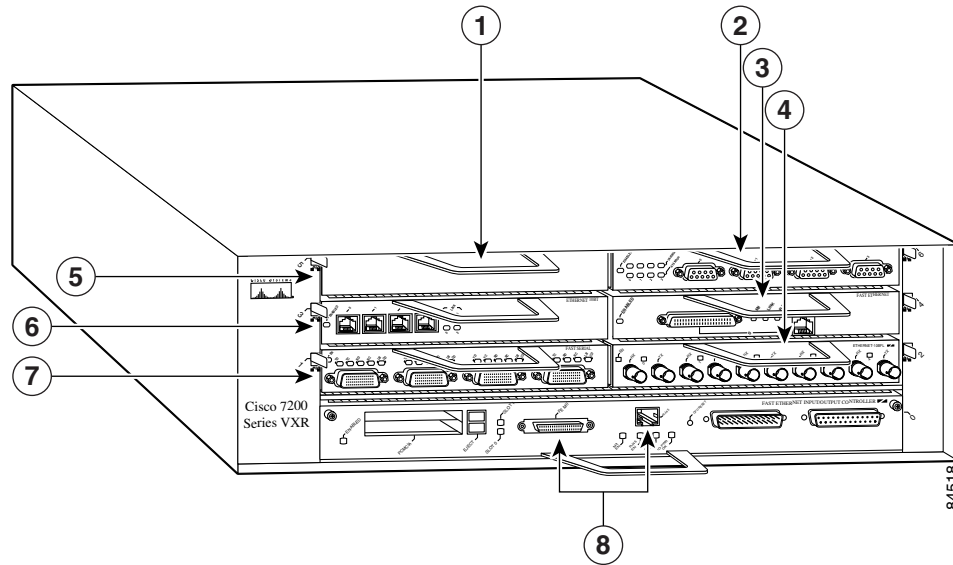
In the Cisco 7200 VXR routers, the *port-adapter-slot-number* is the chassis slot in which a port adapter is installed, whereas the *logical-interface-number* is the physical location of the interface port on a port adapter.

Port adapter slots in the Cisco 7200 VXR routers are numbered from left to right— slot 1 through slot 4 in the Cisco 7204VXR (see [Figure 1-31](#)) and slot 1 through slot 6 in the Cisco 7206VXR (see [Figure 1-32](#)). Port adapter slot 0 is always reserved for the Fast Ethernet port on the I/O controller—if present.

Figure 1-31 Port Adapter Slot Numbering—Cisco 7204VXR



1	Blank port adapter	4	Port adapter slot 3
2	Port adapter slot 4	5	Port adapter slot 1
3	Port adapter slot 2	6	Port adapter slot 0 (Reserved for the Fast Ethernet port on the I/O controller. With the NPE-G1 or NPE-G2 and the Port Adapter Jacket Card installed, the slot becomes port adapter slot 5.)

Figure 1-32 Port Adapter Slot Numbering—Cisco 7206VXR

1	Blank port adapter	5	Port adapter slot 5
2	Port adapter slot 6	6	Port adapter slot 3
3	Port adapter slot 4	7	Port adapter slot 1
4	Port adapter slot 2	8	Port adapter slot 0 (Reserved for the Fast Ethernet port on the I/O controller. With the NPE-G1 or NPE-G2 and the Port Adapter Jacket Card installed, the slot becomes port adapter slot 7.)

The Media Access Control (MAC) address or hardware address is a standardized data link layer address that is required for certain network interface types. These addresses are not used by other devices in the network; they are specific and unique to each port. The Cisco 7200 VXR routers use a specific method to assign and control the MAC addresses of its port adapters. For a description of the MAC address, see the “MAC Address” section on page 1-57.

Port adapter slots maintain the same slot number regardless of whether other port adapters are installed or removed. However, when you move a port adapter to a different slot, the port adapter slot number changes to reflect the new slot number.

You can identify port adapter slots by using software commands. To display information about all port adapter slots, use the **show interfaces** command. To display information about a specific port adapter slot, use the **show interfaces** command with the port adapter type and slot number in the format **show interfaces port-adapter-type slot-number/port-number**. If you abbreviate the command (**sh int**) and do not specify port adapter type and slot number (or arguments), the system interprets the command as **show interfaces** and displays the status of all port adapters and ports.

To identify port adapter slots and the Port Adapter Jacket Card and to obtain information about the port adapters, use the **show diag** command.

The following example shows how the **show interfaces** command, used without arguments, displays status information (including the physical port adapter number) for each port adapter in a Cisco 7206VXR.

In the following example, most of the status information for each interface is omitted.

Router# **show interfaces**

```
FastEthernet0/0 is administratively down, line protocol is down
  Hardware is i82543 (Livengood), address is 0000.0000.0000 (bia 0000.0000.0000)
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
    reliability 255/255, txload 1/255, rxload 1/255

(display text omitted)

FastEthernet0/1 is administratively down, line protocol is down
  Hardware is i82543 (Livengood), address is 0000.0000.0000 (bia 0000.0000.0000)
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
    reliability 255/255, txload 1/255, rxload 1/255

(display text omitted)

GigabitEthernet0/1 is up, line protocol is up
  Hardware is BCM-12500 Internal MAC, address is 0000.0000.0000 (bia 0000.0000.0000)
  Internet address is 00.00.00.00/00
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
    reliability 255/255, txload 2/255, rxload 2/255

(display text omitted)

GigabitEthernet0/2 is up, line protocol is up
  Hardware is BCM-12500 Internal MAC, address is 0000.0000.0000 (bia 0000.0000.0000)
  Internet address is 00.00.00.00/00
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
    reliability 255/255, txload 2/255, rxload 2/255

(display text omitted)

GigabitEthernet0/3 is administratively down, line protocol is down
  Hardware is BCM-12500 Internal MAC, address is 0000.0000.0000 (bia 0000.0000.0000)
  Internet address is 00.00.00.00/00
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
    reliability 255/255, txload 1/255, rxload 1/255

(display text omitted)

FastEthernet2/0 is administratively down, line protocol is down
  Hardware is i82543 (Livengood), address is 0000.0000.0000 (bia 0000.0000.0000)
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
    reliability 255/255, txload 1/255, rxload 1/255

(display text omitted)

FastEthernet2/1 is administratively down, line protocol is down
  Hardware is i82543 (Livengood), address is 0000.0000.0000 (bia 0000.0000.0000)
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
    reliability 255/255, txload 1/255, rxload 1/255

(display text omitted)

FastEthernet5/0 is up, line protocol is up
  Hardware is DEC21140, address is 0000.0000.0000 (bia 0000.0000.0000)
  Internet address is 00.00.00.00/00
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
    reliability 255/255, txload 1/255, rxload 1/255
```

You can also use arguments such as the interface type (Ethernet, Token Ring, ATM, and so forth) and the port address (*slot-number/port-number*) to display information about a specific interface only.

The following example shows the display for the first port on the Fast Ethernet port adapter in port adapter slot 5:

```
Router# show interface fastethernet 5/0

FastEthernet5/0 is up, line protocol is up
  Hardware is DEC21140, address is 0000.000.0000 (bia 0000.0000.0000)
  Internet address is 0.0.0.0
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive not set
  Full-duplex, 100Mb/s, 100BaseTX/FX
  ARP type:ARPA, ARP Timeout 04:00:00
  (display text omitted)
```

For complete descriptions and instructions of the commands used to configure your Cisco 7200 VXR router, refer to the *Configuration Fundamentals Configuration Guide* and *Configuration Fundamentals Command Reference* publications, which are available on Cisco.com or the Documentation DVD.

MAC Address

All LAN interfaces (ports) require unique MAC addresses, also known as *hardware addresses*. Typically, the MAC address of an interface is stored on a memory component that resides directly on the interface circuitry; however, the OIR feature requires a different method. (For a description of OIR, see the [“Online Insertion and Removal” section on page 1-57.](#))

Using OIR, you can remove a port adapter and replace it with another identically configured one. If the new port adapter matches the port adapter you removed, the system immediately brings it online. In order to enable OIR, an address allocator with unique MAC addresses is stored in an EPROM on the router midplane. Each address is reserved for a specific port and slot in the router regardless of whether a port adapter resides in that slot. The MAC addresses are assigned to the slots in sequence. The first address is assigned to slot 0, and the last address is assigned to slot 4 in the Cisco 7204VXR or to slot 6 in the Cisco 7206VXR. Using this address scheme, you can remove port adapters and insert them into other routers without causing the MAC addresses to move around the network or be assigned to multiple devices.

Note that if the MAC addresses were stored on each port adapter, OIR would not function because you could never replace one port adapter with an identical one; the MAC addresses would always be different. Also, each time a port adapter was replaced, other devices on the network would have to update their data structures with the new address. If the other devices did not update quickly enough, the same MAC address could appear in more than one device at the same time.



Note

Storing the MAC addresses for every slot in one central location means the addresses stay with the memory device on which they are stored.

Online Insertion and Removal

All port adapters and service adapters in the Cisco 7200 VXR routers support online insertion and removal (OIR). However, it is wise to shut down the interface before removing a port adapter that has active traffic moving through it. Removing a port adapter while traffic is flowing through the ports can cause system disruption. Once the port adapter is inserted, the ports can be brought back up.

**Note**

The Port Adapter Jacket Card does not support OIR. However, the port adapter installed in the Port Adapter Jacket Card does support OIR.

**Note**

As you disengage the port adapter from the router or switch, online insertion and removal (OIR) administratively shuts down all active interfaces in the port adapter.

OIR allows you to install and replace port adapters and service adapters while the router is operating; you do not need to notify the software or shut down the system power, although you should not run traffic through the port adapter you are removing while it is being removed. OIR is a method that is seamless to end users on the network, maintains all routing information, and preserves sessions.

The following is a functional description of OIR for background information only; for specific procedures for installing and replacing a port adapter or service adapter in a Cisco 7200 VXR router, refer to the online configuration note for each port adapter or service adapter.

**Caution**

The network processing engine or network services engine and the I/O controller are required system components that cannot be removed if the router is operating. Removing the network processing engine or network services engine or the I/O controller while the router is operating causes the router to shut down or crash and might damage or destroy memory files.

Each port adapter or service adapter has a bus connector that connects it to the router midplane. Each midplane connector has a set of tiered pins in three lengths that send specific signals to the system as they make contact with the port adapter or service adapter. The system assesses the signals it receives and the order in which it receives them to determine if a port adapter or service adapter is being removed or inserted into the midplane. From these signals, the system determines whether to reinitialize a new interface or shut down a removed interface. For example, when you insert a port adapter or service adapter, the longest pins make contact with the port adapter or service adapter first, and the shortest pins make contact last. The system recognizes the signals and the sequence in which it receives them.

When you remove or insert a port adapter or service adapter in a Cisco 7200 VXR router, the midplane pins send signals to notify the system, which then performs as follows:

1. Rapidly scans the midplane for configuration changes.
2. Initializes all newly inserted port adapters or service adapters, noting any removed interfaces and placing them in the administratively shutdown state.
3. Brings all previously configured interfaces on the port adapter back to the state they were in when they were removed. Any newly inserted interfaces are put in the administratively shutdown state, as if they were present (but not configured) at boot time. If a similar port adapter type is reinserted into a slot, its ports are configured and brought online up to the port count of the original port adapter. (A service adapter has no configurable ports.)

Environmental Monitoring and Reporting Functions

Environmental monitoring and reporting functions are controlled by the network processing engine or network services engine and allow you to maintain normal system operation by identifying and resolving adverse conditions prior to loss of operation. The environmental monitoring functions constantly monitor the internal chassis air temperature and DC supply voltages and currents. Each power supply monitors its own voltage and temperature and shuts itself down if it detects a critical condition within the power supply. If conditions reach shutdown, the system shuts down to avoid equipment damage from excessive heat. The reporting functions periodically log the values of measured parameters so that you can retrieve them for analysis later, and the reporting functions display warnings on the console if any of the monitored parameters exceed defined thresholds.

Environmental Monitoring

The environmental monitoring functions use four sensors, two on the network processing engine or network services engine and two on the I/O controller, to monitor the temperature of the cooling air as it moves through the chassis.

If the air temperature exceeds a defined threshold, the system controller displays warning messages on the console terminal, and if the temperature exceeds the shutdown threshold, the system controller shuts down the system. The system stores the present parameter measurements for both temperature and DC voltage in NVRAM so you can retrieve them later as a report of the last shutdown parameters.

In addition, the power supplies monitor internal power supply temperatures and voltages. A power supply is either within tolerance (normal) or out of tolerance (critical). If an internal power supply temperature or voltage reaches a critical level, the power supply shuts down without any interaction with the system processor.

The environmental monitoring functions use the following levels of status conditions to monitor the system:

- Normal—All monitored parameters are within normal tolerances.
- Warning—The system has exceeded a specified threshold. The system continues to operate, but operator action is recommended to bring the system back to a normal state.
- Critical—An out-of-tolerance temperature or voltage condition exists. The system continues to operate; however, the system is approaching shutdown. Immediate operator action is required.
- Shutdown—The processor has detected a temperature condition that could result in physical damage to system components and has disabled DC power to all internal components. This condition requires immediate operator action. All DC power remains disabled until you toggle the power switch. Before any shutdown, the system logs the status of monitored parameters in NVRAM so you can retrieve it later to help determine the cause of the problem.
- Power supply shutdown—The power supply detected an internal out-of-tolerance overvoltage, overcurrent, or temperature condition and shut itself down. All DC power remains disabled until you toggle the power switch.

[Table 1-34](#) lists the typical temperature thresholds for the NPE-G2. [Table 1-35](#) lists the typical temperature thresholds for the NPE-G1. [Table 1-36](#) lists the typical temperature thresholds for earlier network processing engines or network services engines, [Table 1-37](#) lists the DC power thresholds for the normal, warning, and critical (power supply-monitored) levels for most Cisco IOS releases, and [Table 1-38](#) lists the DC power thresholds for the normal and critical (power supply-monitored) levels for Cisco IOS Release 12.0(23) and later releases of Cisco IOS Release 12.0.

Table 1-34 NPE-G2 Processor-Monitored Temperature Thresholds

NPE-G2¹	Low Warning	High Warning	Shutdown
NPE inlet	111°F (44°C)	138°F (59°C)	176°F (80°C)
NPE outlet	120°F (49°C)	147°F (64°C)	183°F (84°C)
I/O controller inlet	105°F (41°C)	132°F (56°C)	168°F (76°C)
I/O controller outlet	107°F (42°C)	134°F (57°C)	170°F (77°C)
CPU Die	194°F (90°C)	221°F (105°C)	230°F (110°C)

1. With an I/O controller installed.

Table 1-35 NPE-G1 Processor-Monitored Temperature Thresholds

NPE-G1¹	Low Warning	High Warning	Shutdown
NPE inlet	111°F (44°C)	138°F (59°C)	176°F (80°C)
NPE outlet	120°F (49°C)	147°F (64°C)	183°F (84°C)
I/O controller inlet	105°F (41°C)	132°F (56°C)	168°F (76°C)
I/O controller outlet	107°F (42°C)	134°F (57°C)	170°F (77°C)

1. With an I/O controller installed.

Table 1-36 Typical Processor-Monitored Temperature Thresholds

Parameter	High Warning	High Critical	Shutdown
NPE-175, NPE-225, NPE-300, NPE-400, NSE-1			
Chassis inlet	104°F (40°C)	122°F (50°C)	—
Chassis outlet 1	109°F (43°C)	127°F (53°C)	136°F (58°C)
Chassis outlet 2	109°F (43°C)	127°F (53°C)	—
Chassis outlet 3	122°F (50°C)	140°F (60°C)	149°F (65°C)
NPE-100 or NPE-200			
Chassis inlet	104°F (40°C)	122°F (50°C)	—
Chassis outlet 1	109°F (43°C)	127°F (53°C)	136°F (58°C)
Chassis outlet 2	167°F (75°C)	167°F (75°C)	—
Chassis outlet 3	122°F (50°C)	140°F (60°C)	149°F (65°C)
NPE-150			
Chassis inlet	104°F (40°C)	122°F (50°C)	—
Chassis outlet 1	109°F (43°C)	127°F (53°C)	136°F (58°C)
Chassis outlet 2	167°F (75°C)	167°F (75°C)	—
Chassis outlet 3	131°F (55°C)	149°F (65°C)	158°F (70°C)

Table 1-37 Typical Power Supply-Monitored DC-Voltage Thresholds

Parameter	Low Critical	Low Warning	High Warning	High Critical
+3.45V	+3.26V	+3.34V	+3.55V	+3.63V
+5.15V	+4.86V	+4.99V	+5.31V	+5.43V
+12.15V	+11.39V	+11.67	+12.62V	+12.91V
-11.95V	-9.52V	-10.73	-13.16V	-14.38V

**Note**

A low warning or high warning message does not mean that the router is at risk of malfunctioning or being damaged.

The low warning and high warning ranges in [Table 1-34](#) and [Table 1-35](#) are informational. If a low warning or high warning message appears, the warning message does *not* signify that an error or hazard is occurring. A high warning message sometimes appears in a lightly loaded chassis, especially if the router is running without port adapters or with dual power supplies. Adding current load to the router may remove the warning; this can be achieved easily by installing one or more port adapters.

Below are sample high warning messages from chassis with 3V and 5V power supplies:

```
Router (boot) #
00:00:44:%ENVN-4-ENVWARN:+3.45 V measured at +3.57
```

```
Router (boot) #
00:04:49:%ENVN-4-ENVWARN:+5.15 V measured at +5.33
```

**Note**

Low critical or high critical warning messages should be addressed immediately through the normal field support procedures.

Table 1-38 Typical Power Supply-Monitored DC-Voltage Thresholds—For Cisco IOS Release 12.0(23), Cisco IOS Release 12.3(8), and Later Releases of Each

Parameter	Low Critical	High Critical
+3.45V	+3.18V	+3.72V
+5.15V	+4.80V	+5.49V
+12.15V	+11.29V	+13.00V
-11.95V	-9.52V	-14.38V

**Note**

The low warning and high warning messages are no longer in existence beginning with Cisco IOS Release 12.0(23) and Cisco IOS Release 12.3(8).

Below are sample high critical messages from chassis with 3V and 5V power supplies in Cisco IOS Release 12.0(23):

```
Router (boot) #
00:02:47:%ENVM-2-ENVCRIT:+3.45 V measured at +3.72
```

```
Router (boot) #
00:06:51:%ENVM-2-ENVCRIT:+5.15 V measured at +5.49
```

Reporting Functions

The Cisco 7200 VXR routers display warning messages on the console if chassis interface-monitored parameters exceed a desired threshold. You can also retrieve and display environmental status reports with the **show environment**, **show environment all**, **show environment last**, and **show environment table** commands. Parameters are measured and reporting functions are updated every 60 seconds. A brief description of each of these commands follows.



Caution

To prevent overheating the chassis, ensure that your system is drawing cool inlet air. Overtemperature conditions can occur if the system is drawing in the exhaust air of other equipment. Ensure adequate clearance around the sides of the chassis so that cooling air can flow through the chassis interior unimpeded and exhaust air exits the chassis and is not drawn into the inlet vent of another device.



Note

Also see the *NPE-G2 Support for the show environment Command* document for information about changes to the output of the **show environment** command with the NPE-G2.

The **show environment** command displays reports of the current environmental system status. The report displays parameters that are out of the normal values. No parameters are displayed if the system status is normal. The example that follows shows the display for a system in which all monitored parameters are within normal range:

```
Router# show environment

All measured values are normal
```

If the environmental status is *not* normal, the system reports the worst-case status level. Following is a sample overvoltage warning:

```
Router# show environment

Warning: +3.45 V measured at +3.83 V
```

The **show environment last** command retrieves and displays the NVRAM log, which shows the reason for the last system shutdown (if the shutdown was related to voltage or temperature) and the environmental status at that time. Air temperature is measured and displayed, and the DC voltage supplied by the power supply is also displayed.

Following is sample output of the **show environment last** command:

```
NPE300(boot)# show environment last
chassis inlet           previously measured at 26C/78F
  chassis outlet 1      previously measured at 28C/82F
  chassis outlet 2      previously measured at 29C/84F
  chassis outlet 3      previously measured at 33C/91F
+3.45 V                 previously measured at +3.46
+5.15 V                 previously measured at +5.23
+12.15 V                previously measured at +12.24
-11.95 V                previously measured at -11.81
last shutdown reason - power supply shutdown
```

The **show environment table** command displays the temperature and voltage thresholds for each temperature sensor and for each monitored status level. These thresholds are related to those listed in [Table 1-36](#) and [Table 1-38](#). The display also lists the shutdown threshold for the system.

Following is sample output of the **show environment table** command for a Cisco 7206VXR that has an installed NPE-300:

```
NPE300(boot)# show environment table
```

Sample Point	LowCritical	LowWarning	HighWarning	HighCritical
chassis inlet			40C/104F	50C/122F
chassis outlet 1			43C/109F	53C/127F
chassis outlet 2			75C/167F	75C/167F
chassis outlet 3			50C/122F	60C/140F
+3.45 V	+3.26	+3.34	+3.55	+3.63
+5.15 V	+4.86	+4.99	+5.31	+5.43
+12.15 V	+11.39	+11.67	+12.62	+12.91
-11.95 V	-9.52	-10.73	-13.16	-14.38

```

System shutdown for chassis inlet is 75C/167F
System shutdown for chassis outlet 1 is 58C/136F
System shutdown for chassis outlet 2 is 75C/167F
System shutdown for chassis outlet 3 is 65C/149F
```



Note

Temperature ranges and values are subject to change.

The **show environment all** command displays an extended report that includes temperature readings and voltage readings. The **show environment all** command also displays a report showing which power supply slots are occupied and which are empty.

Following is sample output of the **show environment all** command:

```
NPE300 (boot) # show environment all

Power Supplies:
  Power Supply 1 is empty.
  Power Supply 2 is Zytex AC Power Supply. Unit is on.

Temperature readings:
  chassis inlet      measured at 26C/78F
  chassis outlet 1 measured at 28C/82F
  chassis outlet 2 measured at 29C/84F
  chassis outlet 3 measured at 33C/91F

Voltage readings:
  +3.45 V           measured at +3.46 V
  +5.15 V           measured at +5.25 V
  +12.15 V          measured at +12.24 V
  -11.95 V          measured at -11.81 V

Envrm stats saved 138 time(s) since reload
```

Fan Failures

When the system power is on, all three fans should be operational. The system continues to operate if a fan fails; however, if the air temperature exceeds a defined threshold, the system controller displays warning messages on the console terminal, and if the temperature exceeds the shutdown threshold, the system controller shuts down the system.

If the system does shut down because the temperature exceeded the shutdown threshold, the system displays the following message on the console screen and in the environment display when the system restarts:

```
Queued messages:
%ENVVM-1-SHUTDOWN: Environmental Monitor initiated shutdown
```

For complete descriptions and instructions for the environmental monitor commands, refer to the *Configuration Fundamentals Configuration Guide* and *Configuration Fundamentals Command Reference* publications, which are available on Cisco.com or the Documentation DVD.



CHAPTER 2

Preparing for Installation

Before installing your Cisco 7200 VXR router, you should consider the power and cabling requirements that must be in place at your installation site, the equipment you need to install the router, and the environmental conditions your installation site must meet to maintain normal operation. This chapter guides you through the process of preparing for your router installation.

The chapter contains the following sections:

- [Tools and Parts Required, page 2-1](#)
- [Electrical Equipment Guidelines, page 2-2](#)
- [Preventing Electrostatic Discharge Damage, page 2-2](#)
- [Site Requirement Guidelines, page 2-3](#)
- [Initial Configuration Information, page 2-9](#)
- [Cisco 7200 VXR Router Installation Checklist, page 2-10](#)
- [Checking the Shipping Container Contents, page 2-12](#)
- [Site Log, page 2-13](#)



Warning

Before you install, operate, or service the system, read the *Regulatory Compliance and Safety Information for Cisco 7200 Series Routers* publication. This document provides important safety information you should know before working with the system. Statement 200

Tools and Parts Required

Your Cisco 7200 VXR chassis is fully assembled at the factory; no assembly is required. However, you need the following tools and equipment to install the chassis and the rack-mount and cable-management kit:

- Number 2 Phillips screwdriver
- A 3/16-inch flat-blade screwdriver
- A 1/4-inch flat-blade screwdriver
- Tape measure (optional)
- Level (optional)

The rack-mount and cable-management kit includes the following parts:

- Two rack-mount brackets for mounting the chassis in the rack

- Four M4 x 8-mm Phillips flathead screws to secure the rack-mount brackets to the chassis
- Six 10-32 x 3/8-inch slotted binderhead screws to secure the rack-mount brackets to the rack rails
- Two cable-management brackets to relieve the strain on installed port adapter interface cables
- Four M4 x 8-mm Phillips flathead screws to secure the cable-management brackets to the chassis or the rack-mount brackets
- Two cable-management brackets for the NPE-G1 or NPE-G2

In addition, you might need the following external equipment:

- One optical cable-management bracket for the NPE-G1 or NPE-G2
- One RJ-45 cable to connect to the Fast Ethernet Management Port on the NPE-G2
- Data service unit (DSU) to connect each serial port to an external network
- One serial port adapter cable for each serial port to connect the port with the remote device or network
- T1 channel service unit/data service unit (CSU/DSU) that converts the High-Level Data Link Control (HDLC) synchronous serial data stream into a T1 data stream with the correct framing and ones density to connect a serial port to a T1 network. (Some telephone systems require a minimum number of 1 bits per time unit in a data stream, called *ones density*.) Several T1 CSU/DSU devices are available as additional equipment, and most provide either a V.35, EIA/TIA-449, or EIA-530 electrical interface.
- Ethernet transceiver
- Token Ring multistation access unit (MSAU)

Electrical Equipment Guidelines

The port adapters and power supplies are designed to be removed and replaced while the system is operating without presenting an electrical hazard or damage to the system. However, you *must* power down the system before removing or replacing the I/O controller, Port Adapter Jacket Card, and network services engine (NSE) or network processing engine (NPE).



Caution

Always tighten the captive installation screws on the network processing engine or network services engine and I/O controller. These screws prevent accidental removal, provide proper grounding for the system, and help ensure that the bus connectors are properly seated in the midplane.

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) damage, which occurs when electronic cards or components are improperly handled, can result in complete or intermittent system failures. The network processing engine or network services engine, I/O controller, and each port adapter consists of a printed circuit board that is fixed in a metal carrier. Electromagnetic interference (EMI) shielding, connectors, and a handle are integral components of the carrier. Although the carrier helps protect the boards, use an antistatic strap whenever handling the network processing engine or network services engine, I/O controller, and port adapters. Handle the carriers by the handle and the carrier edges only; never touch the boards or connector pins.

Site Requirement Guidelines

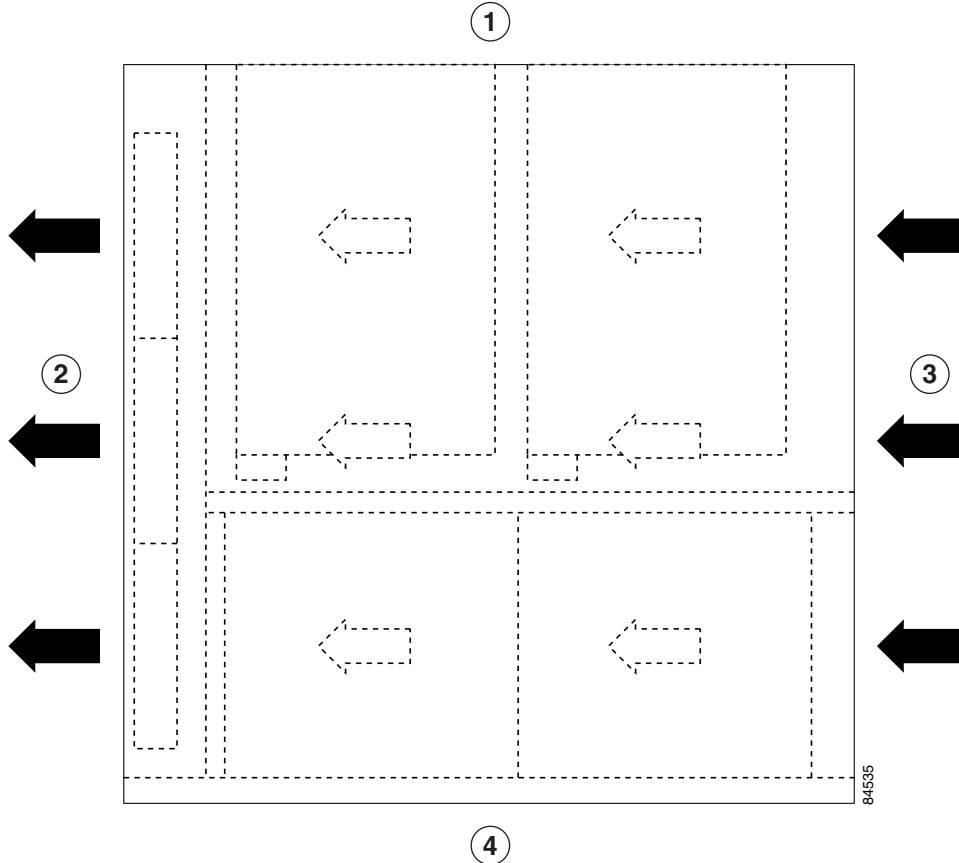
The environmental monitoring functionality in the Cisco 7200 VXR routers protects the system and components from potential damage from overvoltage and overtemperature conditions. To ensure normal operation and avoid unnecessary maintenance, plan your site configuration and prepare your site *before* installation. After installation, make sure the site maintains an ambient temperature of 32°F through 104°F (0°C through 40°C), and keep the area around the chassis as free from dust as is practical.

Planning a proper location for the Cisco 7200 VXR router and the layout of your equipment rack or wiring closet is essential for successful system operation. Equipment placed too close together or inadequately ventilated can cause system overtemperature conditions. In addition, chassis panels made inaccessible by poor equipment placement can make system maintenance difficult. Following are precautions that can help avoid problems during installation and ongoing operation.

When you plan the location and layout of your equipment rack or wiring closet, you need to consider how air flows through your router. The Cisco 7200 VXR routers draw cooling air in through the intake vent on the right side of the chassis (when you view the router from the front), and move the air across the internal components and out the exhaust vent on the left side of the chassis.

Temperature sensors on the network processing engine or network services engine and I/O controller monitor the internal air temperature and send warning messages when the internal air temperature approaches a specified threshold. If the internal temperature exceeds the specified threshold, the system environmental monitor shuts down all internal power to prevent equipment damage from excessive heat. (See the [“Environmental Monitoring and Reporting Functions”](#) section on page 1-59 for temperature threshold information.)

[Figure 2-1](#) shows the airflow through the router.

Figure 2-1 Internal Airflow—Top View

1	Chassis rear (power supply)	3	Inlet airflow
2	Exhaust air	4	Chassis front (port adapters)

The left and right sides of the chassis must remain unobstructed to ensure adequate air flow and prevent overheating inside the chassis; we recommend at least 3 in. (7.62 cm) of clearance.

Follow these general precautions when planning your equipment locations and connections:

- Use the **show environment** command regularly to check the internal system status. The environmental monitor continually checks the interior chassis environment; it provides warnings for high temperature and maximum and minimum voltages and creates reports on any occurrences. If warning messages are displayed, take immediate action to identify the cause and correct the problem.
- We recommend keeping Cisco 7200 VXR routers off the floor and out of any area that tends to collect dust.
- Follow ESD prevention procedures to avoid damage to equipment. Damage from static discharge can cause immediate or intermittent equipment failure.
- Ensure that the network processing engine or network services engine, I/O controller, port adapters, any blank port adapters, Port Adapter Jacket Card, power supplies, and any power supply filler plates are in place and secure. The fans direct cooling air throughout the chassis interior; a loose component or empty slot can redirect the air flow away from active components.

The following sections address the site environment requirements for the Cisco 7200 VXR routers.

Rack-Mounting Guidelines

Before installing the Cisco 7200 VXR router in a rack, read the “Site Preparation and Safety” section of the *Regulatory Compliance and Safety Information for Cisco 7200 Series Routers* to familiarize yourself with proper site and environmental conditions. Failure to read and follow the guidelines could lead to an unsuccessful installation and possible damage to the router and components.

The rack-mounting hardware included with Cisco 7200 VXR routers is suitable for most 19-inch equipment racks and two-post racks. To easily access FRUs while the router is installed in a rack, make certain you have access to the front and rear of the router.

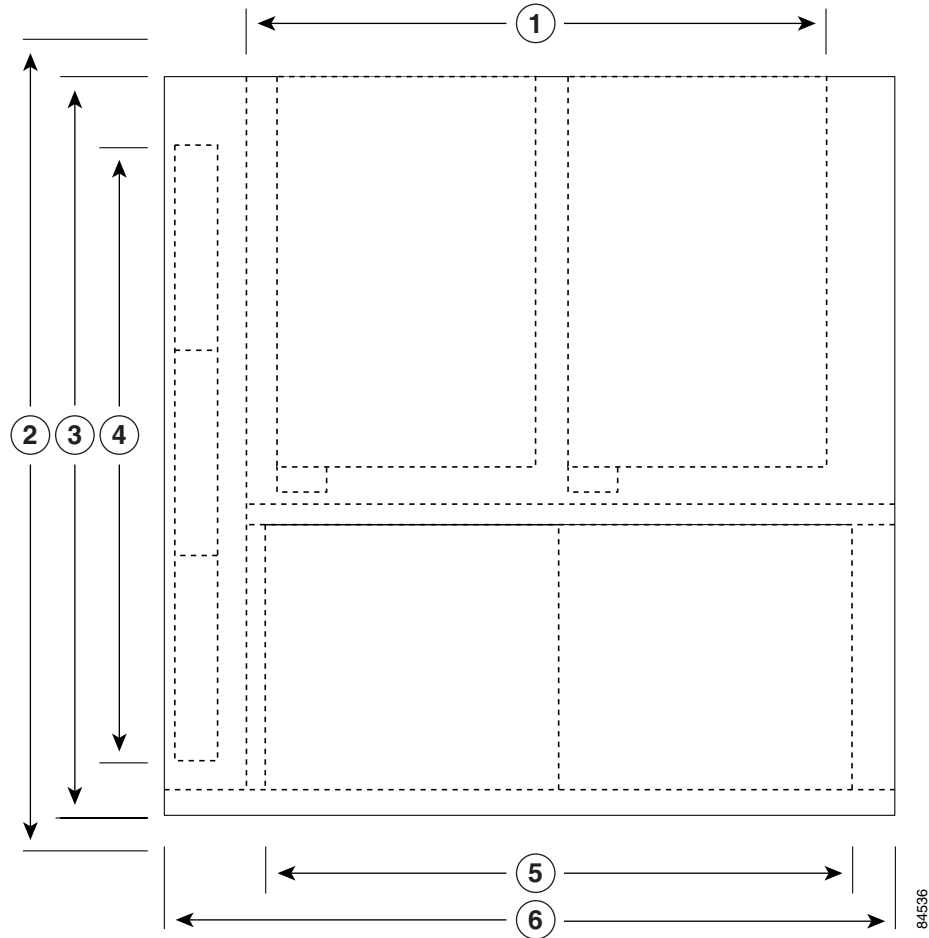
Before using a particular rack, check for obstructions (such as a power strip) that could impair rack-mount installation. If a power strip does impair a rear rack-mount installation, remove the power strip before installing a Cisco 7200 VXR router in the rack, and then replace it after the chassis is installed. As an alternative, you can mount a Cisco 7200 VXR router on an equipment shelf provided that the rack dimensions allow you to secure the router to the shelf, and the overall configuration permits safe installation and access. However, we recommend rack-mounting Cisco 7200 VXR routers.

[Figure 2-2](#) shows the Cisco 7200 VXR router footprint and outer dimensions.

To use the rack-mounting hardware provided with the Cisco 7200 VXR routers, consider the following guidelines:

- To mount the router between two posts or rails using the brackets, the inner clearance (the width between the *inner* sides of the two posts or rails) must be at least 17.00 inches (43.18 cm).
- The height of the chassis is 5.25 inches (13.34 cm).
- When mounting the router in either four-post or two-post racks, be sure to use all the screws and the brackets provided to secure the chassis to the rack posts.

Figure 2-2 Cisco 7200 VXR Router Footprint and Outer Dimensions



1	Network processing engine width 13.8 in. (35.05 cm)	4	Fan tray depth 15.81 in. (40.16 cm)
2	Chassis depth (including cable service loop and port adapter cables) 26 in. (66.04 cm)	5	Card cage and I/O controller width 13.5 in. (34.29 cm)
3	chassis depth 17.0 in. (43.18 cm)	6	Chassis width 16.8 in. (42.67 cm).

When planning your rack installation, consider the following guidelines:

- If you plan to use an equipment shelf, ensure that the shelf is constructed to support the weight and dimensions of the chassis. [Figure 2-2](#) shows the chassis footprint, which you need if you are designing a customized shelf. We recommend that you use the rack-mount kit designed for Cisco 7200 VXR routers.



Caution

To prevent chassis overheating, never install the Cisco 7200 VXR in an enclosed rack or room that is not properly ventilated or air-conditioned.

- Allow sufficient clearance around the rack for maintenance. If the rack is mobile, you can push it back near a wall or cabinet for normal operation and pull it out for maintenance (installing or moving port adapters, connecting cables, or replacing or upgrading components). Otherwise, allow 19 inches (48.3 cm) of clearance to remove Cisco 7200 VXR FRUs.
- If you are planning to install the cable-management brackets on a Cisco 7200 VXR router that you are rack-mounting from the front, you *must* install the cable-management brackets and the rack-mount brackets *before* you install the chassis in the rack.
- Provide an adequate chassis ground (earth) connection for your router chassis.



Note

We strongly recommend that you provide a chassis ground connection. See the [“Attaching a Chassis Ground Connection”](#) section on page 3-17 in [Chapter 3, “Installing a Cisco 7200 VXR Router”](#) for instructions.

To properly install a Cisco 7200 VXR chassis in a rack, see the instructions in the [“Rack-Mounting a Cisco 7200 VXR Router”](#) section on page 3-2 in [Chapter 3, “Installing a Cisco 7200 VXR Router.”](#)

Temperature and Humidity Requirements

[Table 2-1](#) lists the operating and nonoperating environmental site requirements. The ranges listed are those within which the Cisco 7200 VXR routers continue to operate; however, a measurement that is approaching the minimum or maximum of a range indicates a potential problem. You can maintain normal operation by anticipating and correcting environmental anomalies before they approach a maximum operating range.

Table 2-1 Specifications for Operating and Nonoperating Environments

Specification	Minimum	Maximum
Temperature, ambient operating	32°F (0°C)	104°F (40°C)
Temperature, ambient nonoperating and storage	–4°F (–20°C)	149°F (65°C)
Humidity, ambient (noncondensing) operating	10%	90%
Humidity, ambient (noncondensing) nonoperating and storage	5%	95%
Altitude, operating, and nonoperating	Sea level	6,500 ft. (2000 m)
Vibration, operating	5–200 Hz, 0.5 g (1 octet/min.)	—
Vibration, nonoperating	5–200 Hz, 1 g (1 octet/min.) 200–500 Hz, 2 g (1 octet/min.)	—

Power Connection Guidelines

Follow these precautions and recommendations when planning power connections to a Cisco 7200 VXR router:

- Check the power at your site before installation and periodically after installation to ensure that you are receiving clean power. Install a power conditioner if necessary.
- Install proper grounding to avoid damage from lightning and power surges.

**Note**

The Cisco 7200 VXR router installation must comply with all applicable codes and is approved for use with copper conductors only. The ground bond fastening hardware should be of compatible material and preclude loosening, deterioration, and electrochemical corrosion of hardware and joined material.

Attachment of the chassis ground to a central office or other interior ground system should be made with a 6-AWG, copper ground conductor at a minimum.

The Cisco 7200 VXR chassis employs two threaded M5 chassis grounding receptacles, located on the rear of the chassis, which are intended to be bonded directly to the central offices or other interior ground system. The chassis ground requires M5 screws and locking hardware, which are not included. (For instructions on how to properly ground the chassis, see the [“Attaching a Chassis Ground Connection” section on page 3-17 in Chapter 3, “Installing a Cisco 7200 VXR Router.”](#))

Plant Wiring Guidelines

Following are guidelines for setting up the plant wiring and cabling at your site. When planning the location of the new system, consider the distance limitations for signaling, EMI, and connector compatibility, as described in the following sections.

Interference Considerations

When wires are run for any significant distance in an electromagnetic field, interference can occur between the field and the signals on the wires. This fact has two implications for the construction of plant wiring:

- Bad wiring practice can result in radio interference emanating from the plant wiring.
- Strong EMI, especially when it is caused by lightning or radio transmitters, can destroy the signal drivers and receivers in the Cisco 7200 VXR routers, and can even create an electrical hazard by conducting power surges through lines and into equipment.

**Note**

To predict and remedy strong EMI, you may also need to consult experts in radio frequency interference (RFI).

If you use twisted-pair cable in your plant wiring with a good distribution of grounding conductors, the plant wiring is unlikely to emit radio interference. If you exceed the recommended distances, use a high-quality twisted-pair cable with one ground conductor for each data signal when applicable.

If wires exceed recommended distances, or if wires pass between buildings, give special consideration to the effect of a lightning strike in your vicinity. The electromagnetic pulse caused by lightning or other high-energy phenomena can easily load enough energy into unshielded conductors to destroy electronic devices. If you have had problems of this sort in the past, you may want to consult experts in electrical surge suppression and shielding.

Distance Limitations and Interface Specifications

The size of your networks and the distances between connections depend on the type of signal, the signal speed, and the transmission media (the type of cabling used to transmit the signals). For example, standard coaxial cable has a greater channel capacity than twisted-pair cabling. The distance and rate limits in the following descriptions are the IEEE-recommended maximum speeds and distances for signaling; however, you can usually get good results at speeds and distances far greater than these. For example, the recommended maximum rate for V.35 is 2 Mbps, but it is commonly used at 4 Mbps without any problems. If you understand the electrical problems that might arise and can compensate for them, you should get good results with rates and distances greater than those shown here; however, do so at your own risk.



Note

We recommend that you do not exceed specified transmission rate and distance limits.

When preparing your site for network connections to a Cisco 7200 VXR router, you must consider a number of factors related to each type of interface:

- The type of cabling required for each type (fiber, thick or thin coaxial, shielded twisted-pair, or unshielded twisted-pair cabling)
- Distance limitations for each signal type
- The specific cables you need to connect each interface
- Any additional interface equipment you need, such as transceivers, hubs, switches, modems, channel service units (CSUs), or data service units (DSUs)
- Cable pinouts if you plan to build your cables

The specific interface information you need is contained in the documentation that is shipped with each port adapter. For example, if you need ATM distance limitations and pinouts, refer to the *PA-A3 Enhanced ATM Port Adapter Installation and Configuration* document. This document is online on Cisco.com and on the Documentation DVD.

Before installing a Cisco 7200 VXR router, have all additional external equipment and cables on hand. For ordering information, contact a customer service representative.

Initial Configuration Information

After you install the chassis and verify that all the hardware is operating properly, you must configure the system and individual interfaces before you can connect your system to external networks. You can use the setup facility or standard configuration commands to enter the configuration information.

Before you begin, you should be prepared with global (system-wide) parameters such as host names, passwords, and routing protocols, and configuration information for each interface such as addresses, rates or speeds of operation, routing protocol specifics, and so on.

Following is some of the information you are likely to need, depending on your configuration:

- Host name for the router
- Passwords to prevent unauthorized privileged-level access to the EXEC command interpreter and for individual virtual terminal lines
- Protocols you plan to route
- Bridging configuration (if you plan to use bridging and, if so, on which interfaces)
- Internet Protocol (IP) addresses and subnet masks if you are routing IP
- Zone names, network numbers, or node numbers for the new interfaces if required
- Operating speeds for specific interfaces—for example, Token Ring interfaces operate at either 4 or 16 Mbps, and serial interfaces operate at speeds of up to 2 Mbps. The speed of an interface often depends on the speed of the remote device to which it is attached.

For complete configuration instructions, refer to the *Configuration Fundamentals Configuration Guide* and the *Configuration Fundamentals Command Reference*, which are available on Cisco.com or on the Documentation DVD.

Cisco 7200 VXR Router Installation Checklist

To assist you with your installation and to provide a historical record of what was done by whom, use the Cisco 7200 VXR Router Installation Checklist in [Table 2-2 on page 2-11](#). Make a copy of this checklist and indicate when each procedure or verification is completed. When the checklist is completed, place it in your site log (described at the end of this chapter) along with the other records for your new router.

Table 2-2 Cisco 7200 VXR Router Installation Checklist

Task	Verified By	Date
Date router received		
Router and all accessories unpacked		
Types and numbers of interfaces verified		
Safety recommendations and guidelines reviewed		
Installation Checklist copied		
Site log established and background information entered		
Site power voltages verified		
Site environmental specifications verified		
Required passwords, IP addresses, device names, and so on, available		
Required tools available		
Network connection equipment available		
Router mounted in rack (optional)		
Cable-management brackets installed (optional but recommended)		
AC power cable(s) connected to AC source(s) and router; retention clip secured		
DC power cable(s) connected to DC source(s) and router		
Captive installation screws on I/O controller and network processing engine or network services engine checked		
Network interface cables and devices connected		
ASCII terminal attached to console port		
Console port set for 9600 baud, 8 data bits, no parity, and 2 stop bits (9600 8N2)		
System power turned on (DC OK LED is on)		
System boot complete (I/O controller enabled LED is on)		
I/O controller, network processing engine or network services engine, and all port adapters operational (enabled LEDs on the port adapters and the I/O controller are on)		
Correct hardware configuration displayed after system banner appears		
System ready for global and interface-specific configuration		

Checking the Shipping Container Contents

Once you receive your Cisco 7200 VXR router, use the following procedure to check the contents of the shipping container. Use the [Cisco 7200 VXR Component List](#) in [Table 2-3](#) to ensure you received all the components you ordered.


Note

Do not discard the shipping container. You need the container if you move or ship the Cisco 7200 VXR router in the future.

-
- Step 1** Verify that the following are included in the shipping container (the accessories box might be separate):
- One Cisco 7200 VXR router, fully assembled (except the rack-mount and cable-management kit)
 - One or more accessories boxes (some or all may be shipped separately)
- Step 2** Check the contents of the accessories box against the [Cisco 7200 VXR Component List](#) and the packing slip to verify that you received all listed equipment, which should include the following:
- One modular power cable for each AC-input power supply
 - One rack-mount and cable-management kit (four brackets and 14 mounting screws)
 - Optional equipment that you ordered, such as network interface cables, transceivers, or special connectors
 - Cisco 7200 VXR router hardware and software documentation, if ordered


Note

We no longer ship the entire router documentation set automatically with each system. You must specifically order the documentation as part of the sales order. If you ordered documentation and did not receive it, we will ship the documents to you within 24 hours. To order documents, contact a customer service representative.

-
- Step 3** Verify that the port adapters installed in your Cisco 7200 VXR router match the port adapter types on the packing list.
- Step 4** Proceed to the [“Site Log”](#) section on [page 2-13](#), and then to [Chapter 3, “Installing a Cisco 7200 VXR Router,”](#) to begin the installation.
-

Table 2-3 Cisco 7200 VXR Component List

Component	Description	Received
Chassis	Cisco 7204VXR or Cisco 7206VXR chassis configured with a network processing engine or network services engine, I/O controller, up to two AC or DC power supplies, up to four port adapters for the 4-slot chassis or up to six port adapters for the 6-slot chassis (blank port adapters should be installed in empty port adapter slots), and up to two Flash Disks or PC cards or a CompactFlash Disk.	
Accessories:	The following accessories might arrive in separate shipping containers:	
• Rack-mount and cable-management kit ¹	Two rack-mount brackets, two cable-management brackets, eight M4 x 8-mm Phillips flathead screws, and six 10-32 x 3/8-inch slotted binderhead screws	
• Power cables	Up to two power cables	
• Documentation	If ordered, router hardware and software documentation set and the Cisco Documentation DVD package ²	

1. The NPE-G1 and the NPE-G2 ship with an additional set of cable-management brackets.

2. Titles and quantities of documents will vary. You must order the type and quantity of documentation sets when you order the hardware.

Site Log

A site log provides a historical record of all actions relevant to the Cisco 7200 VXR router operation and maintenance. Keep your site log in a common place near the chassis where anyone who performs tasks has access to it. Site log entries might include the following:

- Installation progress—Make a copy of the Cisco 7200 VXR Router Installation Checklist and insert it into the site log. Make entries on this checklist as each procedure is completed.
- Upgrades, removal, and replacement procedures—Use the site log as a record of system maintenance and expansion history. Each time a procedure is performed on the system, update the site log to reflect the following:
 - Port adapters installed, removed, and replaced
 - I/O controller removed and replaced
 - Network processing engine or network services engine removed and replaced
 - Power supply removed or replaced
 - Chassis replaced
 - Configuration changed; port adapters moved
 - Software upgraded
 - Corrective maintenance procedures performed
 - Intermittent problems
 - Related comments

Table 2-4 Site Log Sample

[illegible]



CHAPTER 3

Installing a Cisco 7200 VXR Router

This chapter explains how to install a Cisco 7200 VXR router. The chapter contains the following sections:

- [Rack-Mounting a Cisco 7200 VXR Router, page 3-2](#)
- [General Tabletop or Workbench Installation, page 3-14](#)
- [Installing the Cable-Management Brackets, page 3-15](#)
- [Attaching a Chassis Ground Connection, page 3-17](#)
- [Connecting Port Adapter Cables, page 3-19](#)
- [Connecting I/O Controller, NPE-G1, or NPE-G2 Cables, page 3-19](#)
- [Connecting Power, page 3-41](#)



Note

For installation and startup procedures for a Cisco 7206VXR as a router shelf in a Cisco AS5800 Universal Access Server, refer to the Cisco AS5800 Universal Access Server publications that shipped with your access server.



Caution

To be installed and maintained by service personnel as defined by AS/NZS 3260. Incorrect connection of this or connected equipment to a General Purpose Outlet could result in a hazardous situation. The telecommunication lines must be disconnected before unplugging the main power connection and while the housing is open.



Warning

Before you install, operate, or service the system, read the “Site Preparation and Safety” section of the *Regulatory Compliance and Safety Information for the Cisco 7200 Series Routers*. This guide contains important safety information you should know before working with the system. Statement 200

A rack-mount and cable-management kit is included in the shipping container. The rack-mount brackets in the kit are for mounting a Cisco 7200 VXR router in standard, 19-inch-wide, four-post equipment racks or two-post equipment racks. The rack-mount brackets are not suitable for use with other racks, such as 23-inch telco racks. The cable-management brackets are designed to relieve the strain on port adapter interface cables that are installed on port adapters in a Cisco 7200 VXR router.

If you are installing an equipment shelf or using mounting hardware other than that supplied with the chassis, review the guidelines in the [“Rack-Mounting Guidelines” section on page 2-5](#) in the chapter [“Preparing for Installation,”](#) and then proceed to the [“General Tabletop or Workbench Installation” section on page 3-14](#).

If you do not plan to install your Cisco 7200 VXR router in an equipment rack, proceed to the [“General Tabletop or Workbench Installation”](#) section on page 3-14.

Rack-Mounting a Cisco 7200 VXR Router

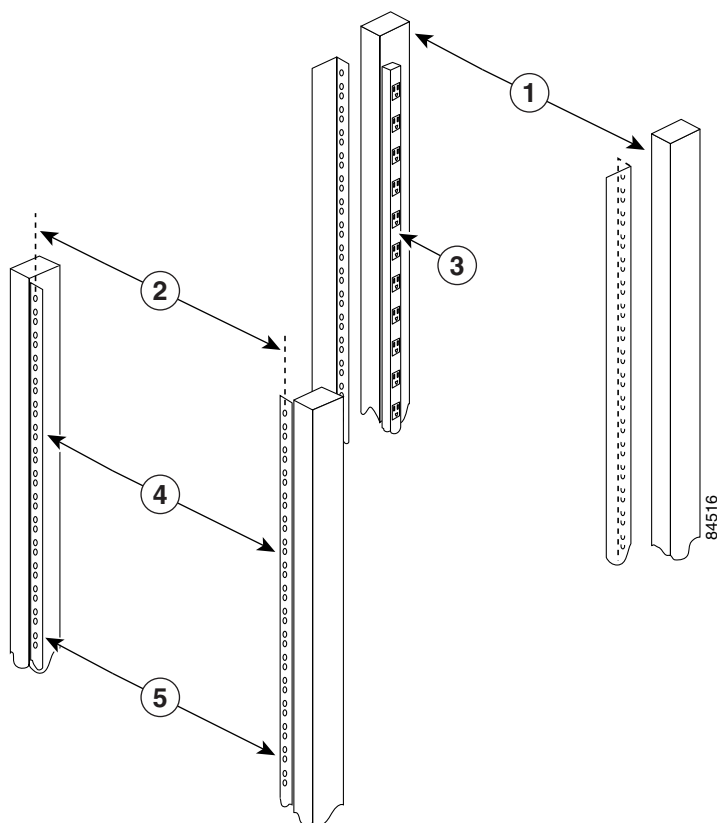
The chassis mounts to two rack posts with brackets that attach to either the front or the rear sides of the chassis. The inside width between the two posts or mounting strips (left and right) must be at least 17.00 inches (43.18 cm).

**Note**

Rack-mounting procedures for the Cisco 7204VXR and the Cisco 7206VXR are identical. Therefore, the illustrations in this section apply to both Cisco 7200 VXR routers.

Some equipment racks provide a power strip along the length of one of the mounting strips. [Figure 3-1](#) shows a typical four-post equipment rack with a power strip along one of the back posts. If your rack has this feature, consider the position of the strip when planning fastener points to ensure that you will be able to pull port adapters and other field replaceable units (FRUs) straight out of their respective slots.

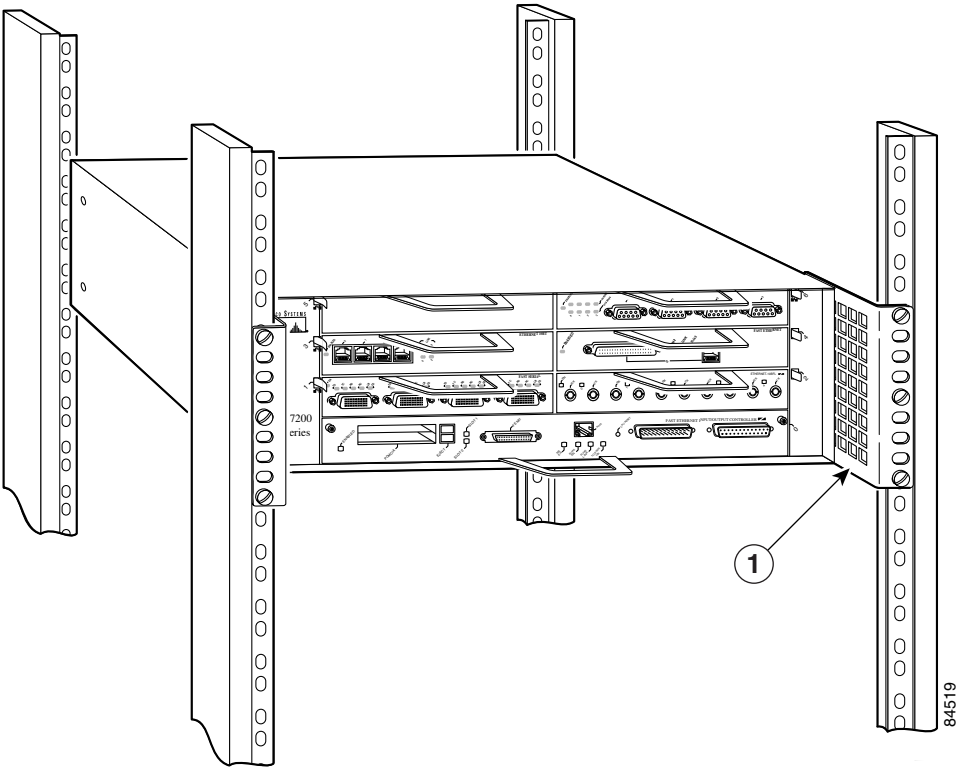
The inlet and exhaust ports for cooling air are located on the right and left of the chassis, respectively, so multiple routers can be stacked in a rack with little or no vertical clearance.

Figure 3-1 Typical Four-Post Equipment Rack Posts and Mounting Strips

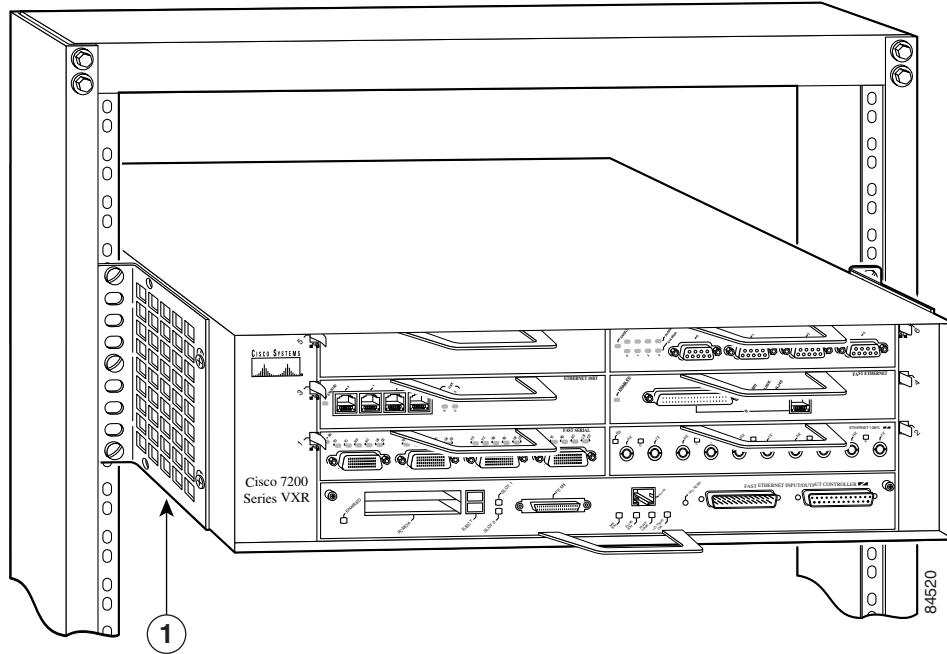
1	Rack posts	4	Mounting strips
2	18.31 in. (46.48 cm) hole center-to-center	5	17.00 in. (43.18 cm) minimum
3	110 VAC outlets		

If you want the port adapter end (the front) of the chassis recessed in the rack, install the rack-mount brackets at the front or rear of the chassis in the orientation shown in [Figure 3-2](#). If you want the front of the chassis protruding from the rack, install the rack-mount brackets at the front or rear of the chassis in the orientation shown in [Figure 3-3](#).

Figure 3-2 Installing the Chassis in a Four-Post Rack—Front Installation Shown



1	Rack-mount bracket		
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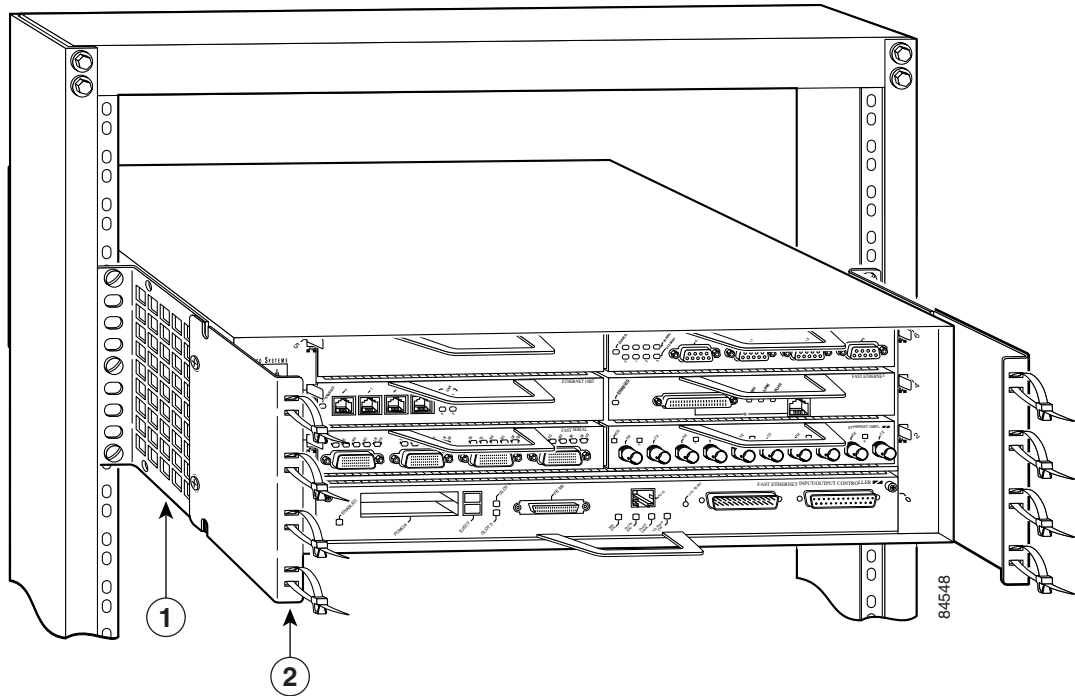
Figure 3-3 Installing the Chassis in a Two-Post Rack—Front Installation Shown

1	Rack-mount bracket
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If you plan to install the cable-management brackets on a Cisco 7200 VXR router that you are rack-mounting, you *must* install the cable-management brackets and the rack-mount brackets on the chassis *before* you install the chassis in the rack.

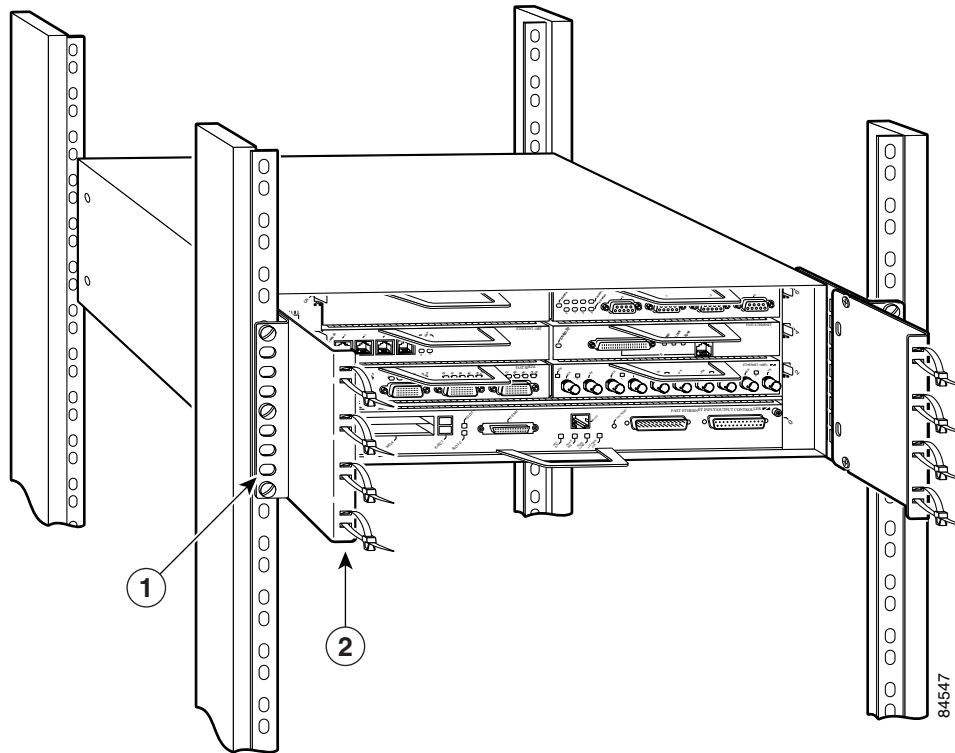
There are two cable-management bracket configurations when you rack-mount a Cisco 7200 VXR router from the front. In the first configuration, the cable-management brackets are installed over the rack-mount brackets, and four screws secure both sets of brackets to the chassis. (See [Figure 3-4](#).) In the second configuration, two screws secure each rack-mount bracket to the chassis, and two additional screws secure each cable-management bracket to a rack-mount bracket. (See [Figure 3-5](#).)

Figure 3-4 *Rack-Mounting the Chassis in a Two-Post Rack with Installed Cable-Management Brackets—Front Installation Shown*



1	Rack-mount bracket	2	Cable-management bracket
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Figure 3-5 *Rack-Mounting the Chassis in a Four-Post Rack with Installed Cable-Management Brackets—Front Installation Shown*



1	Rack-mount bracket	2	Cable-management bracket
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If you are rack-mounting a Cisco 7200 VXR router from the rear, the rack-mount brackets are installed at the rear of the chassis, and the cable-management brackets are installed at the front of the chassis. You must install both sets of brackets *before* you install the chassis in the rack.

Attaching the Chassis Rack-Mount and Cable-Management Brackets

This section explains how to install the rack-mount and cable-management brackets at the front and the rear of a Cisco 7200 VXR router. Before installing the chassis in the rack, you must install a rack-mount bracket on each side of the front or rear of the chassis. If you are rack-mounting the chassis from the front and you plan to use the cable-management brackets, you must install the cable-management brackets when you install the rack-mount brackets on the chassis.

If you are rack-mounting the chassis from the rear, you may install the rack-mount and cable-management brackets separately; however, both sets of brackets must be installed on the chassis before the chassis is installed in the rack.

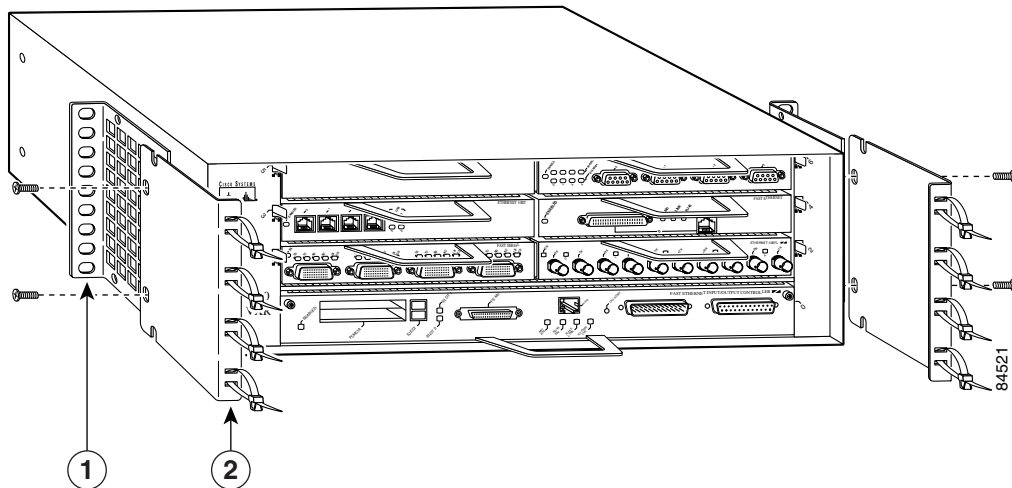
The parts and tools required for installing the rack-mount and cable-management brackets are listed in [Chapter 2, “Preparing for Installation,”](#) the “Tools and Parts Required” section on page 2-1.

Installing the Brackets on the Front of the Chassis

To install the rack-mount and cable-management brackets on a Cisco 7200 VXR router for a front rack-mount configuration, complete the following steps:

- Step 1** Locate the threaded holes in the front sides of the chassis.
- Step 2** If you want the front of the chassis protruding from the rack, align the first rack-mount bracket and the first cable-management bracket to the threaded holes in the right side of the chassis as shown in [Figure 3-6](#).
- Step 3** Thread two M4 x 8-mm Phillips flathead screws through both brackets and into the side of the chassis. Use a number 2 Phillips screwdriver to tighten the screws. (See [Figure 3-6](#).)

Figure 3-6 *Installing the Rack-Mount Brackets on the Front of the Chassis so the Front Protrudes from the Rack*

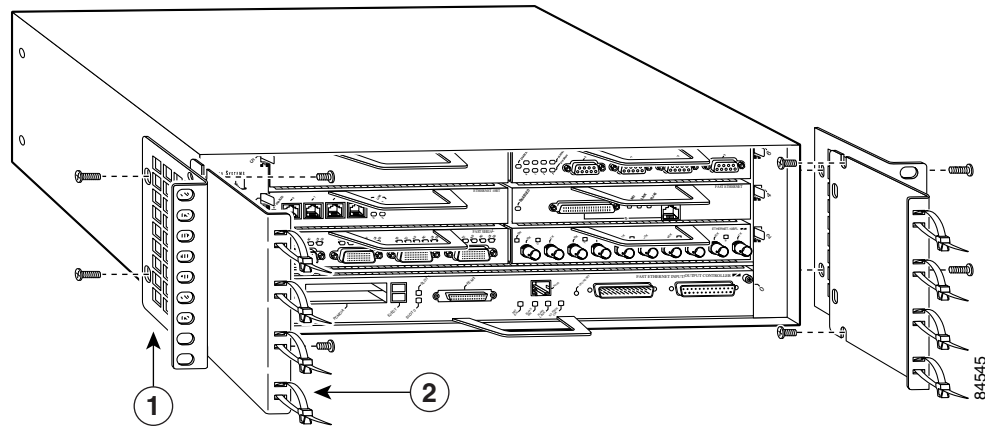


1	Rack-mount bracket	2	Cable-management bracket
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- Step 4** If you want the front of the chassis recessed in the rack, align the first rack-mount bracket to the threaded holes in the right side of the chassis as shown in [Figure 3-7](#).

Thread two M4 x 8-mm Phillips flathead screws through the bracket into the side of the chassis and use a number 2 Phillips screwdriver to tighten the screws. Then align the first cable-management bracket to the rack-mount bracket and thread two M4 x 8-mm Phillips flathead screws through the two brackets. Use a number 2 Phillips screwdriver to tighten the screws. (See [Figure 3-7](#).)

Figure 3-7 *Installing the Rack-Mount Brackets on the Front of the Chassis so the Front Is Recessed in the Rack*



1	Rack-mount bracket	2	Cable-management bracket
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Step 5 Repeat Step 1 through Step 4 for the other rack-mount bracket and cable-management bracket (if required).

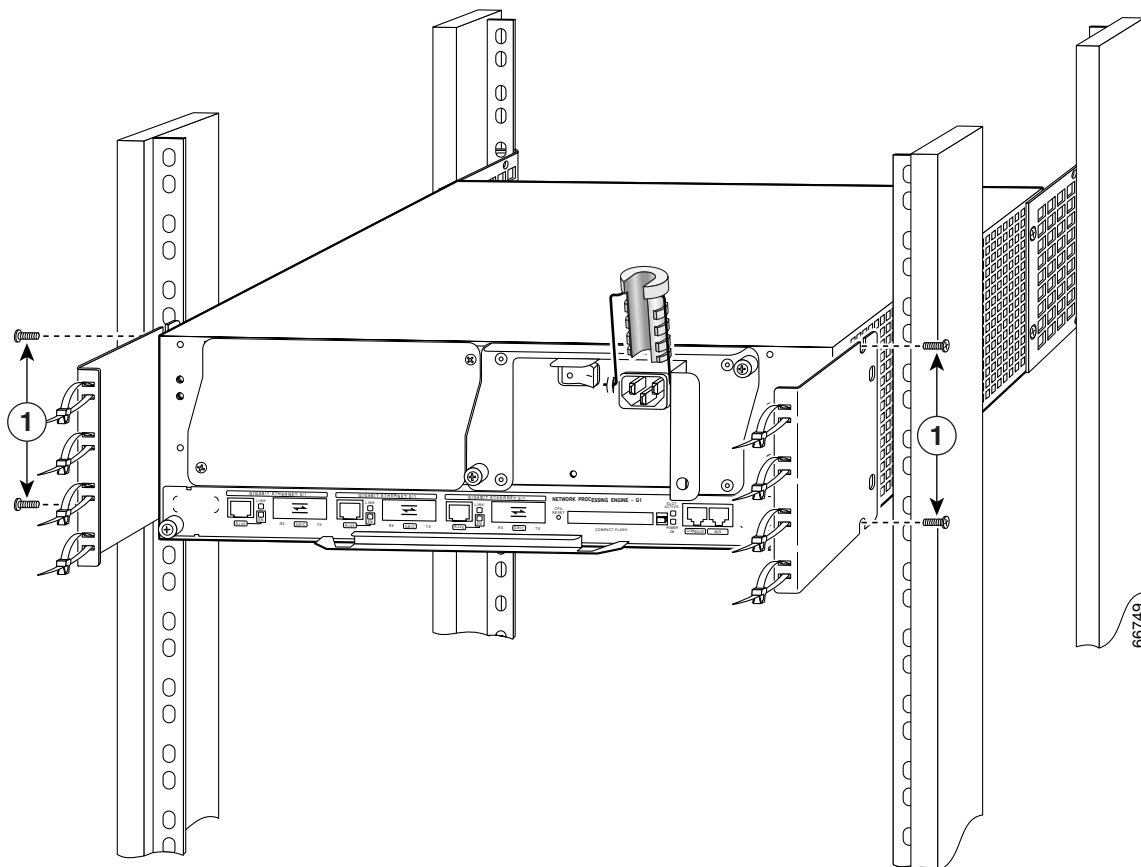
This completes the procedure for installing the rack-mount and cable-management brackets on a Cisco 7200 VXR router for a front rack-mount configuration.

Installing the NPE-G1 and NPE-G2 Cable-Management Brackets on a Front-Mounted Router

You can install Cisco 7200 VXR routers standard cable-management brackets or an optical cable-management bracket on the NPE-G1 or NPE-G2.

- To install the standard cable-management brackets on a Cisco 7200 VXR router with an NPE-G1 or NPE-G2 installed, see the [“Installing the Cable-Management Brackets”](#) section on page 3-15.
- To install the optical cable-management bracket on an NPE-G1 or NPE-G2 in a Cisco 7200 VXR router, see the [“Installing the NPE-G1 and NPE-G2 Optical Cable-Management Bracket”](#) section on page 3-11.

Figure 3-8 *Installing the Standard Rear Cable-Management Brackets with an NPE-G1 or NPE-G2—Router Front-Mounted*



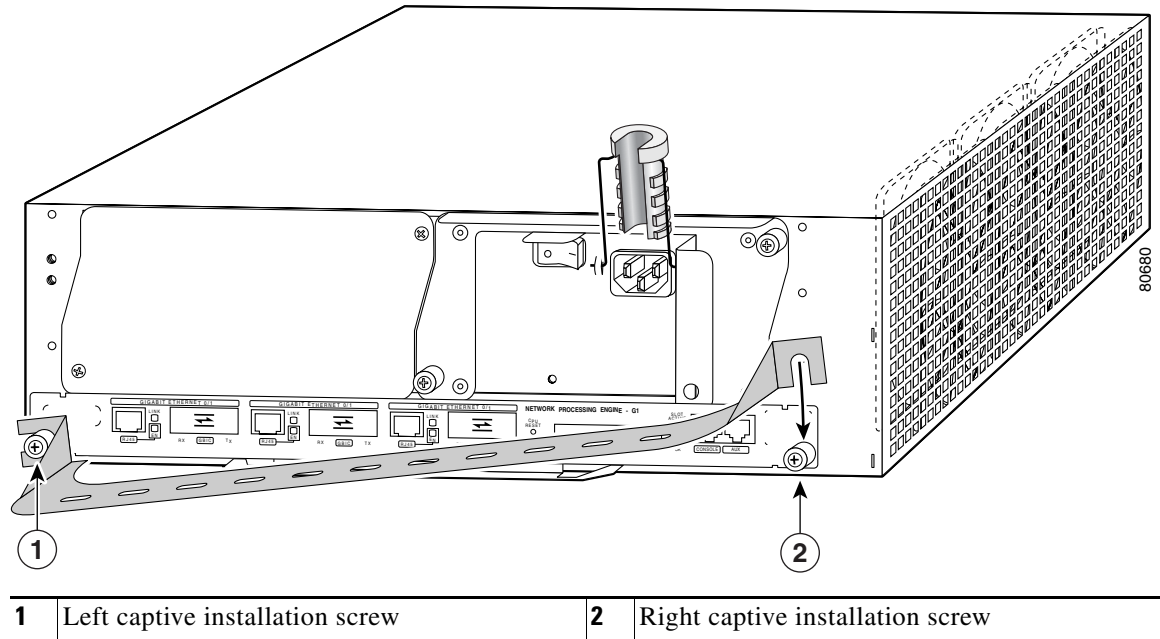
1	Cable-management bracket screws
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If you have an NPE-G1 or NPE-G2 installed, you will want to install standard cable-management brackets on the rear of the router as well as on the front of the router.

-
- Step 1** If the back of the router protrudes from the rack, place the cable-management brackets against the router as shown in [Figure 3-8](#).
- Step 2** Insert two screws into each bracket, and tighten them to the router.
- Step 3** Insert the GBIC cables or RJ-45 cables into the interface ports on the NPE-G1, or the SFP module cables or RJ-45 cables into the interface ports on the NPE-G2.
- Step 4** Place the cables through the cable-management brackets.
-

Installing the NPE-G1 and NPE-G2 Optical Cable-Management Bracket

Figure 3-9 Installing the NPE-G1 and NPE-G2 Optical Cable-Management Bracket



- Step 1** Loosen the left and right captive installation screws.
- Step 2** Hold the cable-management bracket so that it is positioned as shown in [Figure 3-9](#).
- Step 3** Place the left end of the cable-management bracket over the screw.
- Step 4** Rotate the cable-management bracket down, until it slides behind the right captive installation screw.
- Step 5** Tighten both captive installation screws.
- Step 6** Install the cables, and fasten them to the cable-management bracket with the straps provided.

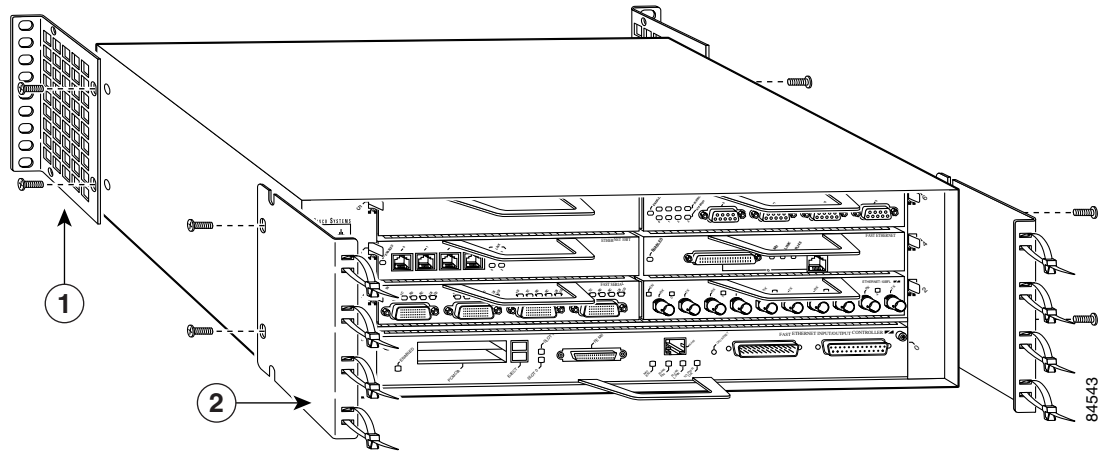
Installing the Brackets on the Rear of the Chassis

To install the rack-mount and cable-management brackets on a Cisco 7200 VXR router for a rear rack-mount configuration, complete the following steps:

- Step 1** Locate the threaded holes in the rear sides of the chassis.
- Step 2** Align the first rack-mount bracket to the threaded holes in the right side of the chassis.

If you want the front of the chassis protruding from the rack, align the rack-mount bracket to the chassis as shown in [Figure 3-10](#). If you want the front of the chassis recessed in the rack, align the rack-mount bracket to the chassis as shown in [Figure 3-11](#).

Figure 3-10 *Installing the Rack-Mount Brackets on the Rear of the Chassis so the Front Protrudes from the Rack*



1	Rack-mount bracket	2	Cable-management bracket
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Figure 3-11 *Installing the Rack-Mount Brackets on the Rear of the Chassis so the Front Is Recessed in the Rack*

1	Rack-mount bracket	2	Cable-management bracket
---	--------------------	---	--------------------------

- Step 3** Thread two M4 x 8-mm Phillips flathead screws through the rack-mount bracket and into the side of the chassis. Use a number 2 Phillips screwdriver to tighten the screws.
- Step 4** Repeat [Step 1](#) through [Step 3](#) for the other rack-mount bracket.
- Step 5** If you plan to include the cable-management brackets in your rear rack-mount configuration, align the first cable-management bracket to the threaded holes in the front side of the chassis. (See [Figure 3-10](#) and [Figure 3-11](#).)
- Step 6** Thread two M4 x 8-mm Phillips flathead screws through the bracket and into the chassis. Use a number 2 Phillips screwdriver to tighten the screws.
- Step 7** Repeat Step 5 and Step 6 for the other cable-management brackets.

**Caution**

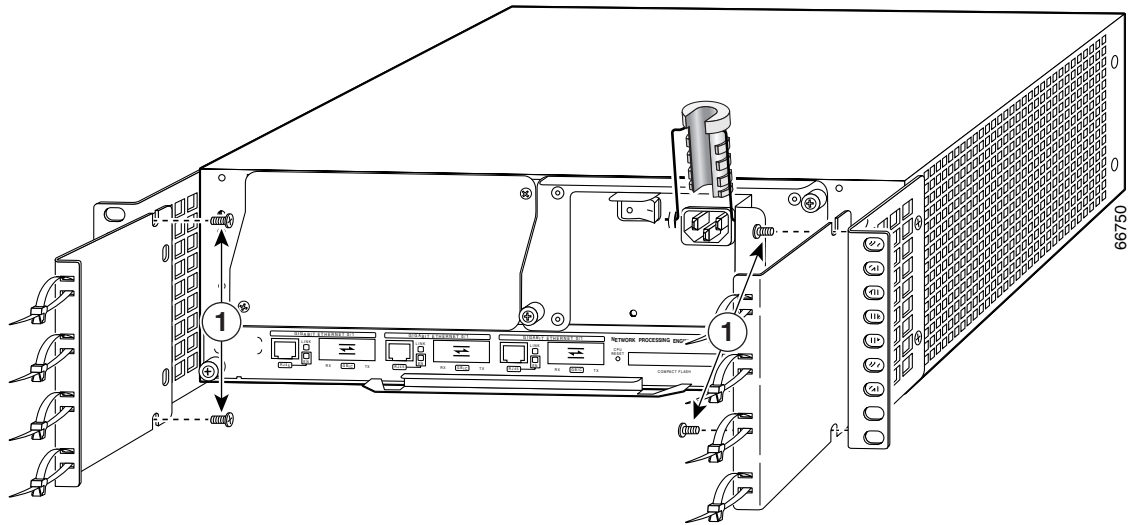
To prevent injury, review the safety precautions in [Chapter 2, “Preparing for Installation,”](#) before installing the router in a rack.

Installing the NPE-G1 and NPE-G2 Cable-Management Brackets on a Rear-Mounted Router

Use the instructions in this section to attach the standard cable-management brackets if you have a rear-mounted router.

If you wish to install the NPE-G1 or NPE-G2 optical cable-management bracket, see the [“Installing the NPE-G1 and NPE-G2 Optical Cable-Management Bracket”](#) section on page 3-11.

Figure 3-12 *Installing the Rear Cable-Management Brackets with the NPE-G1 or NPE-G2—Router Rear-Mounted*



1	Cable-management bracket screws
----------	---------------------------------

If you have an NPE-G1 or NPE-G2 installed, you will want to install cable-management brackets on the rear of the router as well as on the front of the router.

- | | |
|---------------|---|
| Step 1 | Align the cable-management brackets with the rack-mount brackets. |
| Step 2 | Insert and tighten two screws for each bracket. The screws come with the cable-management brackets. |

This completes the procedure for installing the rack-mount brackets and cable-management brackets on a Cisco 7200 VXR router. Proceed to the [“Installing the Chassis in the Rack”](#) section on page 3-14.

Installing the Chassis in the Rack

After installing the brackets on the chassis, you mount the router by securing the rack-mount brackets to two posts or mounting strips in the rack using the six slotted screws provided. Because the brackets support the weight of the entire chassis, be sure to use all six slotted screws to fasten the two rack-mount brackets to the rack posts. [Figure 3-2](#), [Figure 3-3](#), [Figure 3-4](#), and [Figure 3-5](#) show typical installations in 19-inch, four-post and two-post equipment racks.

We recommend that you allow at least 1 or 2 inches (2.54 or 5.08 cm) of vertical clearance between the router and any equipment directly above and below it.

To install the chassis in the rack, complete the following steps:

-
- Step 1** On the chassis, ensure that all captive screws on the network services engine (NSE) or network processing engine (NPE), the I/O controller, and each power supply are tightened and the port adapter levers are in the locked position.
 - Step 2** Make sure that your path to the rack is unobstructed. If the rack is on wheels, ensure that the brakes are engaged or that the rack is otherwise stabilized.
 - Step 3** Position the chassis so that the front end is closest to you. Lift the chassis and move it to the rack. To prevent injury, avoid sudden twists or moves.
 - Step 4** Slide the chassis into the rack, pushing it back until the brackets (installed at the front or rear of the chassis) meet the mounting strips or posts on both sides of the equipment rack.
 - Step 5** While keeping the brackets flush against the posts or mounting strips, position the router so the holes in the brackets are aligned with those in the mounting strips.
 - Step 6** Insert all six 10-32 x 3/8 slotted screws (three on each side) through the brackets and into the mounting strip (use the top and bottom bracket holes, as shown in [Figure 3-2](#), [Figure 3-3](#), [Figure 3-4](#), and [Figure 3-5](#)). Using a 1/4-inch flat-blade screwdriver, tighten all the screws.
-

This completes the procedure for installing the chassis in the rack. Proceed to the [“Connecting Port Adapter Cables”](#) section on [page 3-19](#) to continue the installation.

General Tabletop or Workbench Installation

The router should already be in the area where you will install it, and your installation location should already be determined. If not, see [Chapter 2, “Preparing for Installation,”](#) the [“Site Requirement Guidelines”](#) section on [page 2-3](#) and the *Site Preparation and Safety Guide*.

When installing a Cisco 7200 VXR router on a workbench or tabletop, ensure that the surface is clean and in a safe location and that you have considered the following:

- The router requires at least 3 inches (7.62 cm) of clearance at the inlet and exhaust vents (the right and left sides of the router).
- The router should be installed off the floor. (Dust that accumulates on the floor is drawn into the interior of the router by the cooling fans. Excessive dust inside the router can cause overtemperature conditions and component failures.)
- There must be approximately 19 inches (48.3 cm) of clearance at the front and rear of the router for installing and replacing router field-replaceable units (FRUs), or accessing network cables or equipment.

- Port adapter and power supply filler panels are installed.
- The router will receive adequate ventilation (it is not being installed in an enclosed cabinet where ventilation is inadequate).
- If you plan to install the cable-management brackets on the front of the chassis, you have unpacked and set aside the two cable-management brackets and four M4 x 8-mm Phillips flathead screws.
- An adequate chassis ground (earth) connection exists for your router chassis.

**Note**

We strongly recommend that you provide a chassis ground connection. See the [“Attaching a Chassis Ground Connection” section on page 3-17](#) for instructions.

Following are the steps for installing a Cisco 7200 VXR router on a workbench or tabletop:

-
- | | |
|---------------|--|
| Step 1 | Remove any debris and dust from the tabletop or workbench, as well as the surrounding area. Also make sure your path between the router and its new location is unobstructed. |
| Step 2 | On the chassis, ensure that all captive screws on the network processing engine or network services engine, the I/O controller, Port Adapter Jacket Card, and each power supply are tightened and the port adapter levers are in the locked position. |
| Step 3 | Lift the chassis by placing your hands around the chassis sides and lifting the chassis from underneath. To prevent injury, avoid sudden twists or moves. |
| Step 4 | Place the router on the tabletop or workbench. |
| Step 5 | Ensure that there is at least 3 inches (7.62 cm) of clearance at the inlet and exhaust vents of the router and no exhaust air from other equipment will be drawn into the chassis. Also, ensure that there is approximately 19 inches (48.3 cm) of clearance at the front and rear of the chassis. |
-

This completes the general tabletop or workbench installation.

Installing the Cable-Management Brackets

To install the cable-management brackets on a Cisco 7200 VXR router, complete the following steps:

-
- | | |
|---------------|--|
| Step 1 | Locate the threaded holes in the front sides of the chassis. |
| Step 2 | Align the first cable-management bracket to the threaded holes in the right side of the chassis. (See Figure 3-6 .) |
| Step 3 | Thread two M4 x 8-mm Phillips flathead screws through the bracket and into the chassis. Use a number 2 Phillips screwdriver to tighten the screws. |
| Step 4 | Install the other cable-management bracket on the left side of the chassis, following the same procedures as in Step 1 and Step 2. |

**Note**

If you have an NPE-G1 or NPE-G2, see the “[Installing the NPE-G1 and NPE-G2 Cable-Management Brackets on a Front-Mounted Router](#)” section on page 3-9 or the “[Installing the Brackets on the Rear of the Chassis](#)” section on page 3-11.

This completes the steps for installing the cable-management brackets on a Cisco 7200 VXR router.

Securing the Port Adapter Cables

To secure port adapter interface cables to the cable-management brackets, complete the following steps:

**Note**

The eight removable tie wraps installed on the cable-management brackets secure port adapter interface cables to the brackets. We recommend that you use the tie wraps that shipped with the cable-management brackets. You can use standard tie wraps; however, you will have to cut and replace them with new tie wraps when you want to release or secure an interface cable to a bracket.

Step 1 Select a tie wrap and release its locking mechanism.

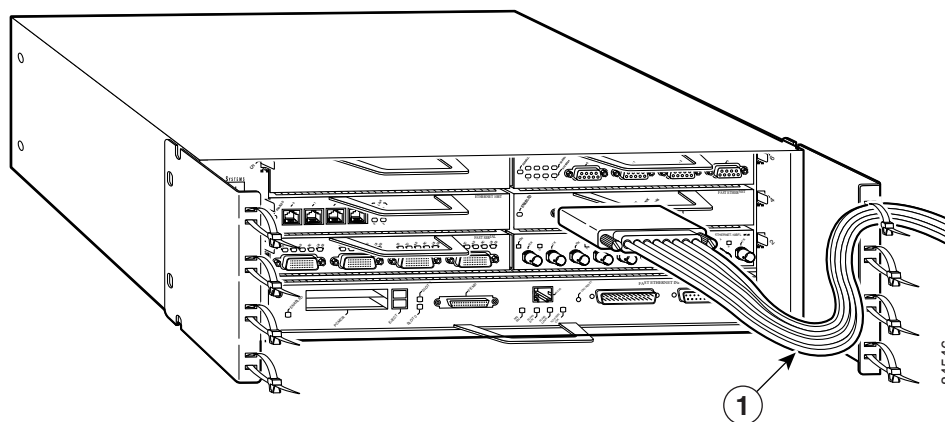
Step 2 Carefully lace the interface cables from a port adapter installed in the chassis between the two ends of the unlocked tie wrap.

**Note**

Be sure to leave a small service loop in the interface cable before securing it to the cable-management bracket.

Step 3 With the interface cables between the ends of the tie wrap and the interface cables service loop in place, tighten the cable tie down around the interface cables until they are secured against the cable-management bracket. (See [Figure 3-13](#).)

Figure 3-13 **Securing Interface Cables to the Cable-Management Brackets**



1	Service loop
----------	--------------

- Step 4** Repeat Step 1 through Step 3 for any other port adapter interface cables installed in the router.
-

This completes the procedure for securing port adapter interface cables to the cable-management brackets. Proceed to the following section “[Attaching a Chassis Ground Connection](#)” to continue the installation.

Attaching a Chassis Ground Connection

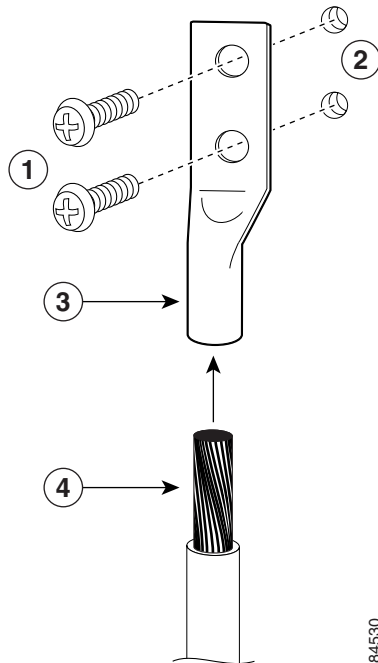
Before you connect power or turn on power to your router, we strongly recommend that you provide an adequate chassis ground (earth) connection for the router chassis. Chassis grounding receptacles are provided on each Cisco 7200 VXR router chassis. (See [Figure 1-4](#).)

To ensure the chassis grounding connection that you provide is adequate, you will need the following parts and tools:

- One grounding lug—Must have two number-10 screw holes that have a 0.63-inch (16.002-mm) spacing between them, and a wire receptacle large enough to accept a 6-AWG multistrand, copper wire. (See [Figure 3-14](#).) This grounding lug is not available from Cisco Systems; electrical-connector vendors provide this type of grounding lug.
- Two Phillips machine screws with locking washers—M5 (metric), 0.031-inch (0.8-mm) pitch, 0.315-inch (8-mm) length. These screws are not available from Cisco Systems; they are available from any commercial hardware vendor.
- One grounding wire—6-AWG, 0.162-inch (4.115-mm) diameter, with approximately 0.108-inch (2.743-mm) insulation, for a total wire diameter of approximately 0.27 inches (6.858 mm). The wire length is dependent on your router location and site environment. This wire is not available from Cisco Systems; it is available from any commercial cable vendor.
- Number 2 Phillips screwdriver
- Crimping tool large enough to accommodate the diameter of the wire receptacle on your grounding lug
- Wire stripper

Use the following procedure to attach the grounding lug to the chassis grounding receptacles on your router chassis:

Figure 3-14 Attaching a Grounding Lug to the Chassis Grounding Receptacles



84530

1	Screws	3	Grounding lug
2	Chassis grounding receptacles	4	Wire

-
- Step 1** Locate the chassis grounding receptacles on your router chassis. (See [Figure 1-4](#) in [Chapter 1](#), “[Cisco 7206VXR Overview](#).”)
- Step 2** Insert the two screws through the holes in the grounding lug. (See [Figure 3-14](#).) Ensure that the grounding lug does not interfere with other router hardware, such as power supplies or the network processing engine or network services engine.
- Step 3** Use the Phillips screwdriver to carefully tighten the screws until the grounding lug is held firmly to the chassis. Do not overtighten the screws.
- Step 4** Use the wire stripper to strip one end of the 6-AWG wire approximately 0.75 inches (19.05 mm).
- Step 5** Insert the 6-AWG wire into the wire receptacle on the grounding lug (See [Figure 3-14](#).)
- Step 6** Use the crimping tool to carefully crimp the wire receptacle around the wire; this step is required to ensure a proper mechanical connection.
- Step 7** Connect the opposite end of the grounding wire to the appropriate grounding point at your site to ensure an adequate chassis ground.
-

This completes the procedure for providing a chassis ground connection.

Connecting Port Adapter Cables

The instructions for connecting the cables for each port adapter installed in the Cisco 7200 VXR routers are contained in the respective configuration note for each port adapter. For example, if you are connecting the cables for a 4-port, Ethernet port adapter, refer to the configuration note *PA-4E Ethernet 10BaseTPort Adapter Installation and Configuration*. The document is available on the Documentation DVD and on Cisco.com.

Instructions for securing port adapter interface cables to the cable-management brackets are contained in the [“Installing the Cable-Management Brackets” section on page 3-15](#).

Connecting I/O Controller, NPE-G1, or NPE-G2 Cables

This section contains connection equipment and pinout information for the Ethernet, Fast Ethernet, Gigabit Ethernet, console, and auxiliary ports that are located on the I/O controller, NPE-G1, or NPE-G2. If you have an NPE-G1 or NPE-G2 installed, you do not need an I/O controller, although an I/O blank panel must be in place if you remove the I/O controller.

The NPE-G1 or NPE-G2 has three Gigabit Ethernet interfaces and six ports; three RJ-45 ports and three GBIC module ports (NPE-G1) or four SFP module ports (NPE-G2). It also has an auxiliary and a console port. See the [“RJ-45 Port Cabling and Pinouts” section on page 3-37](#) for information about the RJ-45 console and auxiliary ports. Additionally, the NPE-G2 has a Fast Ethernet Management port.

**Note**

You can install the C7200-I/O and C7200-I/O-FE I/O controllers in Cisco 7200 VXR routers, including a Cisco 7206VXR router shelf in a Cisco AS5800 Universal Access Server.

Connecting to Gigabit Ethernet Slots and Ports

The NPE-G2, the NPE-G1, and C7200-I/O-GE+E I/O controller have Gigabit Ethernet slots and ports.

- The NPE-G2 has three Gigabit Ethernet interfaces; four SFP module ports and 3 RJ-45 ports. Any three of the six can be used at the same time.
- The NPE-G1 has three Gigabit Ethernet interfaces; three GBIC module ports and three RJ-45 ports. Any three of the six can be used at the same time.
- The C7200-I/O-GE+E I/O controller has one GBIC slot and one Fast Ethernet RJ-45 port.

For further information and specifications, see the [Gigabit Interface Converter GBIC Module and Small Form-Factor Pluggable \(SFP\) GBIC Module Installation Instructions and Specifications](#)

This section contains information on both the GBIC and RJ-45 connections. See the [“Gigabit Ethernet GBIC Connections” section on page 3-24](#) or the [“Gigabit Ethernet RJ-45 Connections on the NPE-G1 and NPE-G2” section on page 3-29](#).

Gigabit Ethernet SFP Module Connections

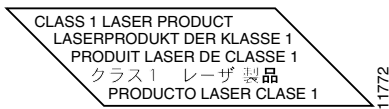
The SFP port is a 1000-Mbps optical interface in the form of an LC-type duplex port that supports IEEE 802.3z interfaces compliant with the 1000BASEX standard. (See [Figure 3-16](#).)



Because invisible laser radiation may be emitted from the aperture of the port when no cable is connected, avoid exposure to laser radiation and do not stare into open apertures. Statement 70

[Figure 3-15](#) shows the Class 1 warning label that appears on the Gigabit Ethernet optical ports.

Figure 3-15 Laser Class 1 Warning Label

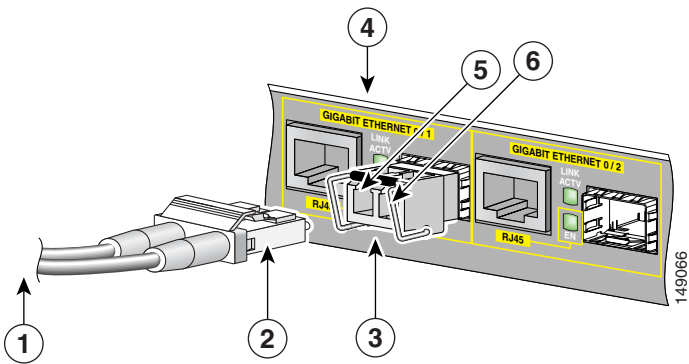


[Figure 3-16](#) shows the duplex LC-type connectors on your multimode or single-mode optical fiber cables. For simplex connectors, two cables are required, one cable for transmit (TX) and a second cable for receive (RX). For duplex connectors, only one cable that has both TX and RX connectors is required. You can use either simplex or duplex connectors to the SFP module ports on the NPE-G2.



We strongly recommend cleaning optical fiber connections before attaching cables to equipment. See the [“Fiber-Optic Cleaning Information”](#) section on [page 5-10](#) for information.

Figure 3-16 SFP Port Connections



1	To external 1000BASEX network	4	Gigabit Ethernet port 0/1
2	1 duplex connector (TX and RX)	5	RX (SFP port 0/1)
3	SFP module	6	TX (SFP port 0/1)

[Table 3-1](#) provides SFP module specifications.

Table 3-1 SFP Module Specifications

Specification	Description
Dimensions (H x W x D)	Height: 0.33 in. (8.5 mm) Width: 2.22 in. (56.5 mm) Depth: 0.53 in. (13.4 mm)
Connectors	Multimode fiber-optic: LC Single-mode fiber-optic: LC

[Table 3-2](#) provides cabling specifications for the SFP modules that you install in the Gigabit Ethernet SFP ports.

The NPE-G2 supports single Ethernet interfaces based on SFP module technology. The following SFP modules are supported by this line card:

- 100BASE-FX SFP—The SFP-GE-F=, 100BASE-FX SFP module is a hot-swappable device that plugs into a Gigabit Ethernet SFP port. It provides full-duplex 100-Mbps connectivity over multimode fiber (MMF) infrastructures. The 100BASE-FX SFP operates on ordinary MMF optical link spans of up to 2 kilometers (km) in length.
- 1000BASE-LX/LH SFP—The SFP-GE-L=, 1000BASE-LX/LH SFP module operates on ordinary single-mode fiber-optic link spans of up to 10,000 meters in length.
- 1000BASE-SX SFP—The SFP-GE-S=, 1000BASE-SX SFP module operates on ordinary multimode fiber-optic link spans of up to 550 meters in length.
- 1000BASE-ZX SFP—The SFP-GE-Z=, 1000BASE-ZX SFP module operates on ordinary single mode fiber-optic link spans of up to 70 kilometers in length. Link spans of up to 100 km are possible using premium single-mode fiber or dispersion-shifted single-mode fiber. The SFP module provides an optical link budget of 23 dB—the precise link span length depends on multiple factors such as fiber quality, number of splices, and connectors.

When shorter distances of single-mode fiber are used, it may be necessary to insert an inline optical attenuator in the link to avoid overloading the receiver. A 5-decibel (dB) or 10-dB inline optical attenuator should be inserted between the fiber-optic cable plant and the receiving port on the SFP-GE-Z= at each end of the link whenever the fiber-optic cable span is less than 25 km.

**Note**

The required line card SFP module is shipped installed in the line card. Cisco sells individual SFP modules separately and you can change the type of Gigabit Ethernet interface supported by this line card by simply changing its SFP module.

**Note**

Optical fiber cables are commercially available; they are not available from Cisco Systems.

**Note**

We strongly recommend cleaning optical fiber connections before attaching cables to equipment. See the [“Fiber-Optic Cleaning Information”](#) section on page 5-10 for information.

Table 3-2 SFP Module Port Cabling Specifications

SFP Module	Wavelength (nm)	Fiber Type	Core Size (microns)	Modal Bandwidth (MHz/km)	Cable Distance
100BASE-FX SFP-GE-F=	1270 (min) 1300 (typical) 1380 (max)	MMF	62.5 62.5 50.0 50.0	500	1.24 miles (2 km, 6562 ft)
1000BASE-LX/LH SFP-GE-L=	1300	MMF ¹	62.5 50.0 50.0	500 400 500	1804 ft (550 m) 1804 ft (550 m) 1804 ft (550 m)
		SMF	9/10	—	6.2 miles (10 km)
1000BASE-SX SFP-GE-S=	850	MMF	62.5	160	722 ft (220 m)
			62.5	200	902 ft (275 m)
			50.0	400	1640 ft (500 m)
			50.0	500	1804 ft (550 m)
1000BASE-ZX SFP-GE-Z=	1550	SMF	9/10	—	43.5 miles (70 km)

1. A mode-conditioning patch cord is required. Using an ordinary patch cord with MMF, 1000BASE-LX/LH SFP modules, and a short link distance (tens of meters) can cause transceiver saturation resulting in an elevated bit error rate (BER). In addition, when using the LX/LH SFP module with 62.5-micron diameter MMF, you must install a mode-conditioning patch cord between the SFP module and the MMF cable on both the transmit and receive ends of the link. The mode-conditioning patch cord is required for link distances greater than 984 ft (300 m).

Table 3-3 provides SFP module power information.

Table 3-3 SFP Module Transmit Power, Receive Power, and Power Budget

SFP Module	Transmit Power		Receive Power		Power Budget
	Minimum	Maximum	Minimum	Maximum	
SFP-GE-F= For 50/125 cabling For 62.5/125 cabling	-23.5 -20	-14 -14	-33.5 -33.5	-11.8 -11.8	10 dBm 13.5 dBm
SFP-GE-L=	-9.5 dBm ¹	-3 dBm ³	-20 dBm	-3 dBm	7.5 dBm ⁴
	-11.5 dBm ²				8.0 dBm ⁵
SFP-GE-S=	-9.5 dBm ⁶	-4 dBm ⁶	-17 dBm	0 dBm	7.5 dBm ⁷
SFP-GE-Z=	0 dBm	5 dBm	-23 dBm	0 dBm	-24 dBm

- For fiber types 9/125 μm SMF.
- For fiber types 62.5/125 μm MMF and 50/125 μm MMF.
- For fiber types 9/125 μm SMF, 62.5/125 μm MMF, and 50/125 μm MMF.
- For fiber types 50/125 μm MMF and 62.5/125 μm MMF.
- For fiber type 10 μm SMF.
- For fiber types 50/125 μm , NA = 0.20 fiber and 62.5/125 μm , NA = 0.275 fiber.
- For fiber types 50/125 μm MMF and 62.5/125 μm MMF.

Table 3-4 provides NPE-G2 CWDM SFP module configuration information.

Table 3-4 NPE-G2 CWDM SFP Module Configurations

CWDM Product Number	Color
CWDM-SFP-1470	Gray
CWDM-SFP-1490	Violet
CWDM-SFP-1510	Blue
CWDM-SFP-1530	Green
CWDM-SFP-1550	Yellow
CWDM-SFP-1570	Orange
CWDM-SFP-1590	Red
CWDM-SFP-1610	Brown

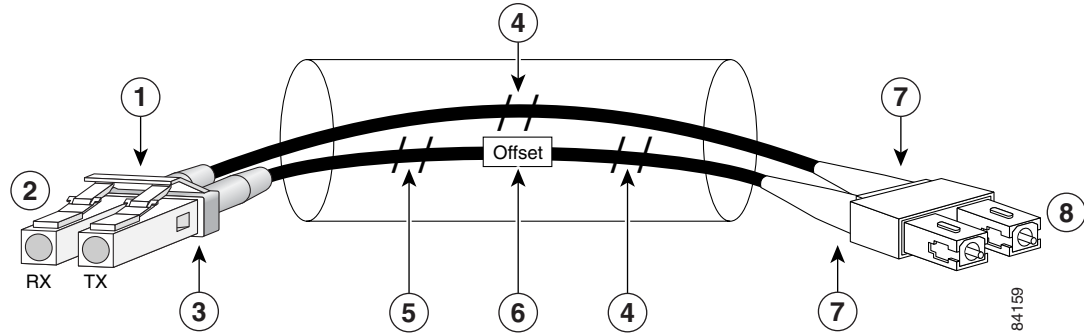
Mode-Conditioning Patch Cord Description

A mode-conditioning patch cord can be used with the SFP-GE-L= (SFP module) to allow reliable laser transmission between the single-mode laser source on the SFP module and a multimode optical fiber cable.

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

This degradation results in a decrease in the link span (the distance between a transmitter and a receiver) that can be supported reliably. The effect of DMD can be overcome by conditioning the launch characteristics of a laser source. A practical means of performing this conditioning is to use a device called a mode-conditioning patch cord.

A mode-conditioning patch cord is an optical fiber cable assembly that consists of a pair of optical fibers terminated with connector hardware. Specifically, the mode-conditioning patch cord is composed of a single-mode optical fiber permanently coupled off-center (see Offset in Figure 3-17) to a graded-index multimode optical fiber. Figure 3-17 shows a diagram of the mode-conditioning patch cord assembly.

Figure 3-17 Mode-Conditioning Patch Cord Assembly for an SFP Module

1	Gray color identifier	5	Single-mode bar
2	To Gigabit Ethernet interface	6	Offset
3	Blue color identifier	7	Beige color identifier
4	Multimode bar	8	To cable plant

The mode-conditioning patch cord assembly is composed of duplex optical fibers, including a single-mode-to-multimode offset launch fiber connected to the transmitter, and a second conventional graded-index multimode optical fiber connected to the receiver. The use of a plug-to-plug patch cord maximizes the power budget of multimode 1000BASELX and 1000BASELH links.

**Note**

The mode-conditioning patch cord is required to comply with IEEE standards. The IEEE found that link distances could not be met with certain types of fiber-optic cable cores. The solution is to launch light from the laser at a precise offset from the center, which is accomplished by using the mode-conditioning patch cord. At the output of the patch cord, the SFP-GE-L= is compliant with the IEEE 802.3z standard for 1000BASELX.

**Note**

We strongly recommend cleaning optical fiber connections before attaching cables to equipment. See the [“Fiber-Optic Cleaning Information”](#) section on page 5-10 for information.

Gigabit Ethernet GBIC Connections

The Gigabit Interface Converter (GBIC) port is a 1000-Mbps optical interface in the form of an SC-type duplex port that supports IEEE 802.3z interfaces compliant with the 1000BASEX standard. (See [Figure 3-18](#).)

**Note**

The GBIC is a separately orderable part and does not ship installed in your I/O controller. You must install the GBIC before you connect the cables to it.

[Figure 3-18](#) shows the simplex and duplex SC-type connectors on your multimode or single-mode fiber-optic cables. For simplex connectors, two cables are required, one cable for transmit (TX) and a second cable for receive (RX). For duplex connectors, one cable that has both TX and RX connectors is required. You can use either simplex or duplex connectors for the C7200-I/O-GE+E or the NPE-G1.

**Warning**

Because invisible laser radiation may be emitted from the aperture of the port when no fiber cable is connected, avoid exposure to laser radiation and do not stare into open apertures. Statement 70

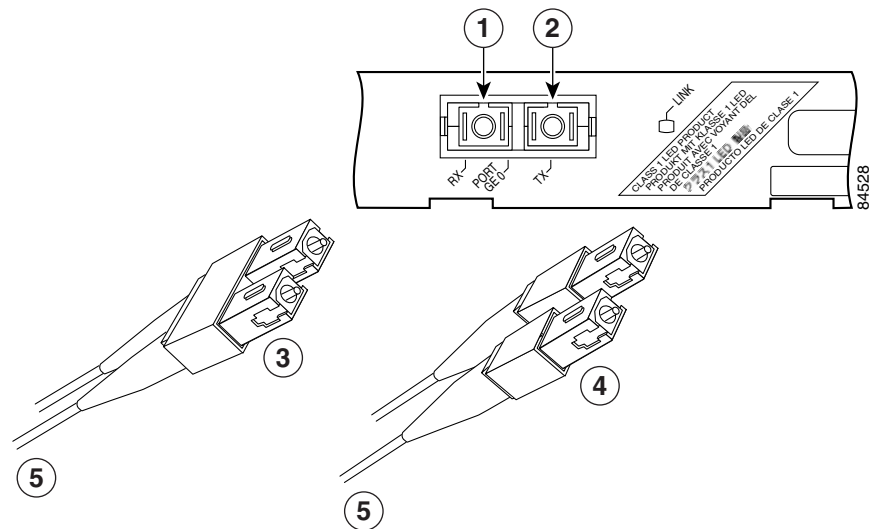
**Warning**

Class 1 laser product. Statement 1008

**Warning**

Class 1 LED product. Statement 1027

Figure 3-18 GBIC Port Connections



1	TX	4	2 simplex connectors
2	RX	5	To external 100BASEX network
3	1 duplex connector (TX and RX)		

Table 3-6, Table 3-7, and Table 3-8 describes the available GBIC options and their product numbers.

The NPE-G1 and the I/O controller C7200 I/O-GE+E on the Cisco 7200 VXR routers use Gigabit Ethernet Gigabit Interface Converters (GBICs). The NPE-G1 uses Gigabit Ethernet Coarse Wavelength-Division Multiplexing (CWDM) GBICs as well.

Table 3-5 GBICs Supported on the I/O Controller C7200 I/O-GE+E

Gigabit Ethernet GBIC	Product Number
1000BASE-SX	WS-G5484
1000BASE-LX/LH	WS-G5486
1000BASE-ZX	WS-G5487

Table 3-6 GBIC Options

Product Number	GBIC	Description
WS-G5484= or GBIC-SX=	Short wavelength (1000BASESX)	Operates on standard multimode fiber-optic link spans of up to 550 m.
WS-G5486= or GBIC-LX/LH=	Long wavelength/long haul (1000BASELX/LH)	Operates on single-mode and multimode fiber-optic link spans of up to 10 km.
WS-G5487= or GBIC-ZX-SM=	Extended distance (1000BASEZX)	Operates on ordinary single-mode fiber-optic link spans of up to 70 km. Link spans of up to 100 km are possible using premium single-mode fiber or dispersion-shifted single-mode fiber.

Table 3-7 GBICs Supported on the NPE-G1

GBIC Type	Gigabit Ethernet GBIC Product Number
	GBIC Product Number
1000BASE-SX	• WS-G5484= or GBIC-SX=
1000BASE-LX/LH	• WS-G5486= or GBIC-LX/LH=
1000BASE-ZX	• WS-G5487= or GBIC-ZX-SM=
	CWDM GBIC Product Number
—	• GBIC-CWDM-1470=
—	• GBIC-CWDM-1490=
—	• GBIC-CWDM-1510=
—	• GBIC-CWDM-1530=
—	• GBIC-CWDM-1550=
—	• GBIC-CWDM-1570=
—	• GBIC-CWDM-1590=
—	• GBIC-CWDM-1610=

**Note**

Fiber-optic cables are commercially available; they are not available from Cisco Systems.

GBIC Cabling and Connection Equipment

The GBIC receptacle is a 1000-Mbps optical interface in the form of an SC-type duplex receptacle that supports IEEE 802.3z interfaces compliant with the 1000BASEX standard.

[Table 3-8](#) provides cabling specifications for the GBICs that you install in Gigabit Ethernet slots. Note that all GBIC ports have SC-type connectors. Also, the minimum cable distance for the WS-G5484= or GBIC-SX and WS-G5486= or GBIC-LX/LH (multimode fiber [MMF] and single-mode fiber [SMF])

is 6.5 feet (2 m), and the minimum link distance for the WS-G5487 or GBIC-ZX-SM is 6.2 miles (10 km) with an 8-dB attenuator installed at each end of the link. Without attenuators, the minimum link distance for the WS-G5487 or GBIC-ZX-SM is 24.9 miles (40 km).

Table 3-8 GBIC Port Cabling Specifications

GBIC	Wavelength (nm)	Fiber Type	Core Size (micron)	Modal Bandwidth (MHz/km)	Maximum Cable Distance
WS-G5484= or GBIC-SX=	850	MMF ¹	62.5	160	722 ft (220 m)
			62.5	200	902 ft (275 m)
			50.0	400	1640 ft (500 m)
			50.0	500	1804 ft (550 m)
WS-G5486= or GBIC-LX/LH=	1300	MMF ² and SMF	62.5	500	1804 ft (550 m)
			50.0	400	1804 ft (550 m)
			50.0	500	1804 ft (550 m)
			9/10	—	6.2 miles (10 km)
WS-G5487= or GBIC-ZX-SM=	1550	SMF	9/10	—	43.5 miles (70 km)
		SMF ³	8	—	62.1 miles (100 km)

1. Multimode fiber (MMF) only.

2. A mode-conditioning patch cord is required.

When using the WS-G5486= or GBIC-LX/LH with 62.5-micron diameter MMF, you must install a mode-conditioning patch cord between the GBIC and the MMF cable on both the transmit and the receive ends of the link when link distances are greater than 984 ft (300 m).

We do not recommend using the WS-G5486= or GBIC-LX/LH and MMF with no patch cord for very short link distance (tens of meters). The result could be an elevated bit error rate (BER).

3. Dispersion-shifted single-mode fiber-optic cable.

Table 3-10 provides power requirements and power budget information.

Table 3-9 GBIC Power Requirements and Power Budget

GBIC	Transmit Power		Receive Power		Power Budget
	Minimum	Maximum	Minimum	Maximum	
WS-G5484 or GBIC-SX	-9.5 dBm ¹	-4 dBm ¹	-17 dBm	0 dBm	7.5 dBm ²
WS-G5486 or GBIC-LXLH	-9.5 dBm ³ -11.5 dBm ⁴	-3 dBm ⁵	-20 dBm	-3 dBm	7.5 dBm ⁶ and 8.0 dBm ⁷
WS-G5487 or GBIC-ZX	0 dBm	5.2 dBm	-24 dBm	-3 dBm	-24 dBm

1. For fiber types 50/125 μ m, NA = 0.20 fiber and 62.5/125 μ m, NA = 0.275 fiber.

2. For fiber types 50 μ m MMF and 62.5 μ m MMF.

3. For fiber types 9/125 μ m SMF.

4. For fiber types 62.5/125 μ m MMF and 50/125 μ m MMF.

5. For fiber types 9/125 μ m SMF, 62.5/125 μ m MMF, and 50/125 μ m MMF.

6. For fiber types 50 μ m MMF and 62.5 μ m MMF.

7. For fiber type 10 μ m SMF.

Note

The 1000BASE-ZX GBIC provides an optical power budget of 21.5 dB. You should measure your cable plant with an optical loss test set to verify that the optical loss of the cable plant (including connectors and splices) is less than or equal to 21.5 dB. The optical loss measurement must be performed with a 1550-nm light source.

Mode-Conditioning Patch Cord Description

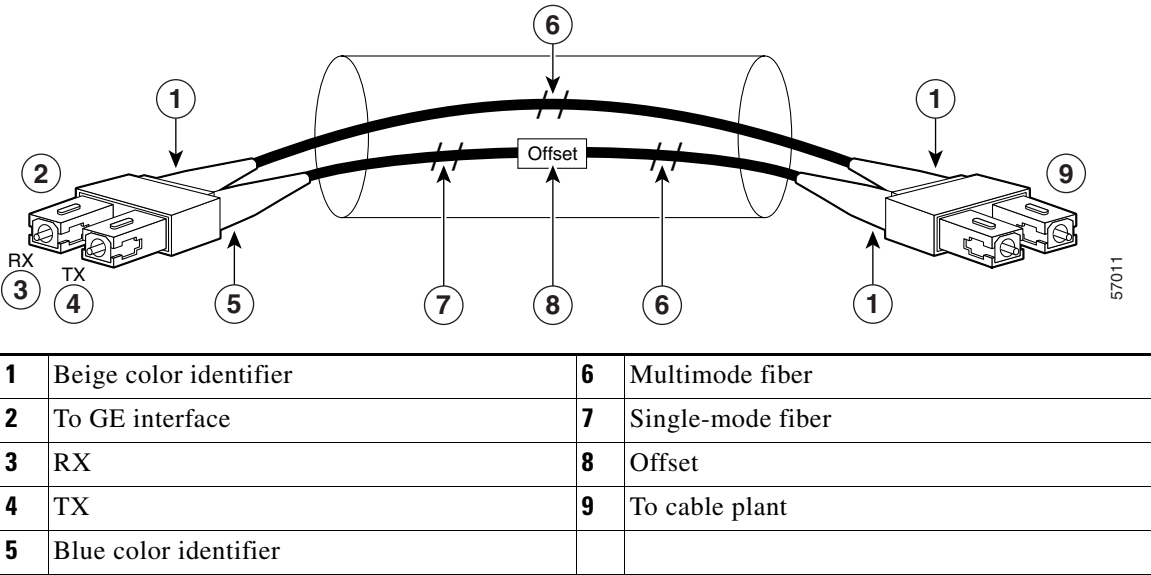
A mode-conditioning patch cord can be used with the WS-G5486= or GBIC-LX/LH= to allow reliable laser transmission between the single-mode laser source on the GBIC and a multimode optical fiber cable.

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

This degradation results in a decrease in the link span (the distance between a transmitter and a receiver) that can be supported reliably. The effect of DMD can be overcome by conditioning the launch characteristics of a laser source. A practical means of performing this conditioning is to use a device called a mode-conditioning patch cord.

A mode-conditioning patch cord is an optical fiber cable assembly that consists of a pair of optical fibers terminated with connector hardware. Specifically, the mode-conditioning patch cord is composed of a single-mode optical fiber permanently coupled off-center (see Offset in Figure 3-19) to a graded-index multimode optical fiber. Figure 3-19 shows a diagram of the mode-conditioning patch cord assembly.

Figure 3-19 GBIC Mode-Conditioning Patch Cord Assembly



A mode-conditioning patch cord assembly is composed of duplex optical fibers, including a single-mode-to-multimode offset launch fiber connected to the transmitter, and a second conventional graded-index multimode optical fiber connected to the receiver. The use of a plug-to-plug patch cord maximizes the power budget of multimode 1000BASELX and 1000BASELH links.

**Note**

The mode-conditioning patch cord is required to comply with IEEE standards. The IEEE found that link distances could not be met with certain types of fiber-optic cable cores. The solution is to launch light from the laser at a precise offset from the center, which is accomplished by using the mode-conditioning patch cord. At the output of the patch cord, the WS-G5486 or GBIC-LX/LH is compliant with the IEEE 802.3z standard for 1000BASELX.

A mode-conditioning patch cord can be used with the WS-G5486 or GBIC-LX/LH to allow reliable laser transmission between the single-mode laser source on the GBIC and a multimode fiber-optic cable.

**Note**

We strongly recommend cleaning optical fiber connections before attaching cables to equipment. See the “Fiber-Optic Cleaning Information” section on page 5-10 for information.

Gigabit Ethernet RJ-45 Connections on the NPE-G1 and NPE-G2

The NPE-G1 and NPE-G2 RJ-45 ports support 10BASET, 100BASETX, and 1000BASET and 1000BASEX protocols and the ports are compliant with IEEE 802.3, IEEE 802.3u, and IEEE 802.1q standards.

The RJ-45 ports support standard straight-through and crossover Category 5 UTP cables with RJ-45 connectors. (See [Figure 3-23](#) and [Figure 3-24](#).) Cisco Systems does not supply Category 5 UTP cables; these cables are available commercially.

[Figure 3-20](#) shows an RJ-45 port and connector. [Table 3-10](#) lists the pinouts and signals for the RJ-45 port.

Table 3-10 NPE-G1 and NPE-G2 RJ-45 Port Pinouts

Pin	10/100 Signal	Gigabit Ethernet Signal
1	Tx Data+ ¹	Tx A+
2	Tx Data–	Tx A–
3	Rx Data+ ²	Rx B+
4	N/C	Tx C+
5	N/C	Tx C–
6	Rx Data–	Rx B–
7	N/C	Rx D+
8	N/C	Rx D–

1. Tx Data = Transmit Data

2. Rx Data = Receive Data

**Note**

With reference to the RJ-45 pinouts in [Table 3-10](#), proper common-mode line terminations should be used for the unused Category 5 UTP cable pairs 4/5 and 7/8. Common-mode line termination reduces electromagnetic interference (EMI).

Depending on your RJ-45 interface cabling requirements, use the pinouts shown in [Figure 3-23](#) and [Figure 3-24](#) for straight-through and crossover twisted-pair cable connections.

Connecting to the I/O Controller Ethernet and Fast Ethernet Ports

The I/O controller Ethernet and Fast Ethernet ports use two types of ports, RJ-45 ports or MII ports, depending on which I/O controller model you have. The following sections explain the Ethernet and Fast Ethernet connection equipment.

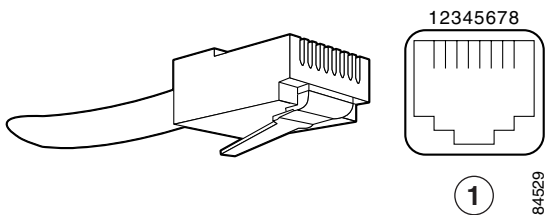
Ethernet and Fast Ethernet RJ-45 Connections

The I/O controller has RJ-45 ports for Ethernet, Fast Ethernet, or autosensing Ethernet and Fast Ethernet connections, depending on your model. The RJ-45 ports support IEEE 802.3 (Ethernet) and IEEE 802.3u (Fast Ethernet) interfaces compliant with 10BASET and 100BASETX specifications.

The RJ-45 port supports standard straight-through and crossover Category 5 unshielded twisted-pair (UTP) cables with RJ-45 connectors. Cisco Systems does not supply Category 5 UTP cables; these cables are available commercially.

Figure 3-20 shows the RJ-45 port and connector. Table 3-11 lists the pinouts and signals for the RJ-45 connector.

Figure 3-20 RJ-45 Port and Connector



1	RJ-45 connector and port		
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Warning

To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telephone-network voltage (TNV) circuits. LAN ports contain SELV circuits, and WAN ports contain TNV circuits. Some LAN and WAN ports both use RJ-45 connectors. Use caution when connecting cables. Statement 1021

Table 3-11 I/O Controller RJ-45 Connector Pinouts

Pin	Description
1	TxD+ ¹
2	TxD–
3	RxD+ ²
6	RxD–

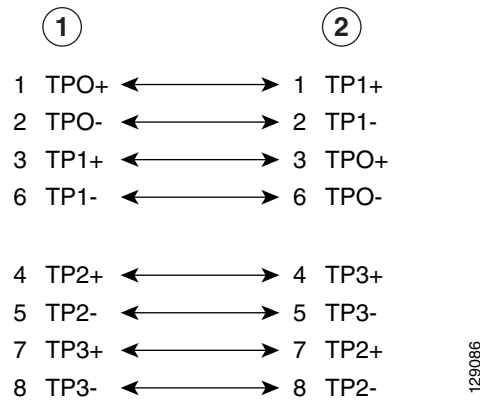
1. TxD = Transmit data
2. RxD = Receive data

**Note**

With reference to the RJ-45 pinout in Table 3-1, proper common-mode line terminations should be used for the unused Category 5 UTP cable pairs 4/5 and 7/8. Common-mode line termination reduces electromagnetic interference (EMI).

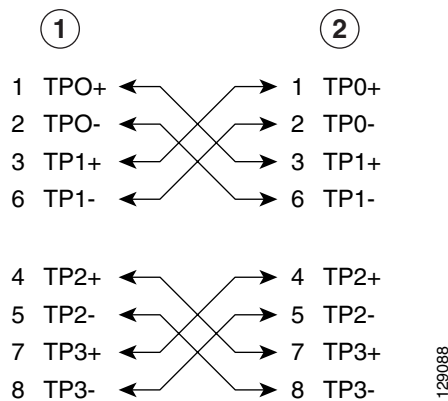
Depending on your RJ-45 interface cabling requirements, use the pinouts shown in [Figure 3-21](#) and [Figure 3-22](#) for Gigabit Ethernet straight-through and crossover twisted-pair cable connections. Use [Figure 3-23](#) for Ethernet/Fast Ethernet straight-through and crossover twisted-pair cable connections.

Figure 3-21 Four Twisted-Pair Straight-Through Cable Pinouts for 10/100/1000 and 1000BASET GBIC Module Ports



1	Router	2	Hub
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Figure 3-22 Four Twisted-Pair Crossover Cable Pinouts for 10/100/1000 and 1000BASET GBIC Module Ports



1	Router	2	Hub
----------	--------	----------	-----

Figure 3-23 Ethernet and Fast Ethernet Straight-Through Cable Pinout, Ethernet Port to a Hub or Repeater

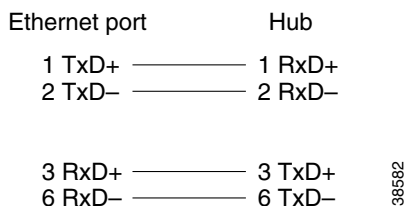
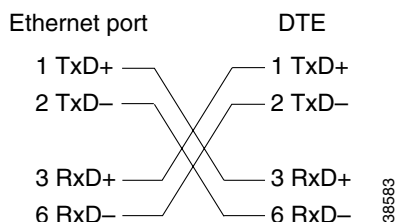
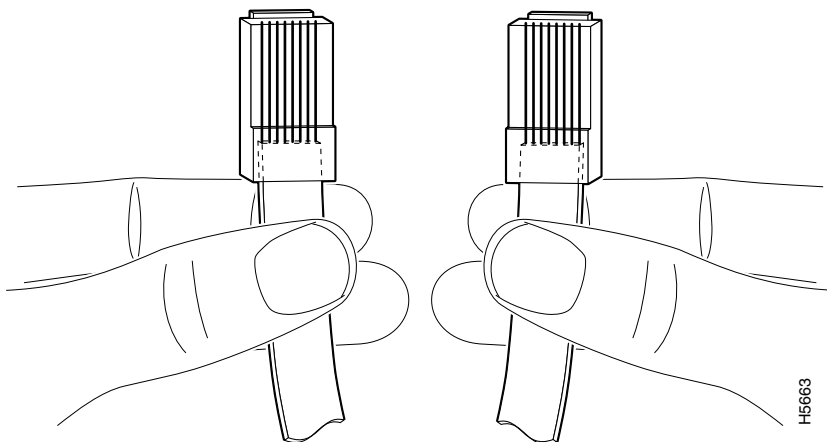


Figure 3-24 Ethernet and Fast Ethernet Crossover Cable Pinout, Ethernet Port to a DTE



To determine whether a UTP cable is a crossover cable or a straight-through cable, hold the two RJ-45 connectors next to each other so you can see the colored wires inside the ends, as shown in [Figure 3-25](#).

Figure 3-25 Crossover or Straight-Through Cable Identification



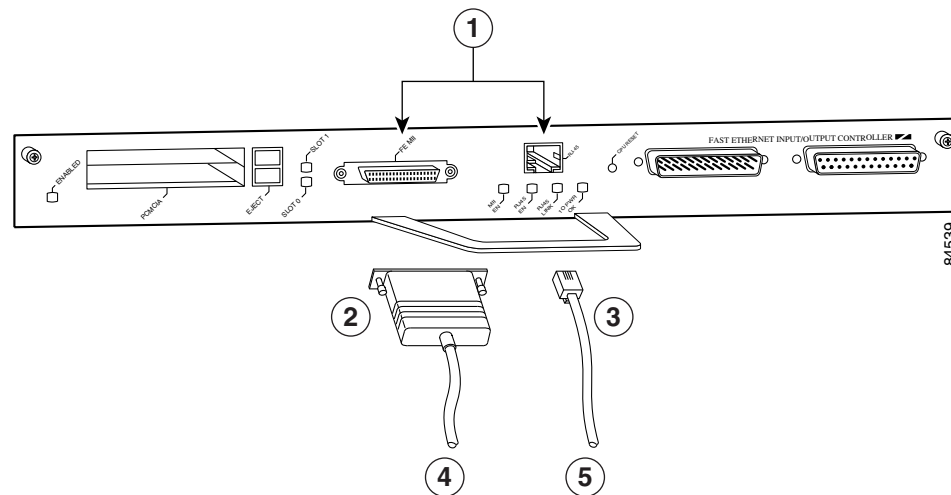
Examine the sequence of colored wires to determine the type of cable, as follows:

- Straight-through—The colored wires are in the same sequence at both ends of the cable.
- Crossover—The first (far left) colored wire at one end of the cable is the third colored wire at the other end of the cable.

Fast Ethernet MII Connections

The MII port on the I/O controller is a 40-pin, D-shell-type connector that is configurable for 100 megabits per second (Mbps). The MII port supports IEEE 802.3u interfaces compliant with the 100BASEX and 100BASET standards. The MII connection requires an external transceiver that permits connection to 100BASEFX or 100BASET4 physical media. (See [Figure 3-26](#).)

Figure 3-26 Fast Ethernet Port Connection



1	Optional Fast Ethernet interface (MII port and RJ-45 port)	4	To transceiver, repeater, or DTE
2	MII connector	5	To repeater or DTE
3	RJ-45 connector		



Caution

Before connecting the transceiver to the MII port on the I/O controller, check the MII transceiver documentation (or with the transceiver manufacturer) to ensure that the transceiver responds to physical sublayer (PHY) address 0; otherwise, anomalies with the MII connection on the I/O controller might occur. (PHY address 0 is defined in section 22.2.4.4 “PHY Address” of the IEEE 802.3u specification.) If you are unable to determine whether the transceiver responds to physical sublayer (PHY) address 0, we recommend using the transceiver’s “Isolation Mode” setting, if present.



Note

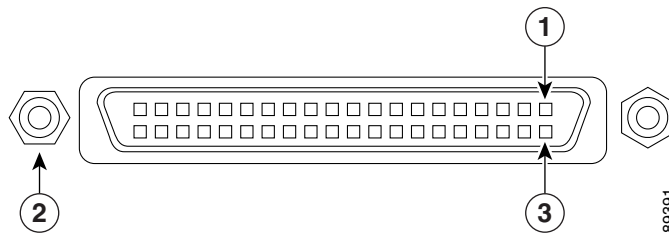
To determine if an MII transceiver that is already connected to the MII port on the I/O controller responds to PHY address 0, ensure that the I/O controller Fast Ethernet port is configured as up and the MII port is configured as the media type, and then disconnect the transceiver from the MII port. If the Fast Ethernet port goes down, the transceiver responds to PHY address 0.

The type of media you use between the MII connection and your router, switch, or hub determines the appropriate connectors for the network side of your 100BASET transceiver.

[Figure 3-27](#) shows the pin orientation of the MII port on the I/O controller.

The MII port uses two 56 screw-type locks, called jackscrews, to secure the cable or transceiver to the port. MII cables and transceivers have knurled thumbscrews that you fasten to the jackscrews on the MII port and tighten with your fingers. Use the jackscrews to secure your MII cable to the MII port.

Figure 3-27 MII Port



1	Pin 1	3	Pin 21
2	Jackscrew		

Table 3-12 lists the pinouts and signals for the I/O controller MII port.

Table 3-12 MII Port Pinouts

Pin ¹	In	Out	I/O	Description
14–17	—	Yes	—	Transmit Data (TxD)
12	Yes	—	—	Transmit Clock (Tx_CLK) ²
11	—	Yes	—	Transmit Error (Tx_ER)
13	—	Yes	—	Transmit Enable (Tx_EN)
3	—	Yes	—	MII Data Clock (MDC)
4–7	Yes	—	—	Receive Data (RxD)
9	Yes	—	—	Receive Clock (Rx_CLK) ²
10	Yes	—	—	Receive Error (Rx_ER)
8	Yes	—	—	Receive Data Valid (Rx_DV)
18	Yes	—	—	Collision (COL)
19	Yes	—	—	Carrier Sense (CRS)
2	—	—	Yes	MII Data Input/Output (MDIO)
22–39	—	—	—	Common (ground)
1, 20, 21, 40	—	—	—	+5.0 volts (V)

1. Any pins not indicated are not used.

2. Tx_CLK and Rx_CLK are provided by the external transceiver.

Connecting to the Console and Auxiliary Ports

The NPE-G1, NPE-G2, and all I/O controllers have a DCE-mode console port for connecting a console terminal, and a DTE-mode auxiliary port for connecting a modem or other DCE device (such as a CSU/DSU or other router) to your router.

**Note**

Both the console and the auxiliary ports are asynchronous serial ports; any devices connected to these ports must be capable of asynchronous transmission. (Asynchronous is the most common type of serial device; for example, most modems are asynchronous devices.)

The I/O controller uses two types of physical media for console port and auxiliary port connections. [Table 3-13](#) describes the I/O controller console and auxiliary port media type for each model.

The NPE-G1 and NPE-G2 use RJ-45 media for console port and auxiliary port connections. See [Table 3-18](#) for console port pinout information and [Table 3-19](#) for auxiliary port pinout information.

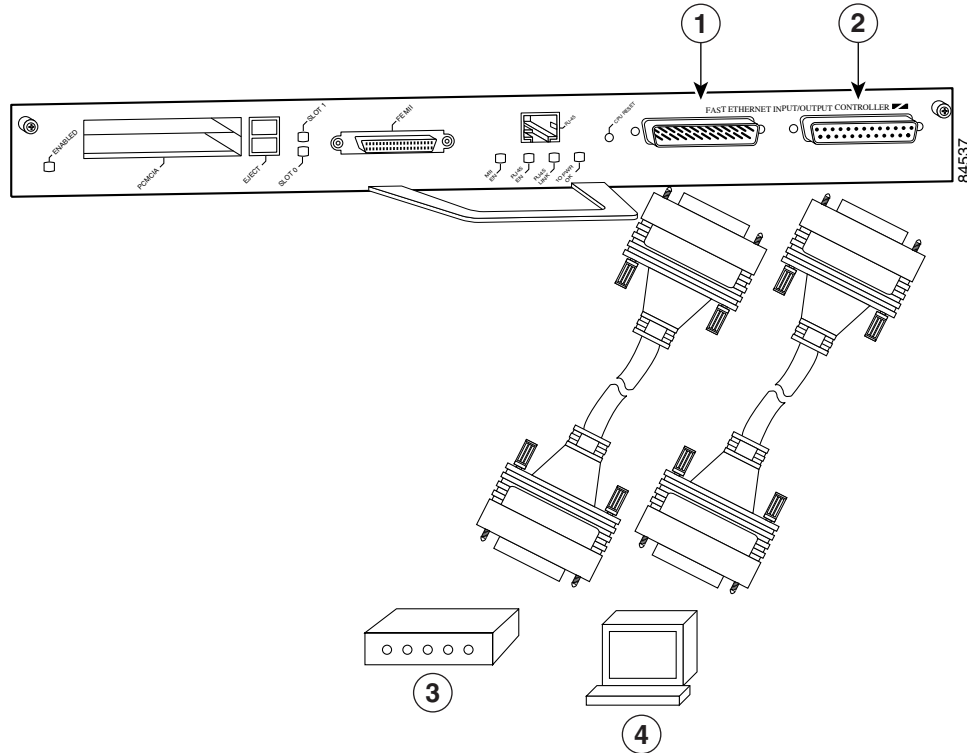
Table 3-13 *Console and Auxiliary Port Physical Media*

Model	Console Port	Auxiliary Port
C7200-I/O-GE+E	RJ-45 port	RJ-45 port
C7200-I/O-2FE/E	RJ-45 port	RJ-45 port
C7200-I/O-FE	DB-25 port	DB-25 connector
C7200-I/O	DB-25 port	DB-25 connector
C7200-I/O-FE-MII	DB-25 port	DB-25 connector

Before connecting a terminal to the console port, configure the terminal to match the router console port as follows: 9600 baud, 8 data bits, no parity, 2 stop bits (9600 8N2). After you establish normal router operation, you can disconnect the terminal.

DB-25 Port Cabling and Pinouts

The DB-25 ports and connectors conform to the EIA/TIA-232 serial data transfer standard for communications between DTE and DCE equipment. [Figure 3-28](#) shows console and auxiliary port connections for DB-25 physical media.

Figure 3-28 Console and Auxiliary Port DB-25 Connections

1	Auxiliary port	3	Modem
2	Console port	4	Console terminal

DB-25 Console Port Signals and Pinouts

Both Data Set Ready (DSR) and Data Carrier Detect (DCD) are supported on the C7200-I/O, C7200-I/O-FE, and C7200-I/O-FE-MII and are active when the system is running. The Request To Send (RTS) signal tracks the state of the Clear To Send (CTS) input. The console port does not support modem control or hardware flow control. [Table 3-14](#) lists the DB-25 console port signals for the C7200-I/O, C7200-I/O-FE, and C7200-I/O-FE-MII. The console port requires a straight-through EIA/TIA-232 cable.

Table 3-14 Console Port Signals for C7200-I/O, C7200-I/O-FE, and C7200-I/O-FE-MII

Pin ¹	Signal	Direction	Description
1	GND	—	Ground
2	TxD	In	Transmit Data
3	RxD	Out	Receive Data
6	DSR	Out	Data Set Ready (always on)
7	GND	—	Ground
8	DCD	Out	Data Carrier Detect (always on)

1. Any pin not referenced is not connected.

DB-25 Auxiliary Port Cabling and Pinouts

Table 3-15 lists the DB-25 auxiliary port signals for the C7200-I/O, C7200-I/O-FE, and C7200-I/O-FE-MII I/O controllers. The auxiliary port supports hardware flow control and modem control.

Table 3-15 Auxiliary Port Signals for C7200-I/O, C7200-I/O-FE, and C7200-I/O-FE-MII

Pin ¹	Signal	Direction	Description
2	TxD	Out	Transmit Data
3	RxD	In	Receive Data
4	RTS	Out	Request To Send (used for hardware flow control)
5	CTS	In	Clear To Send (used for hardware flow control)
6	DSR	In	Data Set Ready
7	GND	—	Signal Ground
8	DCD	In	Data Carrier Detect (used for modem control)
20	DTR	Out	Data Terminal Ready (used for modem control only)

1. Any pin not referenced is not connected.

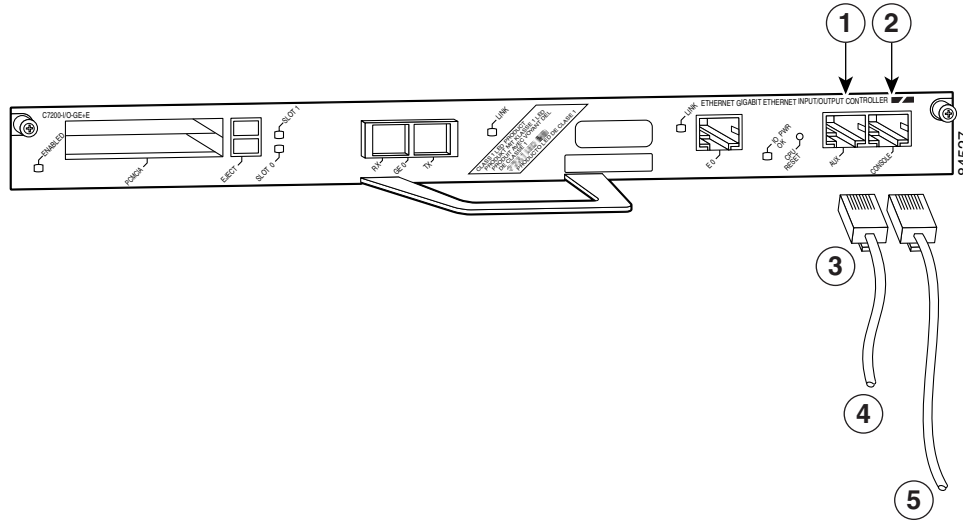


Note

When connecting to an auxiliary port on a Cisco 7200 VXR router, the port will not function at baud rates higher than 19.2k. If the baud rate on the connecting device is set higher than 19.2k, either garbled text or nothing will be displayed on the screen.

RJ-45 Port Cabling and Pinouts

For the NPE-G2, NPE-G1, and the C7200-I/O-GE+E and C7200-I/O-2FE/E I/O controllers, both the console and auxiliary ports use rollover or straight-through cables with RJ-45 connectors. Adapters are available for connection to modems and other external communications equipment. (See Table 3-16.)

Figure 3-29 Console and Auxiliary Port RJ-45 Connector

1	Auxiliary port	4	To modem or DCE
2	Console port	5	To console terminal
3	RJ-45 connectors		

Both ports are configured as asynchronous serial ports. [Figure 3-29](#) shows the RJ-45 console and auxiliary port connections.

An auxiliary and console port cable and adapter kit is available from Cisco Systems (Product Number ACS-2500ASYN=). [Table 3-16](#) describes the cable and adapter configurations that can be used to connect terminals and modems to the console or the auxiliary asynchronous serial port.

**Note**

Both the console and the auxiliary ports are asynchronous serial ports; any devices connected to these ports must be capable of asynchronous transmission. (Asynchronous is the most common type of serial device; for example, most modems are asynchronous devices.)

The NPE-G1 and NPE-G2 use RJ-45 media for console port and auxiliary port connections.

Before connecting a terminal to the console port, configure the terminal to match the router console port as follows: 9600 baud, 8 data bits, no parity, 2 stop bits (9600 8N2). After you establish normal router operation, you can disconnect the terminal.

**Note**

When connecting to an auxiliary port on a Cisco 7200 VXR router, the port will not function at baud rates higher than 19.2k. If the baud rate on the connecting device is set higher than 19.2k, either garbled text or nothing will be displayed on the screen.

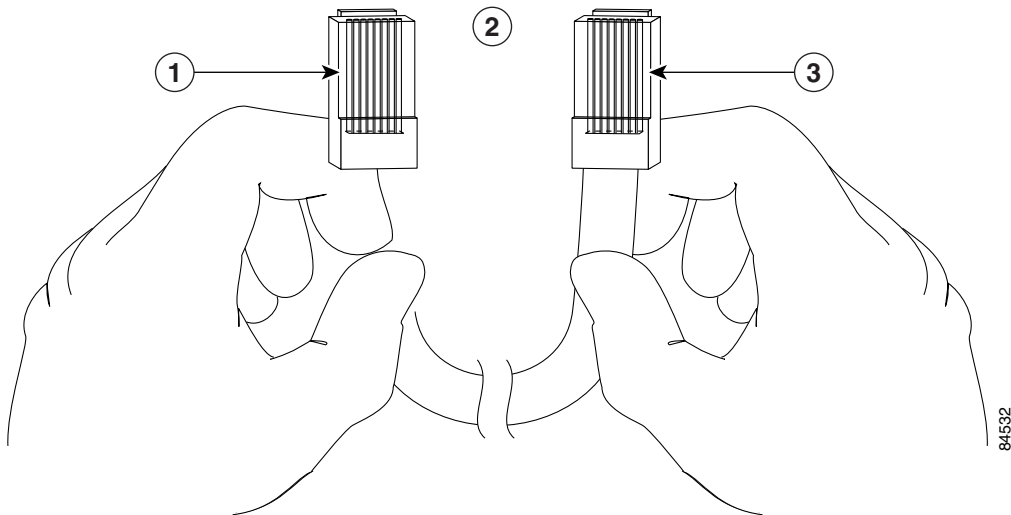
Table 3-16 Pinouts for the RJ-45-to-DB-25 Adapters

Adapter	DTE M/F Pins ¹	DCE M/F Pins	MMOD Pins ²
1	4	5	5
2	20	6	8
3	2	3	3
4	7	7	7
5	7	7	7
6	3	2	2
7	6	20	20
8	5	4	4

1. The female data terminal equipment (FDTE) adapter that is available from Cisco is labeled “Terminal”.
2. The MMOD adapter that is available from Cisco is labeled “Modem”.

Refer to [Table 3-16](#) for a list of the pinouts used on the RJ-45-to-DB-25 adapters, used with an RJ-45 cable, to connect terminals and modems to the Cisco 7200 VXR routers. The cable you use may be a roll-over cable or a straight-through cable.

A roll-over cable can be detected by comparing the two modular ends of the cable. Holding the cables in your hand, side-by-side, with the tab at the back, the wire connected to the pin on the outside of the left plug should be the same color as the pin on the outside of the right plug. If your cable was purchased from Cisco, pin 1 will be white on one connector, and pin 8 will be white on the other (a roll-over cable reverses pins 1 and 8, 2 and 7, 3 and 6, and 4 and 5). (See [Figure 3-30](#).)

Figure 3-30 Identifying a Roll-Over Cable

1	Pin 1	3	Pin 8
2	Pin 1 and pin 8 should be the same color		

The Cisco 7200 VXR routers ship with a roll-over cable. Connection to a terminal or a modem will require an RJ-45-to-DB-25 adapter, and possibly a DB-25-to-DB9 adapter. Refer to [Table 3-17](#) for the cable and adapter configurations that can be used to connect terminals and modems to the Cisco 7200 VXR routers.

Table 3-17 Asynchronous Device Cabling Options

Access Server Port	RJ-45 Cable Type	DB-25 Adapter	End Device
Console or auxiliary	Roll-over	FDTE ¹	Terminal
Console or auxiliary	Straight	FDCE	Terminal
Console or auxiliary	Roll-over	MMOD ²	Modem

1. The FDTE RJ-45-to-DB-25 adapter is labeled “Terminal”.
2. The MMOD RJ-45-to-DB-25 adapter is labeled “Modem”.

RJ-45 Console Port Signals and Pinouts

The NPE-G1, NPE-G2, and the C7200-I/O-2FE/E and C7200-I/O-GE+E I/O controllers do not support Data Carrier Detect (DCD). [Table 3-18](#) lists the RJ-45 console port signals for the NPE-G1, NPE-G2, and the C7200-I/O-2FE/E and C7200-I/O-GE+E I/O controllers.

Table 3-18 Console Port Signals for NPE-G1, NPE-G2, and C7200-I/O-2FE/E and C7200-I/O-GE+E

Pin ¹	Signal	Direction	Description
1	CTS	Out	Clear To Send (tracks RTS)
2	DSR	Out	Data Set Ready (always on)
3	RXD	Out	Receive Data
4	GND	—	Ground
6	TXD	In	Transmit Data
7	DTR	In	Data Terminal Ready
8	RTS	In	Ready To Send

1. Any pin not referenced is not connected.

RJ-45 Auxiliary Port Signals and Pinouts for the NPE-G2, NPE-G1 and I/O Controllers

[Table 3-19](#) lists the RJ-45 auxiliary port signals for the C7200-I/O-2FE/E and C7200-I/O-GE+E I/O controllers and NPE-G1, and NPE-G2

Table 3-19 Auxiliary Port Signals for NPE-G2, NPE-G1 and C7200-I/O-2FE/E and C7200-I/O-GE+E

Pin ¹	Signal	Direction	Description
1	RTS	Out	Ready To Send
2	DTR	Out	Data Terminal Ready
3	TXD	Out	Transmit Data
4 ²	RING	In	Ring Indication

Table 3-19 Auxiliary Port Signals for NPE-G2, NPE-G1 and C7200-I/O-2FE/E and C7200-I/O-GE+E (continued)

Pin ¹	Signal	Direction	Description
5	GND	—	Signal Ground
6	RXD	In	Receive Data
7 ³	DSR/DCD (RLSD)	In	Data Set Ready/Data Carrier Detect (Receive Line Signal Detect)
8	CTS	In	Clear To Send

1. Any pin not referenced is not connected.
2. RING is not supported on Cisco-supplied adapters. To use this pin, you must create a customized cable.
3. Pin 7 can be used as a DCD input for connection to a modem. The RJ-45-to-DB-25F adapter maps DCD to this pin when the adapter is used with a straight-through cable. (See [Table 3-16](#).)



Note

When connecting to an auxiliary port on a Cisco 7200 VXR router, the port will not function at baud rates higher than 19.2k. If the baud rate on the connecting device is set higher than 19.2k, either garbled text or nothing will be displayed on the screen

Connecting Power

This section provides the procedures for connecting AC-input and DC-input power to your Cisco 7200 VXR router.



Warning

This unit might have more than one power cord. To reduce the risk of electric shock, disconnect the two power supply cords before servicing the unit. Statement 14



Note

Detailed instructions for handling and replacing the Cisco 7200 VXR power supplies are contained in the *280-Watt AC Power Supply Replacement Instructions* and *280-Watt DC-Input Power Supply Replacement Instructions* documents. These documents are available on the Documentation DVD and on Cisco.com.



Warning

The AC power supply has double pole/neutral fusing. Statement 188

Connecting AC-Input Power

Connect a 280W AC-input power supply as follows:

- Step 1**
- At the rear of the router, check that the power switch is in the off (O) position.
- Step 2**
- Slide the cable-retention clip up, away from the AC port, and plug in the power cable.
- Step 3**
- Secure the cable in the power supply AC port by sliding the cable-retention clip down until it fits around the connector. The cable-retention clip provides strain relief for the AC power cable. (See Figure 3-31.)

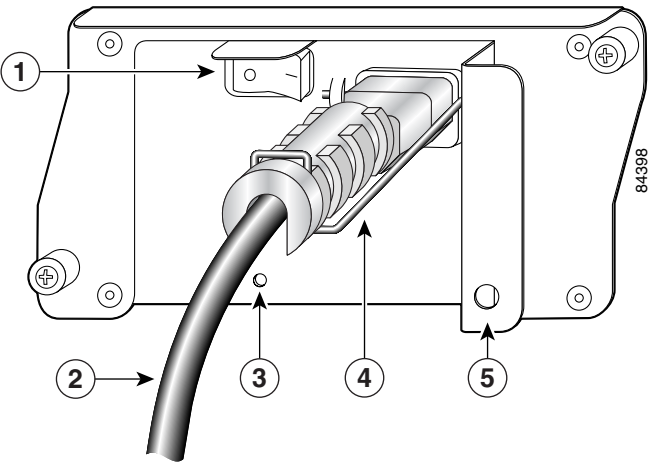


Note For additional AC power cable strain relief, secure the cable to the power supply handle by inserting a nylon cable tie through the hole in the handle and around the cable.

- Step 4**
- Plug the AC power supply cable into the AC power source.
- Step 5**
- Repeat Step 1 through Step 4 for the second power supply (if present).

This completes the procedure for connecting AC-input power.

Figure 3-31 Connecting AC-Input Power



1	Power switch	4	Cable-retention clip
2	AC power cable	5	Hole for nylon cable tie
3	PWR OK LED		

Connecting DC-Input Power

Two 280W DC-input power supplies are available for the Cisco 7200 VXR routers, a –24V and a –48V power supply. To determine which power supply is in your router, look at the power supply ratings label. The 24V label located on the power supply next to the cable connector reads 24 - 60V. The 48V label located on the power supply next to the cable connector reads 48 - 60V. For more information on these power supplies see the *280-Watt DC-Input Power Supply Replacement Instructions* at <http://www.cisco.com/univercd/cc/td/doc/product/core/7200vx/72vxfn/6311dcp.htm>.

Connect a 280W DC-input power supply as follows:

**Note**

The color coding of the DC-input power supply leads depends on the color coding of the DC power source at your site. Typically, green or green/yellow is used for ground. Make certain the lead color coding you choose for the DC-input power supply matches the lead color coding used at the DC power source.

**Warning**

Before completing any of the following procedures, ensure that power is removed from the DC circuit. To ensure that all power is OFF, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the OFF position, and tape the switch handle of the circuit breaker in the OFF position. Statement 322

**Warning**

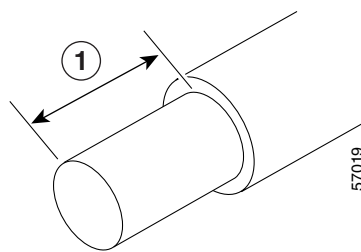
When installing the unit, always make the ground connection first and disconnect it last. Statement 42

**Caution**

The DC return connection to this system is to remain isolated from the system frame and chassis (DC-I).

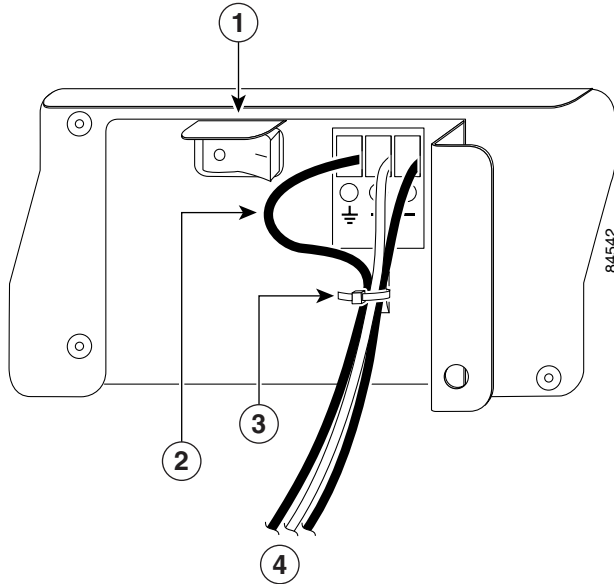
- Step 1** At the rear of the router, check that the power switch is in the off (O) position.
- Step 2** Ensure that no current is running through the –V and +V leads. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the off position, and tape the switch handle of the circuit breaker in the off position.
- Step 3** Disconnect the –V and +V leads.
- Step 4** Using a wire stripper, strip approximately 0.55 inch (14 mm) from the –V, +V, and ground leads. (See [Figure 3-32](#).)

Figure 3-32 Stripping the DC-Input Leads



1	0.55 in. (14 mm)		
----------	------------------	--	--

- Step 5** Insert the stripped end of the ground lead all the way into the ground lead receptacle on the DC-input power supply (see [Figure 3-33](#)), and tighten the receptacle screw using a 3/16-inch flat-blade screwdriver.

Figure 3-33 Connecting DC-Input Power

1	Power switch	3	Cable tie
2	Ground lead service loop	4	DC power leads

- Step 6** Insert the stripped end of the +V lead all the way into the +V lead receptacle and tighten the receptacle screw using the same 3/16-inch flat-blade screwdriver. Repeat this step for the –V lead.



Note Make sure the entire stripped end of each lead is inserted all the way into its receptacle. If any exposed wire at the stripped end of a lead is visible after inserting the lead into its receptacle, remove the lead from the receptacle, use the wire stripper to cut the stripped end of the lead, and repeat [Step 4](#) through [Step 6](#).

- Step 7** After tightening the receptacle screw for the ground, +V, and –V DC-input leads, use a cable tie (see [Figure 3-33](#)) to secure the three leads to the power supply faceplate.



Note When securing the ground, +V, and –V DC-input leads to the power supply faceplate, leave a small service loop in the ground lead to ensure that the ground lead is the last lead to disconnect from the power supply if a great deal of strain is placed on all three leads (see [Figure 3-33](#)).

- Step 8** Switch the circuit breaker to the on position.

This completes the procedure for connecting DC-input power. Your installation is complete. Proceed to [Chapter 4, “Observing System Startup and Performing a Basic Configuration”](#) to start the router and to perform a basic configuration.



CHAPTER 4

Observing System Startup and Performing a Basic Configuration

This chapter describes how to start the system and perform a basic configuration for your Cisco 7200 VXR router. The chapter contains the following sections:

- [Checking Conditions Prior to System Startup, page 4-1](#)
- [Starting the System and Observing Initial Conditions, page 4-2](#)
- [Configuring a Cisco 7200 VXR Router, page 4-3](#)
- [Performing Other Configuration Tasks, page 4-15](#)
- [Using show Commands to Check the Installation, page 4-16](#)
- [Replacing or Recovering a Lost Password, page 4-17](#)
- [Viewing Your System Configuration, page 4-20](#)
- [Performing Complex Configurations, page 4-22](#)



Note

For instructions about how to perform a basic configuration for a Cisco 7206VXR as a router shelf in a Cisco AS5800 Universal Access Server, refer to the Cisco AS5800 Universal Access Server publications that shipped with your access server.

This chapter guides you through a basic router configuration, which is sufficient for you to access your network. Complex configuration procedures are beyond the scope of this publication and can be found in 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.

To configure a Cisco 7200 VXR router from a console, you need to connect a terminal to the router console port. Configuration requires access to the console port on the router I/O controller.

Checking Conditions Prior to System Startup

Check the following conditions before you start your router:

- Each port adapter is inserted in its slot and its respective port adapter lever is in the locked position.
- The network services engine (NSE) or network processing engine (NPE) and the I/O controller, or the Port Adapter Jacket Card with and NPE-G1 and NPE-G2, are inserted in their slots and their captive installation screws are tightened.

- All network interface cables are connected to the port adapters.
- A CompactFlash Disk, Flash Disk or Flash memory card is installed in its slot.
- Each power cable is connected and secured with the cable-retention clip.
- The console terminal is turned on.

You are now ready to start your router. Proceed to the section “[Starting the System and Observing Initial Conditions](#).”

Starting the System and Observing Initial Conditions

After installing your Cisco 7200 VXR router and connecting cables, start the router as follows:

- Step 1** At the rear of the router, place the power switch on the power supply in the on (I) position. Repeat this if a second power supply is installed. The green OK LED on the power supply turns on.



Note When powering on or power off the router, wait 30 seconds before powering it on or powering it off again.

- Step 2** Listen for the fans; you should immediately hear them operating.
- Step 3** During the boot process, observe the system LEDs. The LEDs on most of the port adapters go on and off in irregular sequence. If the Port Adapter Jacket Card is installed, observe its LEDs. Some may go on, go out, and go on again for a short time. On the I/O controller, the IO power OK LED comes on immediately.
- Step 4** Observe the initialization process. When the system boot is complete (a few seconds), the network processing engine or network services engine begins to initialize the port adapters and the I/O controller. During this initialization, the LEDs on each port adapter behave differently (most flash on and off).

The enabled LED on each port adapter goes on when initialization is completed, and the console screen displays a script and system banner similar to the following:

```
Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-JS-M), Released Version 12.0(19980705:021501)Copyright(c)
1986-1998 by cisco Systems, Inc.
Compiled Tue 25-Aug-98 14:38 by xxxxx
Image text-base: 0x600088C4, data-base: 0x60FA6000
```

- Step 5** When you start up the router for the first time, the system automatically enters the setup facility, which determines which port adapters are installed and prompts you for configuration information for each one. On the console terminal, after the system displays the system banner and hardware configuration, you will see the following System Configuration Dialog prompt:

```
--- System Configuration Dialog ---
```

```
At any point you may enter a questions mark '?' for help.
Use ctrl-c to abort configuration dialog at any prompt.
Default settings are in square brackets '['].
```

```
continue with configuration dialog? [yes]:
```

You have the option of proceeding with the setup facility to configure the interfaces, or exiting from setup and using configuration commands to configure global (system-wide) and interface-specific parameters. You do not have to configure the interfaces immediately; however, you cannot enable the interfaces or connect them to any networks until you have configured them.

Many of the port adapter LEDs do not go on until you have configured the interfaces. To verify correct operation of each interface, complete the first-time startup procedures and configuration, and then refer to the configuration note for each port adapter for LED descriptions and to check the status of the interfaces.

If the system does not complete each of the steps in the startup procedure, proceed to [Chapter 5, “Troubleshooting the Installation”](#) for troubleshooting recommendations and procedures.

Configuring a Cisco 7200 VXR Router

Before configuring the router, determine whether or not you want to use a management tool such as Cisco Security Device Manager.

Cisco Security Device Manager (SDM), version 1.1, is an optional Java-based device-management tool that allows you to configure LAN interfaces, routing, Network Address Translation (NAT), firewalls, Virtual Private Networks (VPNs), and other features without knowledge of the Cisco command-line interface (CLI). You can configure features such as Access Control Lists (ACLs), routing protocols, and other options using SDMs advanced mode.



Note

You will need to use CLI commands to configure several features that SDM does not support. SDM does not support the following features: WAN configuration, Gigabit Ethernet (GE) interfaces, AA client, EZ VPN server, QoS, SSHv2, DHCP server configuration options, and usability enhancements.

SDM is preinstalled on your router's Flash Disk or CompactFlash Disk when it is ordered as part of a VPN bundle or as part of a 7xxx VPN bundle. If your router did not ship with SDM preinstalled, you can download a free copy from the Software Center at Cisco.com at <http://www.cisco.com/kobayashi/sw-center/index.shtm>. Because SDM uses a GUI, it requires that you access it from a PC using a supported web browser. Go to the [Security Device Manager \(SDM\), Version 1.1 User Note for the 7xxx Routers](#) for more information.

You can configure your Cisco 7200 VXR router using one of the procedures described in the following sections:

- [Performing a Basic Configuration Using AutoInstall, page 4-4](#)
- [Performing a Basic Configuration Using the Setup Facility, page 4-4](#)
- [Configuring Port Adapter Interfaces, page 4-10](#)
- [Performing a Basic Configuration Using Global Configuration Mode, page 4-14](#)

Follow the procedure that best fits the needs of your network configuration.



Note

You need to acquire the correct network addresses from your system administrator or consult your network plan to determine correct addresses before you can complete the router configuration.

Before continuing the configuration process, check the current state of the router by entering the **show version** command. The **show version** command displays the release of Cisco IOS software that is available on the router.

Performing a Basic Configuration Using AutoInstall

The AutoInstall process is designed to configure the Cisco 7200 VXR router automatically after connection to your WAN. For AutoInstall to work properly, a Transmission Control Protocol/Internet Protocol (TCP/IP) host on your network must be preconfigured to provide the required configuration files. The TCP/IP host may exist anywhere on the network as long as the following two conditions are maintained:

1. The host must be on the remote side of the router synchronous serial connection to the WAN.
2. User Datagram Protocol (UDP) broadcasts to and from the router and the TCP/IP host are enabled.

This functionality is coordinated by your system administrator at the site where the TCP/IP host is located. You should not use AutoInstall unless the required files are available on the TCP/IP host. Refer to the publications *Configuration Fundamentals Configuration Guide* and *Configuration Fundamentals Command Reference* for information about how AutoInstall works.

Complete the following steps to prepare your Cisco 7200 VXR router for the AutoInstall process:

-
- Step 1** Attach the appropriate synchronous serial cable to synchronous serial interface 0 on the router.
- Step 2** Turn the power switch on each power supply to the on (I) position. (This action turns on AC power to the router.)



Note

After powering off the router, wait at least 30 seconds before powering it on again.

The router loads the operating system image from Flash memory. If the remote end of the WAN connection is connected and properly configured, the AutoInstall process begins.

Once the AutoInstall process is completed, use the **copy running-config startup-config** command to write the configuration data to the router's nonvolatile random-access memory (NVRAM). Perform the following step to complete this task.

- Step 3** At the # prompt, enter the following command:

```
Hostname# copy running-config startup-config
```



Note

Completing Step 3 saves the configuration settings that the AutoInstall process created to NVRAM. If you fail to do this, your configuration will be lost the next time you reload the router.

Performing a Basic Configuration Using the Setup Facility

If you do not plan to use AutoInstall, do not connect the router's serial (WAN) cable to the channel service unit/data service unit (CSU/DSU). If the WAN cable is not connected, the router boots from Flash memory and goes automatically into the setup facility.



Note

You can run the setup facility any time you are at the enable prompt (#) by entering the **setup** command.

If the serial (WAN) cable is connected to the CSU/DSU and the router does not have a configuration stored in NVRAM, the router attempts to run AutoInstall at startup. The router may take several minutes to determine that AutoInstall is not set up to a remote TCP/IP host. Once the router determines that AutoInstall is not configured, it defaults to the setup facility.

Configuring Global Parameters

When you first start the setup program, you must configure the global parameters. These parameters are used for controlling system-wide settings. Complete the following steps to enter the global parameters:

- Step 1** Connect a console terminal to the console port on the I/O controller, NPE-G1, or NPE-G2, and then boot the router.

The system boots from Flash memory. The following information appears after about 30 seconds. When you see this information, you have successfully booted your router:

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cisco Systems, Inc.
170 West Tasman Drive
San Jose, California 95134-1706

Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-JS-M), Released Version 12.0(19980705:021501) Copyright(c)
1986-1998 by cisco Systems, Inc.
Compiled Thu 15-Oct-98 02:20 by xxxxx
Image text-base: 0x600088C4, data-base: 0x60FA6000

cisco 7206VXR (NPE300) processor with 61440K/20480K bytes of memory.
R7000 CPU at 262Mhz, Implementation 39, Rev 1.0, 256KB L2, 2048KB L3 Cache
Six slot VXR midplane, Version 2.0

Last reset from power-on
Bridging software.
X.25 software, Version 3.0.0.
SuperLAT software (copyright 1990 by Meridian Technology Corp).
TN3270 Emulation software.
8 Ethernet/IEEE 802.3 interface(s)
3 FastEthernet/IEEE 802.3 interface(s)
125K bytes of non-volatile configuration memory.

20480K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
8192K bytes of Flash PCMCIA card at slot 1 (Sector size 128K).
4096K bytes of Flash internal SIMM (Sector size 256K).!!

Press RETURN to get started!

The first two sections of the configuration script (the banner and the installed hardware) appear only at initial system startup. On subsequent uses of the setup facility, the script begins with a System Configuration Dialog as shown in the following example.

```
--- System Configuration Dialog ---
```

```
At any point you may enter a question mark '?' for help.
Use ctrl-c to abort configuration dialog at any prompt.
Default settings are in square brackets '[]'.
```

- Step 2** When asked if you want to enter the initial configuration dialog and see the current interface summary, enter **yes** or press **Return**:

```
Would you like to enter the initial configuration dialog? [yes]:
```

```
First, would you like to see the current interface summary? [yes]:
```

In the following example, the summary shows a Cisco 7200 VXR router at first-time startup; that is, nothing is configured.

```
Any interface listed with OK? value "NO" does not have a valid configuration
```

Interface	IP-Address	OK?	Method	Status	Protocol
ATM1/0	unassigned	NO	unset	down	down
FastEthernet2/0	unassigned	NO	unset	down	down

- Step 3** Choose which protocols to support on your interfaces. For Internet Protocol (IP)-only installations, you can accept the default values for most of the questions. A typical configuration using IP, IPX, and AppleTalk follows and continues through [Step 8](#):

```
Configuring global parameters:
```

```
Enter host name [Router]:
```

- Step 4** Enter enable secret, enable, and virtual terminal passwords:

```
The enable secret password is a one-way cryptographic secret
password used instead of the enable password when it exists.
```

```
Enter enable secret: barney
```

```
The enable password is used when there is no enable secret
password and when using older software and some boot images.
```

```
Enter enable password: betty
```

```
Enter virtual terminal password: fred
```

- Step 5** The Simple Network Management Protocol (SNMP) is the most widely supported open standard for network management. It provides a means to access and set configuration and run-time parameters of routers and communication servers. SNMP defines a set of functions that can be used to monitor and control network elements.

Enter **yes** or press **Return** to accept SNMP management; enter **no** to refuse it:

```
Configure SNMP Network Management? [yes]:
Community string [public]:
```

Step 6 For the following queries, do not enable VINES, LAT, DECnet, CLNS, bridging, XNS, or Apollo:

```
Configure Vines? [no]:
Configure LAT? [no]:
Configure DECnet? [no]:
Configure CLNS? [no]:
Configure bridging? [no]:
Configure XNS? [no]:
Configure Apollo? [no]:
```

Step 7 For the following queries, enable routing on AppleTalk and IPX:

```
Configure AppleTalk? [no]: yes
    Multizone networks? [no]: yes

Configure IPX? [no]: yes
```

Step 8 In most cases you use IP routing. If you are using IP routing, you must also select an interior routing protocol. You can specify only one of two interior routing protocols to operate on your system using the setup facility: Interior Gateway Routing Protocol (IGRP) or Routing Information Protocol (RIP).

To configure IP routing, enter **yes** (the default) or press **Return**, and then select an interior routing protocol:

```
Configure IP? [yes]:
    Configure IGRP routing? [yes]:
        Your IGRP autonomous system number [1]: 15
```

The following sample display includes a continuous listing of all configuration parameters selected in [Step 3](#) through [Step 8](#). Only IP, IPX, and AppleTalk are the selected protocols for this example.

Configuring global parameters:

```
Enter host name [Router]: router
```

The enable secret is a one-way cryptographic secret used instead of the enable password when it exists.

```
Enter enable secret: barney
```

The enable password is used when there is no enable secret and when using older software and some boot images.

```
Enter enable password: betty
Enter virtual terminal password: fred
Configure SNMP Network Management? [yes]:
    Community string [public]:
Configure Vines? [no]:
Configure LAT? [no]:
Configure AppleTalk? [no]: yes
    Multizone networks? [no]: yes
Configure DECnet? [no]:
Configure IP? [yes]:
    Configure IGRP routing? [yes]:
        Your IGRP autonomous system number [1]: 15
    Configure RIP routing? [no]:
Configure CLNS? [no]: n
Configure bridging? [no]:
Configure IPX? [no]: yes
Configure XNS? [no]:
Configure Apollo? [no]:
```

- Step 9** Save your settings to NVRAM. (See the “[Saving the Running Configuration to NVRAM](#)” section on [page 4-15](#).) If you do not save the configuration setting that you created in the router using configuration mode and the setup facility, your configuration will be lost the next time you reload the router.

Configuring the Native Gigabit Ethernet Interfaces

The NPE-G2 and NPE-G1 report both the RJ-45 and SFP or GBIC GE interface ports as GigabitEthernet 0/1, GigabitEthernet 0/2, and GigabitEthernet 0/3. Before configuring either interface, you must first use the **media-type** interface command to select the media type, either the GBIC (**gbic**) for NPE-G1 or SFP (**sfp**) for NPE-G2, RJ-45 (**rj45**) port.



Note

The RJ-45 port is the default media.

Changing the Media Type of the Native Gigabit Ethernet GBIC or SFP or RJ-45 Ports

To be able to use a particular media port, use Cisco IOS to select the media type. This is done by using the **media-type** interface command:

```
media-type { gbic | sfp | rj45 }
```

Example:

```
interface GigabitEthernet 0/1
media-type rj45
end
```

Configuring the Interface Transmission and Speed Modes

- Step 1** After changing the media type, configure the speed and transmission modes to appropriately match the new interface characteristics. Changing the speed and duplex of an NPE-G1 or NPE-G2 Gigabit Ethernet interface is done using the **speed** and **duplex** interface commands.



Note

These commands are only applicable when using the RJ-45 media.

```
speed { 10 | 100 | 1000 | auto }
duplex { full | half | auto }
```

The following speed/duplex settings are supported:

Media Type	Speed	Duplex
RJ45	10, 100, 1000, auto	full, half, auto
GBIC (1)	1000, auto(2)	full, half, auto

- If you are using the **no negotiation auto** command, the speed and duplex should be set to a value other than **auto** for correct operation.
- The only available speed in the no autonegotiation mode is **1000 Mbps**; there is no difference whether **1000** or **auto** is selected.

When using the GBIC media, there is also the additional **negotiation auto** command that is used to enable the IEEE 802.1z Gigabit Ethernet (1000 Mbps) autonegotiation protocol.

- Step 2** To turn the autonegotiation feature off (it is on by default), issue the interface command **no negotiation auto**. This is useful for connecting to other Gigabit Ethernet equipment that does not support 802.1z autonegotiation.

**Note**

The autonegotiation feature is not supported when using the rj-45 media type and will be ignored if implementation is attempted

If you change from the GBIC or SFP to the RJ-45 media type, you must set speed and duplex after you have executed the **media-type** command to ensure the interface will operate in the correct mode.

The **media-type GBIC** or **media-type SFP** mode will always default to 1000 Mbps. Both full-duplex and half-duplex operation are supported in this mode.

Sample Configuration

The following shows a typical configuration for the three Gigabit Ethernet interfaces on the NPE-G1. In this example, the first interface is configured for the GBIC media type, the second interface is configured for the RJ-45 media type, and the third interface is not used.

```
interface GigabitEthernet0/1
ip address 10.198.75.35 255.255.255.240
load-interval 30
no keepalive
duplex full
speed 1000
media-type gbic
no negotiation auto
no cdp enable
no shutdown
!
interface GigabitEthernet0/2
ip address 10.179.16.2 255.255.255.240
duplex auto
speed auto
media-type rj45
no cdp enable
no shutdown
!
interface GigabitEthernet0/3
no ip address
shutdown
duplex auto
speed auto
media-type rj45
no negotiation auto
no cdp enable
```

**Note**

At the very minimum, an interface must be configured with the **ip address**, **media-type**, and **speed** commands before it can be enabled using the **no shutdown** command. Other interface commands might be needed, depending on the nature of the connected network.

Debugging

Cisco IOS provides two commands to provide information on your interfaces: **show interface GigabitEthernet 0/X** (where X is 1, 2, or 3) and **show controllers GigabitEthernet 0/1**

The output of the **show interface** command is useful for determining the current operating mode of the interface (speed/duplex/media-type) and the current interface statistics.

The output of the **show controller** command displays more information specific to the I/O controller interface. For example, it shows the detected link status, speed, and duplex, and also determines the current status of autonegotiation and the link partners' abilities (if it is an autonegotiation-capable interface).

The **show controller** command also displays the current operating state of the driver and the Ethernet controller hardware. The **show controller** command is a very powerful debugging aid, especially for Cisco engineers should you need help in debugging a problem. If you have any problems with your Gigabit Ethernet interfaces, you will need to provide this information to Cisco for analysis.

Resetting the Interface on the NPE-G1 or NPE-G2

Should you have a problem with your interface and wish to try and reset it, use the command:

clear interface GigabitEthernet 0/X (where X is 1, 2, or 3.)

Clearing Counters on the NPE-G1 or NPE-G2

Interface counters on the NPE-G1 or NPE-G2 may be cleared (reset) by using the command:

clear counters GigabitEthernet 0/X (where X is 1, 2, or 3.)

This will not reset the interface.

Configuring Port Adapter Interfaces

Following are the steps for configuring interfaces to allow communication over a LAN or WAN. To configure the interface parameters, you need your interface network addresses and subnet mask information. Consult with your network administrator for this information.

Configuring ATM Interfaces

In the following example, an ATM interface in slot 1 is configured for an ATM LAN using IP. Follow these steps to configure an ATM interface.

Step 1 Using your own addresses and mask at the setup prompts, respond to the prompts as follows:

Configuring interface parameters:

Configuring interface ATM1/0:

Is this interface in use? [yes]:

Configure IP on this interface? [yes]:

IP address for this interface: **1.1.1.10**

Number of bits in subnet field [0]:

Class C network is 1.1.1.0, 0 subnet bits; mask is /24

- Step 2** Determine if you are going to enable IPX on this interface; if you are, enter the unique IPX network number:

```
Configure IPX on this interface? [no]: yes
IPX network number [2]:
```

- Step 3** If you are using AppleTalk on the interface, enter **yes**. Enter **yes** to configure for extended AppleTalk networks, and then enter the cable range number. Enter the zone name and any other additional zones that are associated with your local zone:

```
Configure AppleTalk on this interface? [no]: yes
Extended AppleTalk network? [no]: yes
AppleTalk starting cable range [0]:
```



Note

If additional ATM interfaces are available in your system, you are prompted for their configurations as well.

- Step 4** Save your settings to NVRAM. (See the [“Saving the Running Configuration to NVRAM”](#) section on page 4-15.)

Configuring Fast Ethernet Interfaces

In the following example, a Fast Ethernet interface in slot 2 is configured for a Fast Ethernet LAN using IP. Follow these steps to configure Fast Ethernet interfaces.

- Step 1** Using your own addresses and mask at the setup prompts, respond to the prompts as follows:

Configuring interface parameters:

```
Configuring interface FastEthernet2/0:
Is this interface in use? [yes]:
Use the 100 Base-TX (RJ-45) connector? [yes]:
Operate in full-duplex mode? [no]:
Configure IP on this interface? [yes]:
IP address for this interface: 1.1.1.20
Number of bits in subnet field [0]:
Class C network is 1.1.1.0, 0 subnet bits; mask is /24
```

- Step 2** Determine if you are going to enable IPX on this interface; if you are, enter the unique IPX network number:

```
Configure IPX on this interface? [no]: yes
IPX network number [2]:
```

- Step 3** If you are using AppleTalk on the interface, enter **yes**. Enter **yes** to configure for extended AppleTalk networks, and then enter the cable range number. Enter the zone name and any other additional zones that are associated with your local zone:

```
Configure AppleTalk on this interface? [no]: yes
Extended AppleTalk network? [no]: yes
AppleTalk starting cable range [0]:
```

- Step 4** Save your settings to NVRAM. (See the “[Saving the Running Configuration to NVRAM](#)” section on [page 4-15](#).) If you do not save the configuration setting that you created in the router using configuration mode and the setup facility, your configuration will be lost the next time you reload the router.

**Note**

If additional Fast Ethernet interfaces are available in your system, you are prompted for their configurations as well.

Configuring Synchronous Serial Interfaces

Synchronous serial interfaces are configured to allow connection to WANs through a CSU/DSU. In the following example, a serial interface in slot 3 is configured for a WAN connection using IP. Follow these steps to configure synchronous serial interfaces:

- Step 1** Using your own addresses and mask at the setup prompts, respond to the prompts as follows:

Configuring interface parameters:

```
Configuring interface serial 3/0:
Is this interface in use? [yes]:
Configure IP on this interface? [yes]:
IP address for this interface: 1.1.1.30
Number of bits in subnet field [0]:
Class A network is 1.1.1.0, 0 subnet bits; mask is /24
```

- Step 2** Determine if you are going to enable IPX on this interface; if you are, enter the unique IPX network number:

```
Configure IPX on this interface? [no]: yes
IPX network number [2]:
```

- Step 3** If you are using AppleTalk on the interface, enter **yes**. Enter **yes** to configure for extended AppleTalk networks, and then enter the cable range number. Enter the zone name and any other additional zones that are associated with your local zone:

```
Configure AppleTalk on this interface? [no]: yes
Extended AppleTalk network? [no]: yes
AppleTalk starting cable range [0]:
```

- Step 4** Save your settings to NVRAM. (See the “[Saving the Running Configuration to NVRAM](#)” section on [page 4-15](#).) If you do not save the configuration setting that you created in the router using configuration mode and the setup facility, your configuration will be lost the next time you reload the router.

**Note**

If additional synchronous serial interfaces are available in your system, you are prompted for their configurations as well.

The following sample display includes a continuous listing of all interface configuration parameters selected for ATM, Fast Ethernet, and serial interfaces.

```
Configuring interface parameters:
```

```
Configuring interface ATM1/0:
```

```

Is this interface in use? [yes]:
Configure IP on this interface? [yes]:
  IP address for this interface: 1.1.1.10
  Number of bits in subnet field [0]: 0
  Class C network is 1.1.1.0, 0 subnet bits; mask is /24
Configure IPX on this interface? [yes]:
  IPX network number [2]:
Configure AppleTalk on this interface? [no]: yes
  Extended AppleTalk network? [no]: yes
  AppleTalk starting cable range [0]:

Configuring interface FastEthernet2/0:
Is this interface in use? [yes]:
Use the 100 Base-TX (RJ-45) connector? [yes]:
Operate in full-duplex mode? [no]:
Configure IP on this interface? [yes]:
  IP address for this interface: 1.1.1.20
  Number of bits in subnet field [0]:
  Class C network is 1.1.1.0, 0 subnet bits; mask is /24
Configure IPX on this interface? [yes]:
  IPX network number [2]:
Configure AppleTalk on this interface? [no]: yes
  Extended AppleTalk network? [no]: yes
  AppleTalk starting cable range [0]:

Configuring interface Serial3/0:
Is this interface in use? [no]: yes
Configure IP on this interface? [no]: yes
Configure IP unnumbered on this interface? [no]:
  IP address for this interface: 1.1.1.30
  Number of bits in subnet field [0]:
  Class A network is 1.0.0.0, 0 subnet bits; mask is 255.0.0.0
Configure IPX on this interface? [no]: yes
  IPX network number [2]:
Configure AppleTalk on this interface? [no]: yes
  Extended AppleTalk network? [no]:
  AppleTalk network number [1]:

```

The following configuration command script was created:

```

hostname Router
enable secret 5 $1$u8z3$PMYY8em./8sszhzk78p/Y0
enable password betty
line vty 0 4
password fred
snmp-server community public
!
ip routing
no vines routing
ipx routing
appletalk routing
no apollo routing
no decnet routing
no xns routing
no clns routing
no bridge 1
! Turn off IPX to prevent network conflicts.
interface ATM1/0
ip address 1.1.1.10 255.0.0.1
appletalk cable-range 0-0 0.0
appletalk discovery
!
interface FastEthernet2/0
media-type 100BaseX

```

```

half-duplex
ip address 1.1.1.20 255.0.0.2
appletalk cable-range 0-0 0.0
appletalk discovery
!
interface serial3/0
ip address 1.1.1.30 255.0.0.3
ip route-cache cbus
no keepalive
!
!
router igrp 15
network 1.0.0.0
!
end

```

Use this configuration? [yes/no]: **yes**
 Building configuration...
 Use the enabled mode 'configure' command to modify this configuration.

Press RETURN to get started!

Your router is now minimally configured and ready to use. You can use the **setup** command if you want to modify the parameters after the initial configuration. To perform more complex configurations, use the **configure** command.

For information on additional interface configuration and specific system configurations, 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.

Performing a Basic Configuration Using Global Configuration Mode

You can configure a Cisco 7200 VXR router manually if you prefer not to use the setup facility or AutoInstall. Complete the following steps to configure the router manually:

-
- Step 1** Connect a console terminal to the console port on the I/O controller.
- Step 2** When asked if you want to enter the initial dialog, answer **no** to go into the normal operating mode of the router:
- ```
Would you like to enter the initial dialog? [yes]: no
```
- Step 3** After a few seconds the user EXEC prompt (*Router>*) is displayed. Type **enable** to enter enable mode (configuration changes can only be made in enable mode):
- ```
Router> enable
```
- The prompt changes to the privileged EXEC prompt:
- ```
Router#
```
- Step 4** Enter the **config terminal** command at the enable prompt to enter configuration mode from the terminal:
- ```
Router# config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
```

At the *Router(config)#* prompt, enter the **interface type slot/port** command to enter the interface configuration mode:

```
Router(config)# interface serial slot/port  
Router(config-int)#
```

In either configuration mode, you can now enter any changes to the configuration. Press **Ctrl-Z** (hold down the **Control** key while you press **Z**) or enter **end** to exit configuration mode and return to the EXEC command interpreter.

- Step 5** Save your settings to NVRAM. (See the [“Saving the Running Configuration to NVRAM”](#) section on page 4-15.) If you do not save the configuration setting that you created in the router using configuration mode and the setup facility, your configuration will be lost the next time you reload the router.
-

Your router is now minimally configured and will boot with the configuration you have entered. To see a list of the configuration commands available to you, enter **?** at the prompt or press the **Help** key while in configuration mode.

Saving the Running Configuration to NVRAM

To store the configuration or changes to your startup configuration in NVRAM, enter the **copy running-config startup-config** command at the Router# prompt:

```
Router# copy running-config startup-config
```

Using this command saves the configuration settings that you created in the router using configuration mode and the setup facility. If you fail to do this, your configuration will be lost the next time you reload the router.

Checking the Running Configuration Settings

To check the value of the settings you have entered, enter the **show running-config** command at the Router# prompt:

```
Router# show running-config
```

To review changes you make to the configuration, use the EXEC mode **show startup-config** command to display the information stored in NVRAM.

Performing Other Configuration Tasks

To make advanced configuration changes after you establish the basic startup configuration for your router, 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. These publications contain additional information on using the **configure** command.

The configuration publications also provide information about the following tasks:

- Understanding and working with the user interface on your router
- Booting and rebooting the router
- Setting the configuration register

- Loading configuration files or system images using remote copy protocol (rcp) or Trivial File Transfer Protocol (TFTP)
- Reloading the operating system

Using show Commands to Check the Installation

Use **show** commands to identify the hardware installed in your router, to verify the operation status, to view interface configuration settings, and to troubleshoot your router configuration. The interfaces on the NPE-G1 or NPE-G2 are identified by their chassis slot number and interface port number (*slot/port*). The interfaces on your I/O controller are also identified by chassis slot number and interface port number (*slot/port*). The chassis slot number for the I/O controller is always slot0. [Table 4-1](#) lists the NPE-G, NPE-G2, and the I/O controller models, their corresponding interfaces, and the interface addressing syntax for each interface.

Table 4-1 Identifying Interface Addresses on the NPE-G1, NPE-G2 and Various I/O Controllers

Model	Interface	Numbers	Syntax
NPE-G1 or NPE-G2	Gigabit Ethernet (port 0/1) ¹	Chassis slot—always 0	Gigabit Ethernet 0/1
	Gigabit Ethernet (port 0/2)	Interface port—1, 2, or 3	Gigabit Ethernet 0/2
	Gigabit Ethernet (port 0/3)		Gigabit Ethernet 0/3
C7200-I/O-GE+E	Gigabit Ethernet (port GE0)	Chassis slot—always 0 Interface port—0	gigabitethernet 0/0
	Ethernet (port E0)	Chassis slot—always 0 Interface port—0	fastethernet 0/0
C7200-I/O-2FE/E	Fast Ethernet/Ethernet (port0)	Chassis slot—always 0 Interface port—0	fastethernet 0/0
	Fast Ethernet/Ethernet (port1)	Chassis slot—always 0 Interface port—1	fastethernet 0/1
C7200-I/O-FE ²	Fast Ethernet (MII or RJ-45)	Chassis slot—always 0 Interface port—0	fastethernet 0/0
C7200-I/O	No interface ports	—	—
C7200-I/O-FE-MII ³	Fast Ethernet (MII)	Chassis slot—always 0 Interface port—0	fastethernet 0/0

1. Both optical and copper ports report the same syntax. For example, Gigabit Ethernet RJ-45 port 0/2 reports GigabitEthernet 0/2, as does Gigabit Ethernet GBIC port 0/2.
2. The Product Number C7200-I/O-FE does not specify MII because both an MII and an RJ-45 receptacle are included.
3. The I/O controller with the Product Number C7200-I/O-FE-MII has a single MII FastEthernet receptacle only. Although still supported by Cisco Systems, this I/O controller with a single MII receptacle is no longer an orderable product as of May 1998.

Replacing or Recovering a Lost Password

This section describes how to recover a lost enable or console login password, and how to replace a lost enable secret password on your Cisco 7200 VXR router.

**Note**

It is possible to recover the enable or console login password. The enable secret password is encrypted, however, and must be replaced with a new enable secret password.

Overview of the Password Recovery Procedure

Following is an overview of the steps in the password recovery procedure:

- Step 1** If you can log in to the router, enter the **show version** command to determine the existing configuration register value.
- Step 2** Press the **Break** key to get to the bootstrap program prompt (ROM monitor). You might need to reload the system image by power cycling the router.
- Step 3** Change the configuration register so the following functions are enabled:
 - a. Break
 - b. Ignore startup configuration
 - c. Boot from Flash memory
- Step 4** Power cycle the router by turning power off and then back on. However, after powering off the router, wait at least 30 seconds before powering it on again.
- Step 5** Log in to the router and enter the privileged EXEC mode.
- Step 6** Enter the **show startup-config** command to display the passwords.
- Step 7** Recover or replace the displayed passwords.
- Step 8** Change the configuration register back to its original setting.

**Note**

The key to recovering a lost password is to set the configuration register bit 6 (0x0040) so that the startup configuration (usually in NVRAM) is ignored. This allows you to log in without using a password and to display the startup configuration passwords.

**Note**

To recover a lost password if the Break function is disabled on the router, you must have physical access to the router.

Details of the Password Recovery Procedure

Complete the following steps to recover or replace a lost enable, enable secret, or console login password:

-
- Step 1** Attach an ASCII terminal to the console port on your router.
 - Step 2** Configure the terminal to operate at 9600 baud, 8 data bits, no parity, and 2 stop bits.
 - Step 3** If you can log in to the router as a nonprivileged user, enter the **show version** command to display the existing configuration register value. Note the value for use later and proceed to Step 6. If you cannot log in to the router at all, go to the next step.
 - Step 4** Press the **Break** key or send a Break from the console terminal. If Break is enabled, the router enters the ROM monitor, indicated by the ROM monitor prompt (`rommon1>`). Proceed to Step 6. If Break is disabled, power cycle the router (turn the router off or unplug the power cord, and then restore power). Then proceed to Step 5.
 - Step 5** Within 60 seconds of restoring the power to the router, press the **Break** key or send a Break. This action causes the router to enter the ROM monitor and display the ROM monitor prompt (`rommon1>`).
 - Step 6** Set the configuration register using the configuration register utility; enter the **confreg** command at the ROM monitor prompt as follows:

```
rommon1> confreg
```

- Step 7** Answer **yes** to the enable “ignore system config info?” question, and note the current configuration register settings.

- Step 8** Initialize the router by entering the **reset** command as follows:

```
rommon2> reset
```

The router initializes, the configuration register is set to 0x142, and the router boots the system image from Flash memory and enters the System Configuration Dialog (prompt) as follows:

```
--- System Configuration Dialog ---
```

- Step 9** Enter **no** in response to the System Configuration Dialog prompts until the following message is displayed:

```
Press RETURN to get started!
```

- Step 10** Press **Return**. The user EXEC prompt is displayed as follows:

```
Router>
```

- Step 11** Enter the **enable** command to enter privileged EXEC mode. Then enter the **show startup-config** command to display the passwords in the configuration file as follows:

```
Router# show startup-config
```

- Step 12** Scan the configuration file display looking for the passwords (the enable passwords are usually near the beginning of the file, and the console login or user EXEC password is near the end). The passwords displayed look something like this:

```
enable secret 5 $1$ORPP$s9syZt4uKn3SnpuLDrhuei
enable password 23skiddoo
.
.
line con 0
password onramp
```

The enable secret password is encrypted and cannot be recovered; it must be replaced. The enable and console login passwords may be encrypted or clear text. Proceed to the next step to replace an enable secret, console login, or enable password. If there is no enable secret password, note the enable and console login passwords, if they are not encrypted, and proceed to [Step 17](#).

**Caution**

Do not execute the next step unless you have determined you must change or replace the enable, enable secret, or console login passwords. Failure to follow the steps as shown might cause you to erase your router configuration.

- Step 13** Enter the **configure memory** command to load the startup configuration file into running memory. This action allows you to modify or replace passwords in the configuration.

```
Router# configure memory
```

- Step 14** Enter the privileged EXEC command **configure terminal** to enter configuration mode:

```
Hostname# configure terminal
```

- Step 15** Change all three passwords using the following commands:

```
Hostname(config)# enable secret newpassword1
Hostname(config)# enable password newpassword2
Hostname(config)# line con 0
Hostname(config-line)# password newpassword3
```

Change only the passwords necessary for your configuration. You can remove individual passwords by using the **no** form of the above commands. For example, entering the **no enable secret** command removes the enable secret password.

- Step 16** You must configure all interfaces to be *not* administratively shut down as follows:

```
Hostname(config)# interface fastethernet 0/0
Hostname(config-int)# no shutdown
```

Enter the equivalent commands for all interfaces that were originally configured. If you omit this step, all interfaces are administratively shut down and unavailable when the router is restarted.

- Step 17** Use the **config-register** command to set the configuration register to the original value noted in Step 3 or Step 8, or to the factory default value 0x2102 as follows:

```
Hostname(config)# config-register 0x2102
```

- Step 18** Press **Ctrl-Z** (hold down the **Control** key while you press **Z**) or enter **end** to exit configuration mode and return to the EXEC command interpreter.

**Caution**

Do not execute the next step unless you have changed or replaced a password. If you skipped [Step 13](#) through [Step 16](#), skip to [Step 20](#). Failure to observe this caution causes you to erase your router configuration file.

- Step 19** Enter the **copy running-config startup-config** command to save the new configuration to NVRAM.

- Step 20** Enter the **reload** command to reboot the router.

- Step 21** Log in to the router with the new or recovered passwords.

This completes the steps for recovering or replacing a lost enable, enable secret, or console login password.

Viewing Your System Configuration

You can use the **show version** and the **show diag** commands to view information specific to the hardware configuration of your Cisco 7200 VXR router.

Use the **show version** (or **show hardware**) command to display the system hardware (the network processing engine or network services engine and the number of interfaces installed), the software version, the names and sources of configuration files, and the boot images.

The following sample output of the **show version** command shows an NPE-G1 installed in the Cisco 7206VXR.

```
Router# show version
```

```
Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-JS-M), Released Version 12.2(20011220:181136) [biff dec21
101]
Copyright (c) 1986-2002 by cisco Systems, Inc.
Compiled Fri 21-Dec-01 05:58 by
Image text-base:0x600089B8, data-base:0x6196E000
```

```
(sample text omitted)
```

```
term1_500 uptime is 1 day, 19 hours, 25 minutes
System returned to ROM by reload at 00:04:18 UTC Tue Nov 30 1999
System image file is "disk2:c7200-js-mz.dev-test.dec21"
```

```
cisco 7206VXR (NPE-G1) processor (revision 0x00) with 245760K/16384K bytes of memory.
Processor board ID 13250983
BCM12500 CPU at 700Mhz, Implementation 1, Rev 0.1, 512KB L2 Cache
6 slot VXR midplane, Version 2.0
```

```
Last reset from power-on
Bridging software.
X.25 software, Version 3.0.0.
SuperLAT software (copyright 1990 by Meridian Technology Corp).
TN3270 Emulation software.
5 FastEthernet/IEEE 802.3 interface(s)
3 Gigabit Ethernet/IEEE 802.3 interface(s)
509K bytes of non-volatile configuration memory.
```

```
62528K bytes of ATA PCMCIA card at slot 2 (Sector size 512 bytes).
16384K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x0
```

Use the **show diag** command to determine what type of port adapters and I/O controller (with or without the Fast Ethernet port) are installed in slot 0 through slot 4 of your Cisco 7204VXR or slot 0 through slot 6 of your Cisco 7206VXR. You can also use the **show diag slot** command to display information about a specific port adapter slot.

The following example shows the **show diag** command output from a Cisco 7206VXR with an NPE-G1 installed.

```
Router# show diag
```

```
Slot 0:
```

```
Dual FastEthernet (RJ-45) I/O Card Port adapter, 2 ports
Port adapter is analyzed
Port adapter insertion time 1d19h ago
EEPROM contents at hardware discovery:
Hardware Revision      :0.0
Board Revision         :01
Connector Type         :FF
```

```

Hardware date code      :20000413
Top Assy. Part Number   :800-07114-01
PCB Serial Number       :PROT-----
EEPROM format version 4
EEPROM contents (hex):
  0x00:04 FF 40 02 15 41 00 00 42 30 31 05 FF 83 01 31
  0x10:2E 9D C0 46 03 20 00 1B CA 01 C1 8B 50 52 4F 54
  0x20:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
  0x30:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
  0x40:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
  0x50:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
  0x60:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
  0x70:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF

```

Slot 2:

```

Dual Port FastEthernet (RJ45) Port adapter, 2 ports
Port adapter is analyzed
Port adapter insertion time 1d19h ago
EEPROM contents at hardware discovery:
Hardware Revision       :1.0
PCB Serial Number       :MIC04412B9X
Part Number             :73-5419-04
Board Revision          :A0
RMA Test History        :00
RMA Number              :0-0-0-0
RMA History             :00
Deviation Number        :0-0
Product Number          :PA-2FE-TX
Top Assy. Part Number   :800-08350-04
EEPROM format version 4
EEPROM contents (hex):
  0x00:04 FF 40 02 24 41 01 00 C1 8B 4D 49 43 30 34 34
  0x10:31 32 42 39 58 82 49 15 2B 04 42 41 30 03 00 81
  0x20:00 00 00 00 04 00 80 00 00 00 00 CB 94 50 41 2D
  0x30:32 46 45 2D 54 58 20 20 20 20 20 20 20 20 20 20
  0x40:20 C0 46 03 20 00 20 9E 04 FF FF FF FF FF FF FF
  0x50:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
  0x60:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
  0x70:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF

```

Slot 5:

```

Fast-ethernet (TX-ISL) Port adapter, 1 port
Port adapter is analyzed
Port adapter insertion time 1d19h ago
EEPROM contents at hardware discovery:
Hardware revision 1.2      Board revision D0
Serial number 12384576    Part number 73-1688-04
Test history 0x0          RMA number 00-00-00
EEPROM format version 1
EEPROM contents (hex):
  0x20:01 11 01 02 00 BC F9 40 49 06 98 04 00 00 00 00
  0x30:68 00 00 00 99 06 01 00 FF FF FF FF FF FF FF FF

```

For specific information on the **show version**, **show diag** and other software commands, 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.

Performing Complex Configurations

After you have installed your Cisco 7200 VXR router hardware, checked all external connections, turned on the system power, allowed the system to boot up, and minimally configured the system, you might need to perform more complex configurations, which are beyond the scope of this publication.

For specific information on system and interface configuration, 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.



CHAPTER 5

Troubleshooting the Installation

Your Cisco 7200 VXR router went through extensive testing before leaving the factory. However, if you encounter problems starting the router, use the information in this chapter to help isolate the cause of the problems. This chapter contains the following sections:

- [Troubleshooting Overview, page 5-1](#)
- [Troubleshooting the Power Subsystem, page 5-6](#)
- [Troubleshooting the Processor Subsystem, page 5-7](#)
- [Troubleshooting the Cooling Subsystem, page 5-10](#)
- [Fiber-Optic Cleaning Information, page 5-10](#)

The procedures in this chapter assume that you are troubleshooting the initial system startup, and that your router is in the original factory configuration. If you have removed or replaced components or changed any default settings, the recommendations in this chapter might not apply. Make sure to review the safety warnings listed in the publication *Regulatory Compliance and Safety Information for the Cisco 7200 Series Routers* that accompanied your Cisco 7200 VXR router before using the troubleshooting procedures in this chapter.

Troubleshooting Overview

This section describes the troubleshooting methods used in this chapter and describes how the Cisco 7200 VXR routers are divided into subsystems for more efficient problem solving. If you are unable to easily solve the problem, contact a customer service representative for assistance and further instructions. Provide the representative with the following information:

- Date you received the router
- Chassis serial number
- Type of software and release number
- Brief description of the problem you are having
- Brief explanation of the steps you have taken to isolate and resolve the problem
- Maintenance agreement or warranty information

[Table 5-1](#) shows the general troubleshooting strategy described in this chapter. Refer to this table, as necessary, to follow the steps to isolate problems to a specific subsystem; resolve the problem if possible.

Table 5-1 General Troubleshooting Strategy

	Action	Yes	No
Step 1	Turn power on. Go to Step 2.	—	—
Step 2	PWR OK LED on?	Go to Step 3.	Troubleshoot power subsystem.
Step 3	Fans operating?	Go to Step 5.	Troubleshoot cooling subsystem.
Step 4	Fans operating?	Go to Step 5.	Obtain technical assistance.
Step 5	Check system state with I/O controller LEDs. I/O controller LEDs OK?	Go to Step 7.	Reseat the NPE-G1 or NPE-G2 and restart or reseat I/O controller and restart. Then go to Step 6.
Step 6	NPE-G1, NPE-G2, or I/O controller LEDs OK?	Go to Step 7.	Obtain technical assistance
Step 7	Check system state with port adapter LEDs. Port adapter enabled LEDs on?	System startup successful.	Reseat the port adapters and restart. Go to Step 9. If a Port Adapter Jacket Card is installed with an NPE-G1 or NPE-G2, remove the port adapter from it and reseat. Go to Step 8.
Step 8	If installed, check Port Adapter Jacket Card power and enabled LEDs. LEDs on?	Go to Step 9.	Remove the port adapter, then the Port Adapter Jacket Card, and then reseat the Port Adapter Jacket Card and port adapter. Go to Step 9.
Step 9	Port adapter enabled LEDs on?	System startup successful.	Obtain technical assistance.

Problem Solving Using a Subsystems Approach

The key to solving problems with the system is isolating the problem to a specific subsystem. The first step in solving startup problems is to compare what the system *is doing* to what it *should be doing*. Because a startup problem is usually caused by a single component, it is more efficient to first isolate the problem to a subsystem rather than troubleshoot each component in the system. For these troubleshooting procedures, consider the following subsystems:

- Power subsystem—This subsystem comprises the power supplies, the external power cable, and the midplane.

- Cooling subsystem—The chassis fan tray is the single component in this subsystem. The fans should be operating whenever system power is on. Replace the fan tray if you determine a fan is not functioning properly.
- Processor subsystem—This subsystem includes the I/O controller, network processing engine (NPE) or network services engine (NSE), the Port Adapter Jacket Card, and all port or service adapters. The system memory and management functions reside on the I/O controller and the network processing engine or network services engine. The enabled LED on each port adapter indicates if the port adapter is initialized. A port adapter that is partially installed in the midplane can cause the system to hang and crash.

The following sections help you isolate a problem to one of these subsystems and direct you to the appropriate troubleshooting section.

Identifying Startup Problems



Note

When powering on or powering off the router, wait 30 seconds before powering it on or powering it off again.

Startup problems are commonly due to the source power or to a board (network processing engine or network services engine, I/O controller, or port or service adapter) that is dislodged from the midplane. Although an overtemperature condition is unlikely at initial startup, the environmental monitoring functions are included in this chapter because they also monitor internal voltages.

When you start up the router for the first time, you should observe the startup sequence described in the [“Starting the System and Observing Initial Conditions”](#) section on page 4-2 in Chapter 4, [“Observing System Startup and Performing a Basic Configuration.”](#) This section contains a more detailed description of the normal startup sequence and describes the steps to take if the system does *not* perform that sequence as expected.

With the exception of the fan tray and network processing engine or network services engine, LEDs indicate all system states in the startup sequence. By checking the state of the LEDs, you can determine when and where the system failed in the startup sequence. Use the following descriptions to isolate the problem to a subsystem, and then proceed to the appropriate sections to try to resolve the problem.

Fans Operating

You should immediately hear the fans operating. If not, proceed to the [“Troubleshooting the Cooling Subsystem”](#) section on page 5-10. If you determine that the power supply is functioning normally and that a fan is faulty, contact a customer service representative. If a fan does not function properly at initial startup, there are no installation adjustments that you should make.

Power LEDs

The green power OK LED (at the rear of the chassis) should come on immediately when you place the power supply switch in the on (I) position, and remain on during normal system operation.

If the green power OK LED *does not* come on, proceed to the [“Troubleshooting the Processor Subsystem”](#) section on page 5-7.

I/O Controller LEDs

The LEDs on the I/O controller should come on as follows:



Note

If you have an NPE-G1 or NPE-G2 installed without an I/O controller, go to the [“NPE-G1 or NPE-G2 LEDs” section on page 5-5](#).

If you have an NPE-G1 or NPE-G2 installed with an I/O controller, the I/O controller works with the NPE-G1, but continues its I/O controller functionality. That is, the information in this I/O controller section is valid. Only the Gigabit Ethernet interface LEDs are active when in use. For information about the Gigabit Ethernet LEDs on the NPE-G1 or NPE-G2, see the [“NPE-G1 or NPE-G2 LEDs” section on page 5-5](#).

- The IO PWR OK LED comes on immediately and indicates that the I/O controller is receiving DC power from the router midplane. This LED comes on during a successful router boot and remains on during normal operation of the router.
- If this LED remains off when you start the router, either there is a problem with the power supply (it is damaged or not connected to the router midplane) or the network processing engine or network services engine, the Port Adapter Jacket Card, or the I/O controller is not connected to the router midplane. Proceed to the [“Troubleshooting the I/O Controller” section on page 5-7](#).
- The ENABLED LED comes on after the IO PWR OK LED and indicates that the network processing engine or network services engine and the I/O controller are enabled for operation by the system; however, it does not mean that the Fast Ethernet port on the I/O controller is functional or enabled. This LED comes on during a successful router boot and remains on during normal operation of the router.

If this LED remains off when you start the router, it is probably a problem with the network processing engine or network services engine or the I/O controller (they are damaged or not connected to the router midplane). Proceed to the [“Troubleshooting the I/O Controller” section on page 5-7](#).

- The FE ENABLE LED comes on after the ENABLED LED and indicates that the Fast Ethernet port on the I/O controller is initialized and enabled for operation by the system. This LED comes on during a successful router boot and remains on during normal operation of the router.

If this LED remains off when you start the router, it is probably a problem with the Fast Ethernet port on the I/O controller. Proceed to the [“Troubleshooting the I/O Controller” section on page 5-7](#).



Note

The I/O controller without the Fast Ethernet port does not have the FE ENABLE LED and the FE LINK LED. The I/O controller without the Fast Ethernet port and the I/O controller that is equipped with a single MII port do not have the MII EN, RJ-45 EN, and RJ-45 LINK LEDs.

- The FE LINK LED comes on only when the Fast Ethernet port on the I/O controller is receiving a carrier signal from the network. This LED remains off during normal operation of the router unless there is an incoming carrier signal, and does not indicate startup problems.

If this LED remains off when you start the router, it is probably a problem with the Fast Ethernet port on the I/O controller. Proceed to the [“Troubleshooting the I/O Controller” section on page 5-7](#).

- The MII EN LED comes on after the ENABLED LED and indicates that the Fast Ethernet port's MII port is initialized and enabled for operation by the system, and configured for operation. This LED comes on during a successful router boot and after the MII port has been configured as the media type for the Fast Ethernet port (the RJ-45 port is the default media type for the Fast Ethernet port). This LED remains on during normal operation of the router.

If this LED remains off when you start the router, it is probably a problem with the Fast Ethernet port on the I/O controller. Proceed to the [“Troubleshooting the I/O Controller” section on page 5-7](#).

- The RJ-45 EN LED comes on after the ENABLED LED and indicates that the Fast Ethernet port's RJ-45 port (the default media type for the Fast Ethernet port) is initialized and enabled for operation by the system. This LED comes on during a successful router boot and remains on during normal operation of the router.

If this LED remains off when you start the router, it is probably a problem with the Fast Ethernet port on the I/O controller. Proceed to the [“Troubleshooting the I/O Controller” section on page 5-7](#).

- The RJ-45 LINK LED comes on only when the Fast Ethernet RJ-45 port is receiving a carrier signal from the network. This LED remains off during normal operation of the router unless there is an incoming carrier signal, and does not indicate startup problems.

If this LED remains off when you start the router, it is probably a problem with the Fast Ethernet port on the I/O controller. Proceed to the [“Troubleshooting the I/O Controller” section on page 5-7](#).



Note

An MII link LED is not provided on the I/O controller because the LED is provided on external transceivers that are required for connecting to the MII port on the I/O controller. See the [“Connecting to the I/O Controller Ethernet and Fast Ethernet Ports” section on page 3-30](#) in Chapter 3, [“Installing a Cisco 7200 VXR Router”](#) for Fast Ethernet MII connection requirements.

- The slot 1 and slot 2 LEDs only come on when either PC card or Flash Disk slot is being accessed by the system. These LEDs remain off during normal operation of the router and do not indicate startup problems.

NPE-G1 or NPE-G2 LEDs

These LEDs function on the NPE-G1 or NPE-G2 when no I/O controller is installed:

- The POWER ON LED on the NPE-G1 or the PWK OK LED on the NPE-G2 comes on immediately—and stays on—and indicates that the NPE-G1 is receiving DC power from the router midplane. This LED comes on during a successful router boot and remains on during normal operation of the router.

If these LEDs remain off when you start the router, either there is a problem with the power supply (it is damaged or not connected to the router midplane) or the network processing engine is not connected to the router midplane. Proceed to the [“Troubleshooting the I/O Controller” section on page 5-7](#).

- The EN (enabled) LED comes on for the three Gigabit Ethernet interfaces only if the RJ-45 media are selected. The EN LED remains off, when operating, if the GBIC media are selected.
- The LINK LED comes on only when any of the Gigabit Ethernet media in use are receiving a carrier signal from the network. This LED remains off during normal operation of the router unless there is an incoming carrier signal, and does not indicate startup problems.
- The SLOT ACTIVE LED on the NPE-G2 comes on when the CompactFlash Disk slot is being used.
- The SYS STAT LED is solid green when Cisco IOS has successfully booted.

- The USB port LEDs on the NPE-G2 are off when there is no activity.
- The FE LINK LED on the NPE-G2 is solid green when there is no activity on the management port.
- The CF ACTV LED on the NPE-G2 is off when there is no activity on the CompactFlash Disk.

Also see the [“NPE-G2 LEDs” section on page 1-41](#).

Port Adapter Jacket Card LEDs

The Port Adapter Jacket Card has two LEDs. The Port Adapter Jacket Card functions only with an NPE-G1 installed. These LEDs function when the Port Adapter Jacket Card is installed in the I/O controller slot with a port adapter installed in the Port Adapter Jacket Card:

- The ENABLE LED comes on when the Port Adapter Jacket Card is enabled for operation.
- The PWR (power) LED comes on when the Port Adapter Jacket Card is receiving power.

Port Adapter LEDs

The ENABLED LED on each port adapter or service adapter comes on when the network processing engine or network services engine completes its initialization of the adapter for operation. The ENABLED LED indicates that the adapter is receiving power and has been recognized by the network processing engine or network services engine; it does not indicate the state of the individual interfaces on the adapters. If an ENABLED LED fails to come on, proceed to the [“Troubleshooting the Port Adapters or Service Adapters” section on page 5-9](#).

System Bootup Banner

When all LEDs come on to indicate that the system has booted successfully, the initial system banner should be displayed on the console screen. If it is not displayed, see [Chapter 3, “Installing a Cisco 7200 VXR Router,”](#) the [“Connecting to the Console and Auxiliary Ports” section on page 3-34](#) to verify that the terminal is set correctly and that it is properly connected to the I/O controller’s console port.

Troubleshooting the Power Subsystem

Check the following to help isolate a problem with the power subsystem:

- On the first power supply, is the PWR OK LED on?
 - If yes, the power source is good, and the power supply is functional.
 - If no, make sure the AC power supply power cable is connected at both ends.
 - If no, make sure the circuit breaker is switched to the on position for DC power supply leads.
 - If the PWR OK LED remains off, and the power switch is set correctly, suspect the power source or the power cable. Turn the switch off, connect the power cable to another power source, if available, and turn the switch back on. If the LED comes on, the problem is the first power source.
 - If the PWR OK LED fails to come on after you connect the power supply to a new power source, replace the power cord, and turn the switch back on. If the AC power (or input power) LED then comes on, return the first power cable for replacement.

- If the LED still fails to come on when the power supply is connected to a different power source with a new power cable, the power supply is probably faulty. If a second power supply is available, install it in the other power supply bay and contact a service representative for further instructions.
- Is the PWR OK LED on for the second (redundant) power supply?
 - If yes, proceed to the “[Troubleshooting the Processor Subsystem](#)” section.
 - If not, repeat each of the preceding procedures for the second power supply.

If you are unable to resolve the problem or you determine that either a power supply or chassis connector is faulty, contact a service representative for instructions.

Troubleshooting the Processor Subsystem

The processor subsystem comprises the I/O controller, network processing engine or network services engine, and all port adapters. The I/O controller and network processing engine or network services engine are required system components. The system cannot operate unless the I/O controller and network processing engine or network services engine are installed properly; however, the system can operate without any port adapters installed as long as none are in *partial* contact with the midplane pins. A port adapter or Port Adapter Jacket Card that is partially connected to the midplane sends incomplete signals to the processor, which faults the PCI bus and causes the system to hang. Therefore, first ensure that the I/O controller and the network processing engine or network services engine are installed properly and the system software has initialized successfully. Then, if necessary, you can troubleshoot individual port adapters.

Troubleshooting the I/O Controller

The procedures in this section assume that the I/O controller, network processing engine or network services engine, and router itself are in the original factory configuration, and that you have not made changes to your configuration file.

If the I/O controller LEDs do not go on as expected (see the “[Identifying Startup Problems](#)” section on [page 5-3](#)), check the following items to help isolate the problem.

- Do all of the I/O controller LEDs remain off when the system power switch is turned on?
 - If the LEDs stay off, first see the “[Troubleshooting the Power Subsystem](#)” section on [page 5-6](#) and the “[Troubleshooting the Cooling Subsystem](#)” section on [page 5-10](#) to ensure that both the fans and the power supply are functioning properly.
 - If the power supply and fans appear operational but none of the I/O controller LEDs are on, suspect that an improperly connected I/O controller or port adapter has hung the system. Tighten all captive installation screws, and then restart the system.
 - With the power supply turned off, reseal the I/O controller in its slot and restart the router.
- Is the I/O controller ENABLED LED on?
 - If yes, the system software has initialized successfully, and the system is operational.
 - If the ENABLED LED remains off, the system detected a processor hardware failure. (This LED should be on in normal operation.) Contact a service representative for instructions.

- If the auxiliary port is not functioning properly, check the baud rate. The auxiliary port will not function at baud rates higher than 19.2k. If the baud rate on the connecting device is set higher than 19.2k, either garbled text or nothing will be displayed on the screen.

Troubleshooting the NPE-G1 or NPE-G2

The procedures in this section assume that the NPE-G1 or NPE-G2 and the router itself are in the original factory configuration, and that you have not made changes to your configuration file.

- If the NPE-G1 POWER ON LED or the NPE-G2 PWR OK LED does not go on as expected, make sure the power to the router is turned off, reseal the NPE-G1 or NPE-G2 in its slot, and restart the router.

If the POWER ON LED or PWR OK LED remains off, the system detected a processor hardware failure. (The LED should be on in normal operation.) Contact an authorized service representative for instructions.

- If the NPE-G1 or NPE-G2 Gigabit Ethernet media LEDs do not come on check the cable connections, clean the fiber-optic cable connectors (see [“Fiber-Optic Cleaning Information” section on page 5-10](#)), try a different GBIC module or SFP module, and check the software to be sure the optical fiber media is selected. See the [“Configuring the Native Gigabit Ethernet Interfaces” section on page 4-8](#).
- If the EN (enabled) LED does not come on when the a Gigabit Ethernet RJ-45 port is selected, try using a different cable. If the EN LED does not come on, check the software to be sure the RJ-45 media is selected. See the [“Configuring the Native Gigabit Ethernet Interfaces” section on page 4-8](#).

If the EN LED remains off when the GBIC or SFP media are selected, the LED is functioning properly.

If any of these actions do not produce a functioning LED, contact an authorized service representative.

- If the LINK LED does not come on only when any of the Gigabit Ethernet media are in use:
 - Check that the router is receiving power.
 - Check that the correct media type is selected in software. See the [“Configuring the Native Gigabit Ethernet Interfaces” section on page 4-8](#).
 - Check that the media cables are functioning and are completely connected to the NPE-G1 or NPE-G2.
 - If GBIC modules are being used, check to be sure they are connected to the NPE-G1.
 - If SFP modules are being used, check to be sure they are connected to the NPE-G2.

If any of these actions do not produce a functioning LED, contact an authorized service representative.

- If the SLOT ACTIVE LED or the CF ACTV LED on the NPE-G2 does not come on when the CompactFlash Disk slot is being used, try inserting a different CompactFlash Disk. If the SLOT ACTIVE LED or the CF ACTV LED still does not come on, contact an authorized service representative.

Troubleshooting the Network Processing Engine or Network Services Engine

The procedures in this section assume that the I/O controller, network processing engine or network services engine, and router itself are in the original factory configuration, and that you have not made changes to your configuration file. Also see the troubleshooting chapter of the *Network Processing Engine and Network Services Engine Installation and Configuration* guide for the network services engine Parallel eXpress Forwarding (PXF) processor information.

If the I/O controller ENABLED LED does not go on as expected, make sure the power to the router is turned off, reseal the network processing engine or network services engine in its slot, and restart the router.

If the ENABLED LED remains off, the system detected a processor hardware failure. (This LED should be on in normal operation.) Contact a service representative for instructions.

Troubleshooting the Port Adapter Jacket Card

Check the following to help isolate a problem with the Port Adapter Jacket Card:

- Is the PWR (power) LED on?

If yes, the system is operational.

- If no, check to be sure that power is turned on to the system. For a DC-powered system, check to make sure that power has not been turned off at the power source. Then check to be sure that the Port Adapter Jacket Card has not pulled away from the backplane. Power down the system, and reseal the Port Adapter Jacket Card.
- If no, check to be sure that the Port Adapter Jacket Card is installed in a Cisco 7200 VXR router with an NPE-G1 installed. If not, remove the Port Adapter Jacket Card and install it in a Cisco 7200 VXR router with an NPE-G1. The Port Adapter Jacket Card does not work with any other network processing engine or network services engine.

- Is the ENABLED LED on?

If yes, the system is operational.

- If no, check to be sure that the Port Adapter Jacket Card is installed in a Cisco 7200 VXR router with an NPE-G1 installed. If not, remove the Port Adapter Jacket Card and install it in a Cisco 7200 VXR router with an NPE-G1. The Port Adapter Jacket Card does not work with any other network processing engine or network services engine.
- If no, suspect the Port Adapter Jacket Card is not properly seated. Power down the system, remove the Port Adapter Jacket Card, and reseal it. If the ENABLED LED remains off, contact a service representative for instructions.

Troubleshooting the Port Adapters or Service Adapters

Check the following to help isolate a problem with the port adapters or service adapters:

- Are *all* adapter ENABLED LEDs on?

If yes, the system is operational.

- Are *any* adapter ENABLED LEDs off?

- If the ENABLED LED on an individual adapter is off, suspect that the adapter has pulled away from the midplane. Reseat the adapter in its slot (you do not have to turn off the system power when removing or replacing port and service adapters). After the system reinitializes the interfaces, the ENABLED LED on the adapter should go on.
- If the ENABLED LED remains off, the system detected a processor hardware failure. (This LED should be on in normal operation.) Contact a service representative for instructions.

Troubleshooting the Cooling Subsystem

Check the following to help isolate a problem with the cooling system:

- When you start up the system, do the fans start operating?

To determine if the fans are operating, listen for them. In noisy environments, place your hand on the left side of the chassis (when viewing the chassis from the front) to feel for air being forced out the vents.

- If yes, the power to the fan tray is good.
- If no, there is a problem with the fan tray or power. See the [“Troubleshooting the Power Subsystem” section on page 5-6](#).

- The following message, if displayed, indicates that the system has detected an overtemperature condition or out-of-tolerance power condition inside the chassis.

```
Queued messages:
%ENVM-1-SHUTDOWN: Environmental Monitor initiated shutdown
```

If an environmental shutdown results from an out-of-tolerance power condition, the PWR OK LED goes off, and the system shuts down. (See the [“Troubleshooting the Power Subsystem” section on page 5-6](#).) Although an overtemperature condition is unlikely at initial startup, ensure that heated exhaust air from other equipment is not entering the router’s inlet vent, and that there is sufficient clearance around the sides of the chassis to allow cooling air to flow. See [Chapter 2, “Preparing for Installation,”](#) the [“Site Requirement Guidelines” section on page 2-3](#) for preventive site configurations.

The above message could also indicate a faulty component or temperature sensor. Before the system shuts down, use the **show environment** or **show environment table** command to display the internal chassis environment. (See [Chapter 1, “Cisco 7200 VXR Product Overview,”](#) the [“Functional Overview” section on page 1-53](#), for descriptions of the **show environment** and **show environment table** commands.)

If you experience trouble with the startup that is not resolved with these procedures, contact a service representative for assistance and further instructions.

Fiber-Optic Cleaning Information

We strongly recommend cleaning all optical connections before reconnecting any optical cables to equipment. For information about cleaning optical connectors, see the [Inspection and Cleaning Procedures for Fiber-Optic Connections](#) document and the [Compressed Air Cleaning Issues for Fiber-Optic Connections](#) document.



APPENDIX A

Configuration Register Information

The following information is found in this appendix:

- [Configuration Bit Meanings, page A-1](#)
- [Displaying the Configuration Register While Running Cisco IOS, page A-5](#)
- [Displaying the Configuration Register While Running ROM Monitor, page A-5](#)
- [Setting the Configuration Register While Running Cisco IOS, page A-6](#)
- [Setting the Configuration Register While Running ROM Monitor, page A-6](#)

Configuration Bit Meanings

Use the processor configuration register information contained in this appendix to do the following:

- Set and display the configuration register value
- Force the system into the bootstrap program
- Select a boot source and default boot filename
- Enable or disable the Break function
- Control broadcast addresses
- Set the console terminal baud rate
- Load operating software from ROM
- Enable booting from a Trivial File Transfer Protocol (TFTP) server

[Table A-1](#) lists the meaning of each of the configuration memory bits. Following the table is a more in-depth description of each setting.

Table A-1 **Configuration Register Bit Settings**

Bit No.	Hex	Meaning
00–03	0x0000–0x000F	Boot field
06	0x0040	Causes the system software to ignore nonvolatile random-access memory (NVRAM) contents
07	0x0080	Original Equipment Manufacturer (OEM) bit enabled
08	0x0100	Break disabled
10	0x0400	IP broadcast with all zeros

Table A-1 Configuration Register Bit Settings (continued)

Bit No.	Hex	Meaning
11–12	0x800–0x1000	Console line speed
13	0x2000	Boots default ROM software if initial boot fails
14	0x4000	IP broadcasts do not have network numbers
15	0x8000	Enables diagnostic messages and ignores NVRAM contents

Bits 0–3

The lowest four bits of the processor configuration register (bits 3, 2, 1, and 0) form the boot field. [Table A-2](#) provides information about the bits settings.

Table A-2 Bits 0–3 Settings

Boot Field	Meaning
0	Stays at the system bootstrap prompt (ROM monitor) on a reload or power cycle
1	Boots the boot helper image as a system image
2	Full boot process, which loads the Cisco IOS image into flash memory
2-F	Specifies a default filename for booting over the network from a TFTP server

The boot field specifies a number in binary. If you set the boot field value to 0, you must have a console port access to boot the operating system manually. Boot the operating system by entering the **b** command at the bootstrap prompt as follows:

```
> b [tftp] flash filename
```

Definitions of the various command options follow:

b—Boots the default system software from ROM

b flash—Boots the first file in flash memory

b filename [host]—Boots over the network using TFTP

b flash filename—Boots the file (*filename*) from flash memory

If you set the boot field value to a value of 2 through F, and there is a valid system **boot** command stored in the configuration file, the router boots the system software as directed by that value. (See [Table A-3](#).) If you set the boot field to any other bit pattern, the router uses the resulting number to form a default boot filename for netbooting.

If there are no **boot** commands in the configuration file, the router attempts to boot the first file in system flash memory. If no file is found in system flash memory, the router attempts to netboot a default file with a name derived from the value of the boot field (for example, cisco2-7200). If the netboot attempt fails, the boot helper image in boot flash memory will boot up.

If **boot** commands are in the configuration file, the router software processes each **boot** command in sequence until the process is successful or the end of the list is reached. If the end of the list is reached without a file being successfully booted, the router will retry the **netboot** commands up to six times if bit 13 of the configuration register is set, otherwise it will load the operating system software available

in ROMmon. If bit 13 is not set, the router will continue to netboot images indefinitely. The default setting for bit 13 is 0. If bit 13 is set, the system boots the boot helper image found in boot flash memory without any retries.

The server creates a default filename as part of the automatic configuration processes. To form the boot filename, the server starts with Cisco and links the octal equivalent of the boot field number, a dash, and the image name. [Table A-3](#) lists the default boot filenames or actions.

**Note**

A **boot system configuration** command in the router configuration in NVRAM overrides the default netboot filename.

Table A-3 *Default Boot Filenames*

Action/File Name	Bit 3	Bit 2	Bit 1	Bit 0
Bootstrap mode	0	0	0	0
ROM software	0	0	0	1
Flash software	0	0	1	0
cisco3-<image-name1>	0	0	1	1
cisco4-<image-name2>	0	1	0	0
cisco5-<image-name3>	0	1	0	1
cisco6-<image-name4>	0	1	1	0
cisco7-<image-name5>	0	1	1	1
cisco10-<image-name6>	1	0	0	0
cisco11-<image-name7>	1	0	0	1
cisco12-<image-name8>	1	0	1	0
cisco13-<image-name9>	1	0	1	1
cisco14-<image-name10>	1	1	0	0
cisco15-<image-name11>	1	1	0	1
cisco16-<image-name12>	1	1	1	0
cisco17-<image-name13>	1	1	1	1

Bit 6

Bit 6 causes the system software to ignore nonvolatile random-access memory (NVRAM) contents.

Bit 7

Bit 7 enables the OEM bit. It disables the bootstrap messages at startup.

Bit 8

Bit 8 controls the console Break key. Setting bit 8 (the factory default) causes the processor to ignore the console Break key. Clearing bit 8 causes the processor to interpret Break as a command to force the system into the bootstrap monitor, halting normal operation. A Break can be sent in the first 60 seconds while the system reboots, regardless of the configuration settings.

Bit 10 and Bit 14

Bit 10 controls the host portion of the IP broadcast address. Setting bit 10 causes the processor to use all zeros; clearing bit 10 (the factory default) causes the processor to use all ones. Bit 10 interacts with bit 14, which controls the network and subnet portions of the IP broadcast address. [Table A-4](#) shows the combined effect of bit 10 and bit 14.

Table A-4 Bit 10 and Bit 14 Settings

Bit 14	Bit 10	IP Address (<net> <host>)
Off	Off	<ones><ones>
Off	On	<zeros><zeros>
On	On	<net><zeros>
On	Off	<net><ones>

Bit 11 and Bit 12

Bit 11 and bit 12 in the configuration register determine the baud rate of the console terminal. [Table A-5](#) shows the bit settings for the four available baud rates. (The factory set default baud rate is 9600.)

Table A-5 Bit 11 and Bit 12 Settings

Baud	Bit 12	Bit 11
9600	0	0
4800	0	1
2400	1	1
1200	1	0

Bit 13

Bit 13 determines the server response to a bootload failure. If **boot** commands are in the configuration file, the router software processes each **boot** command in sequence until the process is successful or the end of the list is reached. If the end of the list is reached without a file being successfully booted, the router will retry the **netboot** commands up to six times if bit 13 of the configuration register is set, otherwise it will load the operating system software available in ROMmon. If bit 13 is not set, the router will continue to netboot images indefinitely. The default setting for bit 13 is 0. If bit 13 is set, the system boots the boot helper image found in boot flash memory without any retries.

Bit 15

Bit 15 enables diagnostic messages and ignores NVRAM contents.

Displaying the Configuration Register While Running Cisco IOS

The configuration register can be viewed by using the **show version** or **show hardware** command.

The following is sample output of the **show version** command from a Cisco 7206VXR router.

Router# **show version**

```
Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-JS-M), Released Version 12.2(20011220:181136) [biff dec21
101]
Copyright (c) 1986-2002 by cisco Systems, Inc.
Compiled Fri 21-Dec-01 05:58 by
Image text-base:0x600089B8, data-base:0x6196E000

(sample text omitted)

term1_500 uptime is 1 day, 19 hours, 25 minutes
System returned to ROM by reload at 00:04:18 UTC Tue Nov 30 1999
System image file is "disk2:c7200-js-mz.dev-test.dec21"

cisco 7206VXR (NPE-G1) processor (revision 0x00) with 245760K/16384K bytes of memory.
Processor board ID 13250983
BCM12500 CPU at 700Mhz, Implementation 1, Rev 0.1, 512KB L2 Cache
6 slot VXR midplane, Version 2.0

Last reset from power-on
Bridging software.
X.25 software, Version 3.0.0.
SuperLAT software (copyright 1990 by Meridian Technology Corp).
TN3270 Emulation software.
5 FastEthernet/IEEE 802.3 interface(s)
3 Gigabit Ethernet/IEEE 802.3 interface(s)
509K bytes of non-volatile configuration memory.

62528K bytes of ATA PCMCIA card at slot 2 (Sector size 512 bytes).
16384K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x0
```

Displaying the Configuration Register While Running ROM Monitor

If the bootstrap prompt is ">", the **o** command displays the virtual configuration register currently in effect. It includes a description of the bits. See the following sample output:

```
>o
Configuration register + 02x100 at last boot
Bit#      Configuration register option settings:
15        Diagnostic mode disabled
14        IP broadcasts do not have network numbers
13        Boot default ROM software if network boot fails
12-11     Console speed is 9600 baud
```

```

10      IP broadcasts with ones
09      Do not use secondary bootstrap
08      Break disabled
07      OEM disabled
06      Ignore configuration disabled
05      Fast boot disabled
04      Fan boot disabled
03-00   Boot to ROM monitor

```

If the prompt is “rommon1”, the **confreg** command displays the virtual configuration register currently in effect. It includes a description of the bits. See the following sample output:

```

rommon1 > confreg

Configuration Summary
enabled are:
load rom after netboot fails
console baud: 9600
boot: the ROM Monitor

Do you wish to change the configuration? y/n  [n]

```

Setting the Configuration Register While Running Cisco IOS

The configuration register can be set in the configuration mode with the **config-register 0x value** command. See the following sample output:

```

Router# configure terminal
Enter configuration commands, one per line. End with CNTRL/Z.
Router (config)# config-register 0x2142
Router (config)# end
Router#
%SYS-5-CONFIG_I: Configured from console by console

```

Setting the Configuration Register While Running ROM Monitor

If the prompt is “>”, the **or0x value** command sets the configuration register. See the following sample output:

```

>o/r 0x2102
>

```

If the prompt is “rommon1”, the **confreg** command sets the configuration register. It prompts the user about each bit. See the following sample output:

```

rommon1> confreg

Confiuration Summary
enabled are:
load rom after netboot fails
console baud: 9600
boot: the ROM Monitor

do you wish to change the configuration y/n  [n]:  y
enable  "diagnostic mode"? y/n  [n]:  n
enable  "use net in IP bcast address"? y/n  [n]:  n
disable "use rom after netboot fails"? y/n  [n]:  n
enable  "use all zero broadcast"? y/n  [n]:  n

```

```
enable "break/abort has effect"? y/n [n]: n
enable "ignore system config info"? y/n [n]: n
change console baud rate? y/n [n]: n
change the boot characteristics? y/n [n]:y
enter to boot:
0 = ROM Monitor
1 = the boot helper image
2 - 15 = boot system
[0]: 2

Configuration Summary:
enabled are:
load rom after netboot fails
console baud: 9600
boot: image sepcified by the boot system commands or default to: cisco2-c7200

do you wish to change the configuration? y/n [n] n

You must reset or power cycle for new config to take effect
rommon 2 >
```




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