



Cisco IGX 8400 Series Installation Guide

Cisco WAN Switching System Software Release 9.3.30 and Later Releases

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Preface

This section discusses the objectives, audience, organization, and conventions found in the *Cisco IGX 8400 Series Installation Guide*.

The Cisco IGX 8400 series (referred to as “IGX” in this guide) is a WAN switch platform running Cisco WAN Switching System Software Release 9.3.30 or later release (referred to as “switch software” in this guide).

Objectives

This guide replaces previous Cisco IGX 8400 series platform documentation, and is designed to be used with multiple switch software releases. This publication has been optimized for online use. If you are accessing this publication through the Documentation CD-ROM, external links may not be accessible.

For information on individual cards, node, trunk, and line configuration and service provisioning, refer to the *Cisco IGX 8400 Series Provisioning Guide*.

For detailed information on system configuration and troubleshooting commands, refer to the *Cisco WAN Switching Command Reference*.

For more information on Cisco IOS configuration and troubleshooting commands, refer to the appropriate Cisco IOS documentation set.

Audience

The *Cisco IGX 8400 Series Installation Guide* provides installers, operators, and network designers and managers with the necessary understanding to plan for IGX use in a network. This manual applies to the Cisco IGX 8410, IGX 8420, and IGX 8430 in both rack-mount and standalone versions.

Organization

This document is organized into the following chapters:

Table 1 Cisco IGX 8400 Series Installation Guide Organization

Chapter Number and Title	Chapter Description
Chapter 1, “ Cisco IGX 8400 Series Product Overview ”	Provides a general introduction to the hardware components that make up the Cisco IGX 8400 series.
Chapter 2, “ Preparing to Install ”	Provides information on how to plan and prepare for IGX installation. Includes information on power consumption, site preparation, seismic and other safety requirements, and enclosure installation (standalone and rack mount).
Chapter 3, “ Installing the IGX ”	Provides information on preparing and installing system cards, bringing up a node, power-up diagnostics, and basic configuration and management information.
Chapter 4, “ Troubleshooting the IGX ”	Provides information on troubleshooting the IGX.
Chapter 5, “ Replacing Parts on the IGX ”	Provides information on replacing IGX components.
Appendix A, “ System Specifications ”	Provides general system specifications, interface specifications, and cabling requirements and specifications.



Tip

Some links in this online document connect with other Cisco documentation resources, such as Cisco IOS documentation or the *Cisco WAN Switching Software Command Reference*. When you find the information you are looking for, use the back button on your web browser to return to this document.

Document Conventions

This publication uses the following conventions to convey instructions and information.

Table 2 Document Conventions

Convention	Description
boldface font	Commands and keywords.
<i>italic font</i>	Variables for which you supply values.
[]	Keywords or arguments that appear within square brackets are optional.
{ x y z }	A choice of required keywords appears in braces separated by vertical bars. You must select one.
screen font	Examples of information displayed on the screen.
boldface screen font	Examples of information you must enter.

Table 2 Document Conventions (continued)

Convention	Description
< >	Nonprinting characters, for example passwords, appear in angle brackets in contexts where italic font is not available.
[]	Default responses to system prompts appear in square brackets.

**Note**

This symbol means *reader take note*. Notes contain helpful suggestions or references to additional information and material.

**Timesaver**

This symbol means *the described action saves time*. You can save time by performing the action described in the paragraph.

**Caution**

This symbol means *reader be careful*. In this situation, you might do something that could result in equipment damage or loss of data.

**Tip**

This symbol means *the following information will help you solve a problem*. The tips information might not be troubleshooting or even an action, but could be useful information, similar to a Timesaver.

**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.

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 esitettyjen 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 ELŐÍRÁSOK

Ez a figyelmeztető jel veszélyre utal. Sérülésveszélyt rejtő helyzetben van. Mielőtt 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.

Megjegyzés ŐRIZZE MEG EZEKET AZ UTASÍTÁSOKAT!

Megjegyzés Ezt a dokumentációt a készülékhez mellékelt üzembe helyezési útmutatóval együtt kell használni. További tudnivalók a mellékelt Üzembe helyezési útmutatóban (Installation Guide), Konfigurációs útmutatóban (Configuration Guide) vagy más dokumentumban található.

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 GARDE 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 GARDE 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。

Related Documentation

**Tip**

The Universal Router Module (URM) is a dual-processor card, featuring both a modified Cisco IGX 8400 series UXM-E processor and a modified Cisco 3660 router processor. Each processor uses a different operating system; refer to documentation for both Cisco IOS software and switch software while working with the URM.

All related technical documentation is available online and on the Documentation CD-ROM. You can also order printed documentation using the document number. See the [“Accessing User Documentation” section on page xxi](#) and the [“Obtaining Documentation” section on page xxii](#) for more information.

Cisco IGX 8400 Series Documentation

Cisco IGX 8400 series product documentation provides information regarding hardware installation, cabling, basic configuration, and regulatory compliance and safety information. Documentation in this category includes the following:

- *Cisco IGX 8400 Series Installation Guide*
- *Cisco IGX 8400 Series Provisioning Guide*
- *Cisco IGX 8400 Series Regulatory Compliance and Safety Information*

You can access these documents at: **Cisco Product Documentation > WAN Switches > IGX 8400 Series**

**Note**

IGX series documentation is organized under the switch software release number. If you have multiple releases in your network, refer to the latest release for the most current IGX documentation.

Cisco WAN Switching System Software and Related Hardware Documentation

Cisco WAN Switching System Software Documentation

Cisco WAN Switching System Software product documentation provides additional information on the switch software commands used to configure the IGX. Documentation in this category includes the following:

- *Cisco WAN Switching Command Reference*
- *Cisco WAN Switching SuperUser Command Reference*
- *Cisco WAN Switching Software Release Notes*

You can access these documents at **Cisco Product Documentation > WAN Switches > IGX 8400 > *switch software release number***.

Related Hardware Documentation

The following documents describe hardware often used in conjunction with the IGX:

- *WAN Interface Cards Hardware Installation Guide*
- *Cisco BPX 8600 Series Installation and Configuration, Release 9.3.30*

You can access the *WAN Interface Cards Hardware Installation Guide* at **Cisco Product Documentation > Access Servers & Routers > Modular Access Routers > Cisco 3600 Series Routers > Hardware installation documents for Cisco 3600 series > WAN interface card (WIC) installation**.

You can access the *Cisco BPX 8600 Series Installation and Configuration* publication at **Cisco Product Documentation > WAN Switches > BPX 8600 Series > *switch software release number***.

Cisco IOS Software Documentation

**Note**

Cisco IOS software is available only on the Universal Routing Module (URM) front card. Unless you intend to configure the IGX for IP services using the URM, you do not need to refer to Cisco IOS documentation.

Cisco IOS software documentation provides information on using the Cisco IOS software required by the IGX for IP services.

**Note**

Cisco IOS documentation is organized by Cisco IOS release, then by product type and name.

Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at <http://www.cisco.com/go/fn>. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

Main Cisco IOS Software Documentation Pages by Release

The main Cisco IOS software documentation pages provide links to all software documentation available for the release. Cisco IOS software documentation is classified as outlined in the following sections.

You can access the main Cisco IOS software documentation pages at **Cisco Product Documentation > Cisco IOS Software > Cisco IOS Software Release you are using**.

Or use the following links:

- Cisco IOS Release 12.1
- Cisco IOS Release 12.2

Master Index to Software Documentation

The Cisco IOS software documentation provides detailed configuration procedures and examples.

You can access these documents at **Cisco Product Documentation > Cisco IOS Software > Cisco IOS Software Release you are using > Cisco IOS Release x.x Master Index > Configuration guide or command reference indexes**.

Or use the following links:

- Cisco IOS Release 12.1 Master Indexes
- Cisco IOS Release 12.2 Master Indexes

Configuration Guides

The Cisco IOS software configuration guides provide detailed configuration procedures and examples.

You can access these documents at **Cisco Product Documentation > Cisco IOS Software > Cisco IOS Software Release you are using > Configuration Guides and Command References > Configuration guide for your application**.

Or use the following links:

- *Cisco IOS Configuration Guides and Command References*, Release 12.1
- *Cisco IOS Configuration Guides and Command References*, Release 12.2
- *Cisco IOS Configuration Fundamentals Configuration Guide*, Release 12.1
- *Cisco IOS Configuration Fundamentals Configuration Guide*, Release 12.2
- *Cisco IOS Wide-Area Networking Configuration Guide*, Release 12.1
- *Cisco IOS Wide-Area Networking Configuration Guide*, Release 12.2

Command References

The Cisco IOS software command references provide detailed information about each configuration command.

You can access these documents at **Cisco Product Documentation > Cisco IOS Software > Cisco IOS Software Release you are using > Configuration Guides and Command References > Command reference for your application**.

Or use the following links:

- *Cisco IOS Configuration Guides and Command References*, Release 12.1
- *Cisco IOS Configuration Guides and Command References*, Release 12.2
- *Cisco IOS Configuration Fundamentals Command Reference*, Release 12.1
- *Cisco IOS Configuration Fundamentals Command Reference*, Release 12.2
- *Cisco IOS Wide-Area Networking Command Reference*, Release 12.1
- *Cisco IOS Wide-Area Networking Command Reference*, Release 12.2

New Feature Documentation

New Feature Documentation contains detailed information about new configuration commands introduced in specific Cisco IOS releases.

You can access these documents at **Cisco Product Documentation > Cisco IOS Software > Cisco IOS Software Release you are using > New Feature Documentation > New Features for the Cisco IOS Software Release you are using**.

Or use the following links:

- *Cisco IOS New Feature Documentation*, Release 12.1
- *Cisco IOS New Feature Documentation*, Release 12.2
- Cisco IOS Voice Features on IGX 8400 Series Universal Router Module

Release Notes

Cisco IOS release notes for all platforms provide up-to-date information about specific Cisco IOS software releases.

You can access these documents at **Cisco Product Documentation > Cisco IOS Software Configuration > Cisco IOS Software Release you are using > Release Notes > Release Notes for the Cisco IOS Software Release you are using**.

Or use the following links:

- *Release Notes for Cisco IGX 8400 Series URM for Cisco IOS Release 12.1 YA*
- *Cisco IOS Release Notes*, Release 12.1
- *Cisco IOS Release Notes*, Release 12.2

Supporting Documents and Related Documentation

Debug commands and other additional information about specific Cisco IOS software releases, platforms, and applications.

You can access these documents at **Cisco Product Documentation > Cisco IOS Software Configuration > Cisco IOS Software Release you are using > Supporting Documents or Related Documentation**.

Or use the following links:

- *Cisco IOS Supporting Documents*, Release 12.1
- *Cisco IOS Supporting Documents*, Release 12.2
- *Cisco IOS Related Documents*, Release 12.1
- *Cisco IOS Related Documents*, Release 12.2

Accessing User Documentation

The following sections provide information on accessing user documentation online or through the included Documentation CD-ROM.

Accessing Online User Documentation

To access online user documentation, you need a desktop or notebook computer with an installed graphical Internet browser and an active connection to the Internet. If you do not have an active Internet connection available, use the Documentation CD-ROM that shipped with the product to access the user documentation (see the “[Accessing User Documentation on the Documentation CD-ROM](#)” section on [page xxii](#)).

- Step 1** Open your Internet browser.
- Step 2** Log in to Cisco.com at <http://www.cisco.com>.



Note If you do not have a user account, click the **Register** option in the navigational bar at the top of the page and proceed through the registration process.

- Step 3** Select the **Technical Documentation** option under the Service & Support heading.
- Step 4** Select the **Cisco Product Documentation** option to open the Cisco Product Documentation index.
- Step 5** Use the document paths provided in the “[Related Documentation](#)” section on [page xvii](#) to find the specific document you need.
-

Accessing User Documentation on the Documentation CD-ROM

To access user documentation on the CD-ROM, you need a computer with an installed graphical Internet browser and a CD-ROM drive.



Timesaver

Follow the Documentation CD-ROM installation instructions found in the CD package before attempting to access user documentation. CD-ROM installation takes approximately 5-10 minutes, depending on your computer and your installation requirements.

- Step 1** Insert the Documentation CD (disc 2) into your CD-ROM drive and launch the Documentation CD (CiscoCD).
 - Step 2** Select the **Cisco Product Documentation** option to open the Cisco Product Documentation index.
 - Step 3** Use the document paths provided in the “[Related Documentation](#)” section on page xvii to find the specific document you need.
-

Obtaining Documentation

Cisco provides several ways to obtain documentation, technical assistance, and other technical resources. These sections explain how to obtain technical information from Cisco Systems.

Cisco.com

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

<http://www.cisco.com/univercd/home/home.htm>

You can access the Cisco website at this URL:

<http://www.cisco.com>

International Cisco websites can be accessed from this URL:

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

Documentation CD-ROM

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

Registered Cisco.com users can order a single Documentation CD-ROM (product number DOC-CONDOCCD=) through the Cisco Ordering tool:

http://www.cisco.com/en/US/partner/ordering/ordering_place_order_ordering_tool_launch.html

All users can order monthly or quarterly subscriptions through the online Subscription Store:

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

Ordering Documentation

You can find instructions for ordering documentation at this URL:

http://www.cisco.com/univercd/cc/td/doc/es_inpck/pdi.htm

You can order Cisco documentation in these ways:

- Registered Cisco.com users (Cisco direct customers) can order Cisco product documentation from the Networking Products MarketPlace:

<http://www.cisco.com/en/US/partner/ordering/index.shtml>

- Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco Systems Corporate Headquarters (California, U.S.A.) at 408 526-7208 or, elsewhere in North America, by calling 800 553-NETS (6387).

Documentation Feedback

You can submit comments electronically on Cisco.com. On the Cisco Documentation home page, click **Feedback** at the top of the page.

You can e-mail your comments to bug-doc@cisco.com.

You can submit comments by using the response card (if present) behind the front cover of your document or by writing to the following address:

Cisco Systems
Attn: Customer Document Ordering
170 West Tasman Drive
San Jose, CA 95134-9883

We appreciate your comments.

Obtaining Technical Assistance

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

Cisco.com

Cisco.com offers a suite of interactive, networked services that let you access Cisco information, networking solutions, services, programs, and resources at any time, from anywhere in the world.

Cisco.com provides a broad range of features and services to help you with these tasks:

- Streamline business processes and improve productivity
- Resolve technical issues with online support
- Download and test software packages

- Order Cisco learning materials and merchandise
- Register for online skill assessment, training, and certification programs

To obtain customized information and service, you can self-register on Cisco.com at this URL:

<http://tools.cisco.com/RPF/register/register.do>

Technical Assistance Center

The Cisco TAC is available to all customers who need technical assistance with a Cisco product, technology, or solution. Two types of support are available: the Cisco TAC website and the Cisco TAC Escalation Center. The type of support that you choose depends on the priority of the problem and the conditions stated in service contracts, when applicable.

We categorize Cisco TAC inquiries according to urgency:

- Priority level 4 (P4)—You need information or assistance concerning Cisco product capabilities, product installation, or basic product configuration. There is little or no impact to your business operations.
- Priority level 3 (P3)—Operational performance of the network is impaired, but most business operations remain functional. You and Cisco are willing to commit resources during normal business hours to restore service to satisfactory levels.
- Priority level 2 (P2)—Operation of an existing network is severely degraded, or significant aspects of your business operations are negatively impacted by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.
- Priority level 1 (P1)—An existing network is “down,” or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

Cisco TAC Website

The Cisco TAC website provides online documents and tools to help troubleshoot and resolve technical issues with Cisco products and technologies. To access the Cisco TAC website, go to this URL:

<http://www.cisco.com/tac>

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

<http://tools.cisco.com/RPF/register/register.do>

If you are a Cisco.com registered user, and you cannot resolve your technical issues by using the Cisco TAC website, you can open a case online at this URL:

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

If you have Internet access, we recommend that you open P3 and P4 cases online so that you can fully describe the situation and attach any necessary files.

Cisco TAC Escalation Center

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

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

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

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

Obtaining Additional Publications and Information

Information about Cisco products, technologies, and network solutions is available from various online and printed sources.

- The *Cisco Product Catalog* describes the networking products offered by Cisco Systems, as well as ordering and customer support services. Access the *Cisco Product Catalog* at this URL:

http://www.cisco.com/en/US/products/products_catalog_links_launch.html

- Cisco Press publishes a wide range of networking publications. Cisco suggests these titles for new and experienced users: *Internetworking Terms and Acronyms Dictionary*, *Internetworking Technology Handbook*, *Internetworking Troubleshooting Guide*, and the *Internetworking Design Guide*. For current Cisco Press titles and other information, go to Cisco Press online at this URL:

<http://www.ciscopress.com>

- *Packet* magazine is the Cisco quarterly publication that provides the latest networking trends, technology breakthroughs, and Cisco products and solutions to help industry professionals get the most from their networking investment. Included are networking deployment and troubleshooting tips, configuration examples, customer case studies, tutorials and training, certification information, and links to numerous in-depth online resources. You can access *Packet* magazine at this URL:

<http://www.cisco.com/go/packet>

- iQ Magazine is the Cisco bimonthly publication that delivers the latest information about Internet business strategies for executives. You can access iQ Magazine at this URL:

<http://www.cisco.com/go/iqmagazine>

- Internet Protocol Journal is a quarterly journal published by Cisco Systems for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the Internet Protocol Journal at this URL:

http://www.cisco.com/en/US/about/ac123/ac147/about_cisco_the_internet_protocol_journal.html

- Training—Cisco offers world-class networking training. Current offerings in network training are listed at this URL:

http://www.cisco.com/en/US/learning/le31/learning_recommended_training_list.html



Cisco IGX 8400 Series Product Overview

This guide describes how to install, troubleshoot, and repair a Cisco IGX 8400 series node running Switch Software Release 9.3.30 or later release. In addition to the chapters that provide these descriptions, the appendix describes system specifications for the operating environment and data transport technologies, supported peripherals, cabling, and the possible arrangements for all series of Cisco WAN switches in a Cisco rack.

The Cisco IGX 8400 Series

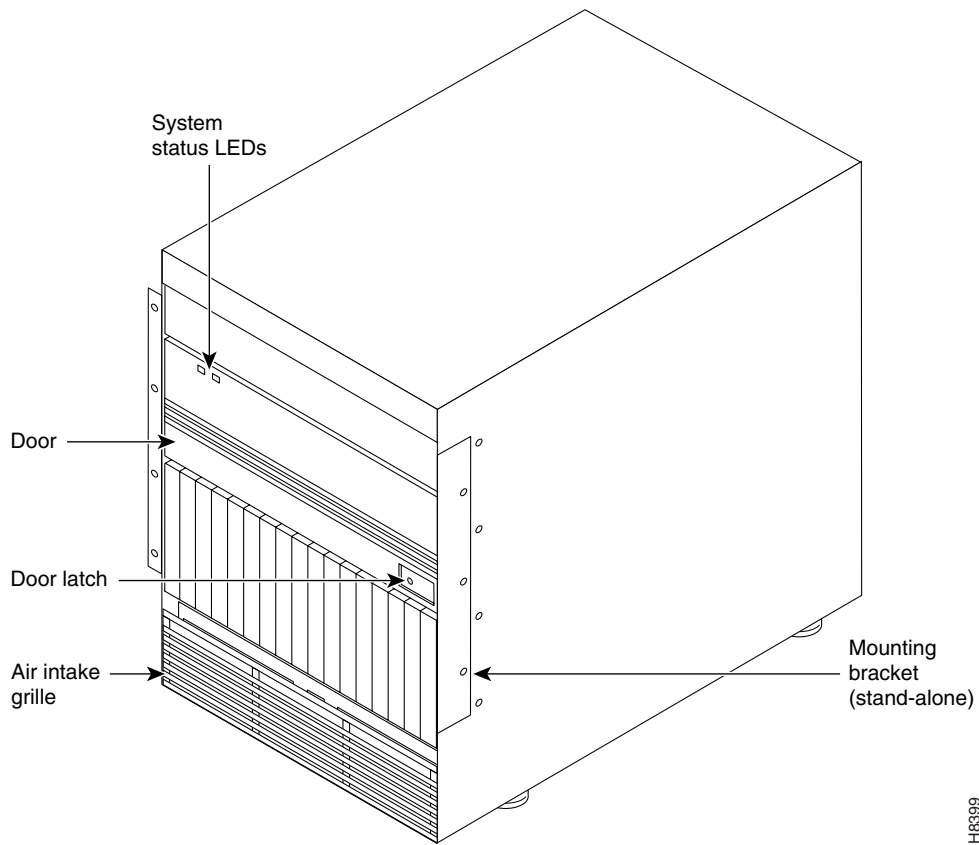
The Cisco IGX 8400 series of WAN switches consist of the IGX 8410, IGX 8420, and IGX 8430. A Cisco IGX 8400 series switch can reside in a rack or a standalone cabinet. [Figure 1-1](#) illustrates an IGX 8410 mounted in a cabinet.

The installation and related topics in this guide consist of the following:

- Enclosure or rack installation
This includes procedures for installing all switches in the IGX series in a cabinet or rack, using appropriate tools and mounting rails.
- AC or DC power supply installation
Procedures for mounting the AC or DC power supplies, installing redundant power supplies, and connecting to the power-entry back cards.
- Cooling unit installation
Installation of cooling fans in the IGX enclosure.
- Power and ground connections
Connecting the IGX to power and ground.
- Card installation
Procedures for installing the various front and back cards available for the IGX node.
- Node startup
Starting the node for the first time.
- Troubleshooting
General directions for isolating a problem area, and possible quick fixes.
- Replacing system components
- Upgrading a rack-mounted IGX 8420 to a rack-mounted IGX 8430

The remaining pages of this chapter illustrate the models in the IGX series.

Figure 1-1 IGX 8410 Chassis



H8399

Figure 1-2 illustrates an IGX 8420 switch in a standalone cabinet.

Figure 1-2 IGX 8420 Chassis

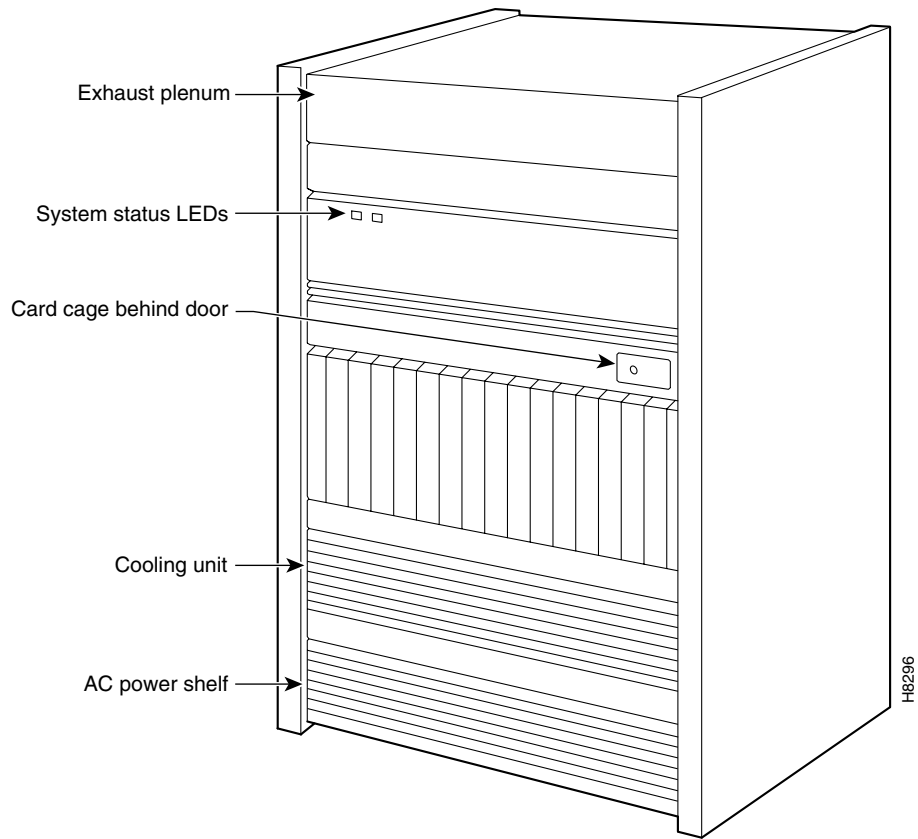
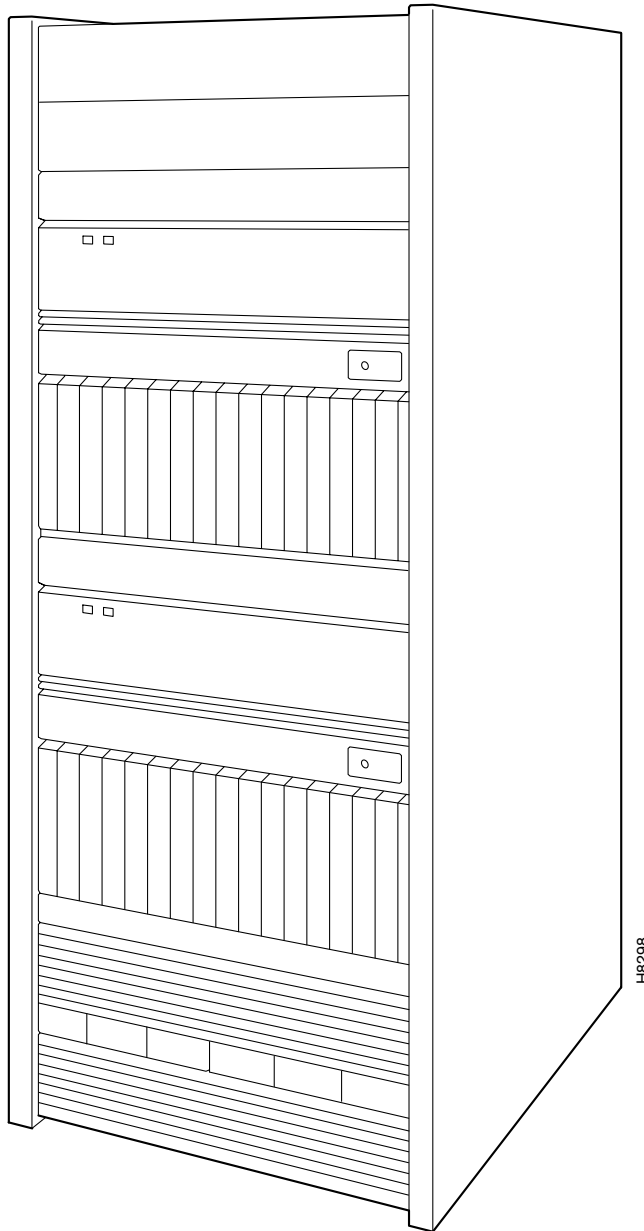


Figure 1-3 illustrates the IGX 8430 in a cabinet supplied by Cisco.

Figure 1-3 IGX 8430 Chassis



For descriptions of the hardware in an IGX 8410, IGX 8420, or IGX 8430 node, refer to the *Cisco IGX 8400 Series Provisioning Guide*.

An IGX series switch is installed with the following steps:

1. Enclosure or rack installation
This includes procedures for installing all switches in the IGX series in a cabinet or rack, using appropriate tools and mounting rails.
2. AC or DC power supply installation
Procedures for mounting the AC or DC power supplies, installing redundant power supplies, and connecting to the power-entry back cards.
3. Cooling unit installation
Installing cooling fans in the IGX enclosure.
4. Power and ground connections
Connecting the IGX to power and ground.
5. Card installation
Procedures for installing the various front and back cards available for the IGX node.
6. Node startup
Starting the node for the first time.

For more information on the procedures necessary to complete these steps, see [Chapter 2, “Power Worksheets.”](#)

Where to Go Next

For information on preparing to install an IGX, see [Chapter 2, “Power Worksheets.”](#)

For software configuration and service provisioning information, see the *Cisco IGX 8400 Series Provisioning Guide*, Chapter 1, [“Introduction to the Cisco IGX 8400 Series.”](#)

For more information on switch software commands, refer to the *Cisco WAN Switching Command Reference*, Chapter 1, [“Command Line Fundamentals.”](#)



Preparing to Install

Power Worksheets



Tip

An interactive version of these worksheets also is available at http://www-tac.cisco.com/Support_Library/Hardware/WAN_Switches_and_Modules/IGX_8400/IGXPowerBudgetWorksheet.html.

Before you install the system, verify that you have adequate power for all cards to be installed in the chassis. Using [Table 2-1](#) and [Table 2-2](#), follow the instructions listed below, or use the interactive version, to calculate your power budget for each node to be installed in the network.

Table 2-1 Cisco IGX 8400 Series Power Consumption Worksheet

Line	IGX Card	Card Power	Quantity	Total Power
1	ALM, all back cards	51 W	_____	_____
2	ARM, all back cards	9 W	_____	_____
3	BTM, all back cards	56 W	_____	_____
4	CVM, all back cards	44 W	_____	_____
5	FRM-B, all back cards	50 W	_____	_____
6	FRM, all back cards	55 W	_____	_____
7	FTM, all back cards	43 W	_____	_____
8	HDM, all back cards	51 W	_____	_____
9	LDM, all back cards	34 W	_____	_____
10	NPM, SCM back card	43 W	_____	_____
11	NTM, all back cards	37 W	_____	_____
12	UFM-C, all back cards	66 W	_____	_____
13	UFM-U, HSSI back card	93 W	_____	_____
14	UFM-U, all minus HSSI	72 W	_____	_____
15	URM, all back cards	73 W	_____	_____
16	UVM, all back cards	55 W	_____	_____
17	UXM, all back cards	73 W	_____	_____

Table 2-1 Cisco IGX 8400 Series Power Consumption Worksheet (continued)

Line	IGX Card	Card Power	Quantity	Total Power
18	UXM-E, all back cards	65 W	_____	_____
19	8420/8430 Fan Tray	160 W	_____	_____
20	Total number of cards		_____	
21	Total power demand			_____

Fill in the blank cells in [Table 2-1](#) using the following rules:


- Step 1** For lines 1 to 19, fill in the number of cards to be installed in the Quantity column.
- Step 2** Multiply the IGX card quantity by the card wattage listed in the Card Power column, and enter the result in the Total Power column.
- Step 3** Total the Quantity column and enter the result in the Total Number of Cards row (line 20).
-  **Tip** If you have an IGX 8420 or IGX 8430, remember to include the fan trays in the total number of cards. Although fan trays are not really cards, include the power consumption of the fan trays in any chassis power configurations.
- Step 4** Confirm that the total number of cards does not exceed the allowable number of cards for your chassis. The IGX 8410 allows 8 cards, the IGX 8420 allows 16 cards, and the IGX 8430 allows 32 cards.
- Step 5** Total the Total Power column and enter the result in the Total Power Demand row (line 21).
- Step 6** Proceed to [Step 1](#) for [Table 2-2](#).

Table 2-2 Cisco IGX 8400 Series Power Supply Worksheet

Line	Power Supply	Rating	Quantity	Total Power
	8410-AC			
22	Per AC power supply	400 W	_____	_____
23	Maximum shelf rating	780 W	_____	_____
24	Available power			_____
	8420/30-AC			
25	Per AC power supply	400 W	_____	_____
26	Maximum shelf rating	2496 W	_____	_____
27	Available power			_____
	8410 and 8420/30-DC			
28	Per DC power supply	1050 W	_____	_____
29	Maximum DC rating per shelf	1050 W	_____	_____
30	Available power			_____

Table 2-2 Cisco IGX 8400 Series Power Supply Worksheet (continued)

Line	Power Supply	Rating	Quantity	Total Power
31	Total shelf power			_____
32	Total shelf power - total power demand			_____

Fill in the blank cells in [Table 2-2](#) using the following rules:

-
- Step 1** Determine which power supply option will be used with the system. The following options are available: 8410-AC, 8420/8430-AC, 8410-DC, and 8420/8430-DC.
- Step 2** Enter the number of power supply units (PSUs) to be installed in the Quantity column for all AC Power Supply and DC Power Supply rows (lines 22, 25, and 28). The allowable values are:
- 8410-AC—One or two power supply units (PSUs)
 - 8430/30-AC—One, two, or three PSUs
 - 8410-DC & 8420/30-DC—One or two PSUs
- Step 3** Multiply the number in the Quantity column by the value in the Rating column, and enter the result in the Total Power column (for lines 22, 25, or 28).
- Step 4** Compare the total power number (lines 22, 25, or 28) to the shelf rating (lines 23, 26, or 29). The available power is the lowest of these two numbers. For example, if the total power number is higher than the shelf rating, the available power will equal the shelf rating.
- Step 5** Enter the available power in the Available power row (lines 24, 27, or 30) and in the Total shelf power row (line 31).
- Step 6** Subtract the Total Power Demand (line 21) from the Total shelf power (line 31), and enter the result in the Total shelf power - total power demand row (line 32).

**Tip**

If the number in the Total shelf power - total power demand row (line 32) is negative, the system is short of power. Either add more power by increasing the number of power supply units as applicable (if possible) or decrease the power demand by removing cards from the chassis.

Parts Checklist

Before you install the system, verify that all the required parts are present and in good condition. If anything is missing or damaged, contact your sales representative.

IGX 8410 Enclosure

Check the cabinet for the following inventory:

- For rack-mount systems, four permanent mounting brackets are present. Also, for installation purposes only, a pair of temporary mounting brackets and a temporary spacer bracket are present.
- The unit has the correct power type (AC or DC) and the factory-installed power-entry back card (PE-BC). For DC-powered systems, DC power entry modules (PEMs) are installed in the PE-BC. For AC systems, check for the power supply tray, correct power cord, and correct number of supplies.

IGX 8420/8430 Enclosures

Check the cabinet for the following inventory:

- The unit has the correct number of card cages (1 or 2).
- The unit has the correct power type (AC or DC) and the factory-installed power-entry back cards (PE-BC), one per shelf. For DC-powered systems, DC PEMs are factory-installed in each PE-BC. For an AC system, check for the power supply tray and correct number of power supplies and cables.

Plug-In Cards

Make sure that all purchased cards are present. Check the number and type of cards shipped against the number and type of card purchased. In [Table 2-3](#), the column on the left lists the front cards. The column on the right lists the possible corresponding back cards. Check off each card type as you inventory them.

An inventory list of the installed cards is shipped with the unit. The list includes each card's serial number, revision number, and slot number (serial and revision numbers are also found on the solder side of each card). Check for the presence of any other items on the shipping list. After verifying that the correct cards are present, tape a copy of the inventory list to the cabinet door or tape into your network documentation.

Table 2-3 Inventory Checklist

Front Card Checklist	Back Card Checklist
Correct number and types of NPMs	One SCM
Correct number of NTMs	Correct number of BC-T1s Correct number of BC-E1s Correct number of BC-Y1s Correct number of BC-SRs

Table 2-3 Inventory Checklist (continued)

Front Card Checklist	Back Card Checklist
Correct number of UXM-Es	Correct number of BC-UAI-4-155-MMFs Correct number of BC-UAI-4-155-SMFs Correct number of BC-UAI-4-155-ELs Correct number of BC-UAI-2-155-SMFs Correct number of BC-UAI-6-T3s Correct number of BC-UAI-6-E3s Correct number of BC-UAI-3-T3s Correct number of BC-UAI-3-E3s Correct number of BC-UAI-8-T1-DB-15s Correct number of BC-UAI-8-E1-DB-15s Correct number of BC-UAI-8-E1-BNCs Correct number of BC-UAI-4-T1-DB-15s Correct number of BC-UAI-4-E1-DB-15s Correct number of BC-UAI-4-E1-BNC
Correct number and types of UVMs	Correct number of BC-UVI-2E1ECs Correct number of BC-UVI-2J1ECs Correct number of BC-UVI-2T1ECs
Correct number and types of CVMs	Correct number of BC-E1s Correct number of BC-J1s Correct number of BC-T1s
Correct number of UFM-Cs	Correct number of UFI-8T1-DB-15s Correct number of UFI-8E1-DB-15s Correct number of UFI-8E1-BNCs
Correct number of UFM-Us	Correct number of UFI-12-V35s Correct number of UFI-12-X21s Correct number of UFI-4-HSSIs
Correct number and types of FRMs (including FRM-2s)	Correct number of FRI-T1s Correct number of FRI-E1s Correct number of FRI-X.21s Correct number of FRI-V.35 Correct number of FRI-2-X.21s
Correct number of HDMs	Correct number of SDIs
Correct number of LDMs	Correct number of LDIs

Table 2-3 Inventory Checklist (continued)

Front Card Checklist		Back Card Checklist
Correct number of ARMs	—	Correct number of ARIs
	—	Blank faceplates for unused back card slots

Site Preparation



Warning

This unit is intended for installation in restricted access areas. A restricted access area can be accessed only through the use of a special tool, lock and key, or other means of security. To see translations of this warning, refer to the Regulatory Compliance and Safety Information document that accompanied this product.

The site must satisfy the following requirements:

- Space

The standalone IGX 8410 node requires a floor area 19.9 inches (50.5 cm) wide and at least 47 in. (180 cm) deep. This depth allows for opening the front door. Sufficient clearance around the cabinet must also be provided for access to the front and back of the cabinet while the door is open. The rack-mount IGX 8410 node requires 24.44 inches of vertical space.

A standalone IGX 8420 or IGX 8430 node requires a floor area 19.9 inches (50.5 cm) wide and at least 47 in. (119.4 cm) deep. This spacing lets you open the front door. Clearance around the cabinet must also allow access to the front and back of the cabinet while the door is open. The rack-mount IGX 8430 requires 32 in. (81.3 cm) of vertical space. The rack-mount IGX 8430 node requires 55 in. (139.7 cm) of vertical space.

In a rack-mount system, the mounting rail pattern follows the EIA standard of 56 in. (or 32 rack-mount units). For displacement information for the IGX components and other components in the Cisco cabinet, refer to [Appendix A, “General IGX 8410 Switch Specifications.”](#)

- Environment

The IGX operating environment should be as follows:

Temperature and humidity range: 0 to 40° C (32 to 104° F) for normal operation, 50° C (122° F) for up to 72 hours. 10 to 85 percent relative humidity, noncondensing.

Shock—The switch withstands 10 G, 10 ms at 1/2 sine wave.

Vibration—The switch withstands 1/4 G, 20 to 500 Hz.

- Power

For AC power use, an AC power source must be available within 6 ft (1.8 m) of the IGX node. For systems using a DC source, Cisco does not supply the DC power cord, so the user or installer determines the cord length and the distance to the DC source. The wire should be 10–12 AWG or 4 square mm.

- Heat Dissipation

A fully loaded, AC-powered IGX 8410 node dissipates up to 3,500 BTUs (1 kw hour).
A DC-powered IGX 8410 node can dissipate up to 2720 BTUs.

A fully loaded, AC-powered IGX 8420 node dissipates up to 4300 BTUs (1 kw hour).
A DC-powered IGX 8420 can dissipate up to 3600 BTUs.

A fully loaded, AC-powered IGX 8430 node dissipates up to 8600 BTUs (1 kw hour).
A DC-powered IGX 8430 node can dissipate up to 6800 BTUs.
- Weight

A fully loaded IGX 8410 enclosure can weigh up to 173 lb (79 kg). A fully loaded IGX 8420 enclosure can weigh up to 250 lb (112.5 kg). A fully loaded IGX 8430 enclosure can weigh up to 500 lb (225 kg).

**Caution**

If you move a Cisco cabinet, do not push it at its sides. Push at the front or back.

- Flooring

Raised flooring with sufficient under-floor space to house the cables is recommended.
- Mounting

An IGX node is either mounted in a rack or free-standing (in a standalone cabinet). The location of the IGX node should accommodate the routing of the data cables and the termination of the telephone company's or common carrier's circuits.
- Electrostatic Discharge

The IGX 8410 node has one mounted wrist strap at the front and one at the back of the cabinet. Personnel with access to the IGX 8410 cards should put on a wrist strap before handling the cards. An IGX 8420/8430 node does not ship with a wrist strap.

Seismic Considerations

To provide some protection against seismic activity, the feet and wheels of the IGX standalone cabinets can be removed to permit the cabinet to be bolted to a concrete floor or to a structural member in the floor.

In cabinets supplied by Cisco, provisions are available for seismic anchoring. Holes exist in the upper and lower corners for 3/8- or 1/2-in. bolts. Also, an optional stability plate can be purchased with the Cisco cabinet. The stability plate is bolted to the floor, then the Cisco cabinet is bolted to the stability plate. The [“Seismic Anchoring for the Cisco Rack”](#) section on page 2-11 contains instructions for installing the seismic stability plate.

Safety Requirements

The following paragraphs contain general safety information and information on telecommunications safety requirements.

General Requirements



Warning

Before working on equipment that is connected to power lines, remove jewelry (including rings, necklaces, and watches). Metal objects will heat up when connected to power and ground and can cause serious burns or weld the metal object to the terminals. To see translations of this warning, refer to the Regulatory Compliance and Safety Information document that accompanied this product.



Warning

Do not work on the system or connect or disconnect cables during periods of lightning activity. To see translations of this warning, refer to the Regulatory Compliance and Safety Information document that accompanied this product.



Warning

Before working on a system that has an on/off switch, turn OFF the power and unplug the power cord. To see translations of this warning, refer to the Regulatory Compliance and Safety Information document that accompanied this product.



Warning

This equipment must be installed and maintained by service personnel as defined by AS/NZS 3260. Incorrectly connecting this equipment to a general-purpose outlet could be hazardous. The telecommunications lines must be disconnected 1) before unplugging the main power connector or 2) while the housing is open, or both. To see translations of this warning, refer to the Regulatory Compliance and Safety Information document that accompanied this product.



Warning

The plug-socket combination must be accessible at all times, because it serves as the main disconnecting device. To see translations of this warning, refer to the Regulatory Compliance and Safety Information document that accompanied this product.



Warning

A readily accessible two-poled disconnect device must be incorporated in the fixed wiring. To see translations of this warning, refer to the Regulatory Compliance and Safety Information document that accompanied this product.



Warning

When installing or replacing the unit, the ground connection must always be made first and disconnected last. To see translations of this warning, refer to the Regulatory Compliance and Safety Information document that accompanied this product.

The following safety requirements must be observed:

- Only authorized personnel should have access to the IGX node.
- Correct alignment of connector pins with connectors is vitally important. Before you insert a card, make sure that the pins are straight and that the connectors on the card and the backplane align with each other. Insert the card gently.

- For the IGX node and peripheral equipment to function safely and correctly, use only the power cords, cables, and connectors that are specified for the equipment and make sure that they are in good condition.
- Use a wrist strap when handling cards.

Power and Grounding

This section lists the requirements that relate to electrical power and grounding. These requirements cover installations at central office (CO) and private enterprise locations.

AC Power Circuit Breakers

For an AC-powered system, verify that the node's power comes from a dedicated AC branch circuit. The circuit must be protected by a dedicated, two-pole circuit breaker. The circuit breaker must have a rated current and trip delay that is greater than those of the IGX circuit breaker. Cisco Systems recommends the following:

- For IGX 8420 or IGX 8430 nodes, the site should have a 20A, 2-pole AC circuit breaker with a long trip-delay at each branch circuit.
- For IGX 8410 nodes, the site should have a 15A, 2-pole AC circuit breaker with a long trip-delay at each branch circuit.

The IGX 8420 and IGX 8430 nodes use a 20A, 2-pole circuit breaker for each AC input. The manufacturer of this circuit breaker is ETA, and the ETA part number for the circuit breaker is 8340-F120-P1P2-B2H020A. The IGX 8410 node uses a 15A, 2-pole AC circuit breaker on each input. This circuit breaker comes from either ETA (part number 8340-F120-P1P2-B2H015A) or Airpax (part number IEGH11-1-62-15.0-91V).



Warning

This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that the protective device is rated not greater than: 120 VAC, 15A U.S. (240 VAC, 10A international)
To see translations of this warning, refer to the Regulatory Compliance and Safety Information document that accompanied this product.

DC Power Circuit Breakers

For a DC-powered system, verify that the node's power comes from a dedicated DC branch circuit. The circuit must be protected by a dedicated circuit breaker. The circuit breaker must have a rated current and trip delay that is greater than those of the IGX circuit breaker. Cisco Systems recommends that the site have a dedicated 25A, 1-pole circuit breaker with a medium trip delay at each branch circuit.

The DC-powered nodes use a 25A, 1-pole circuit breaker with a short trip delay on each -48V input. The manufacturer of this circuit breaker is ETA, and the ETA part number is 8340F110P1K1A2H00025.



Warning

This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that the protective device is rated not greater than: 25A minimum, 60VDC
To see translations of this warning, refer to the Regulatory Compliance and Safety Information document that accompanied this product.

Electrical Power for AC Units

An AC power source must be available within 6 ft (1.8 m) of the system and easily accessible. Before turning on the power, verify that the power supplied to the node comes from a dedicated branch circuit.

The power receptacles to which the node connects must be of the grounding type. The grounding conductors that connect to the receptacles should connect to protective earth at the service equipment.

Electrical Power for DC Units

Only a 48-VDC supply that complies with the Safety Extra Low Voltage (SELV) requirements of EN 60950 can connect to the IGX DC input.

For DC supply connections, consult local and national codes for proper conductor sizing. The conductors must be suitable for 20 A. Wiring that is 10 to 12 AWG (4 sq mm) is adequate.

Bonding and Grounding

To maintain the full EMI and EMC integrity of this equipment, it must be bonded to an integrated ground plane or an isolated ground plane network. In addition, the front card faceplate must be properly installed. The purpose of this is to mitigate the damaging effects to equipment from electrostatic discharge and lightning. Refer to the latest edition of ITU Recommendation K.27 or Telcordia Technologies GR-1089-CORE requirements to ensure that the correct bonding and grounding procedures are followed. As recommended in these documents, a frame bonding connection is provided on the cabinet supplied by Cisco for rack-mounted systems and on the standalone cabinets.

Refer to the [“Making the Frame Bonding \(Ground\) Connection” section on page 2-35](#) for information on the locations of the frame bonding connections and how to make a connection.

Except for the AC power supply module, every module in a rack-mount system relies on the rack itself for grounding. Therefore, the rack must be properly connected to protective earth before operating the system.

A DC-powered IGX node must have grounding conductors that connect at two separate locations, as follows:

- The grounding conductor provided with the supply source must connect to the correct terminal of the power entry module (PEM). The [“DC Power Connections” section on page 2-41](#) describes how to make this connection.
- A grounding conductor as described in the first paragraph of this section must connect to the appropriate terminal of a rack assembly or to the chassis of an IGX node.

Telecommunications Requirements

The telecommunications requirements might be relevant to a private network connected to the public, switched networks in some international service areas.

- The following port types on the IGX node are approved to carry public-switched, non-voice traffic (OTR001, issue 3, port types 2DN):
 - BC-E1 ports (G.703 2048 KBps).
 - SDI-EIA/TIA-232, LDI-EIA/TIA-232, BC-SR, SDI-EIA/TIA-449, FRI-V.35 (approved for direct connection to V.35 leased digital circuit).
 - SDI-EIA/TIA-449 (when connected using Cisco EIA/TIA449/X.21 interface cable).
- The following port type on the IGX node is approved to carry PSTN digitized voice traffic:
 - BC-E1 ports (G.703 2048 Kbps, when connected to a CVM or NTM front card).



Warning

To prevent accidental discharge in the event of a power line cross, route on-premise wiring away from power cables and off-premise wiring, or use a grounded shield to separate the on-premise wiring from the power cables and off-premise wiring. A power line cross is an event, such as a lightning strike, that causes a power surge. Off-premise wiring is designed to withstand power line crosses. On-premise wiring is protected from power line crosses by a device that provides overcurrent and overvoltage protection. Nevertheless, if the on-premise wiring is in close proximity to, or not shielded from, the off-premise wiring or power cables during a lightning strike or power surge, the on-premise wiring can carry a dangerous discharge to the attached interface, equipment, and nearby personnel. To see translations of this warning, refer to the Regulatory Compliance and Safety Information document that accompanied this product.



Note

Cables must be attached so that their securing bolts are tightened such that a screwdriver is needed for removal.

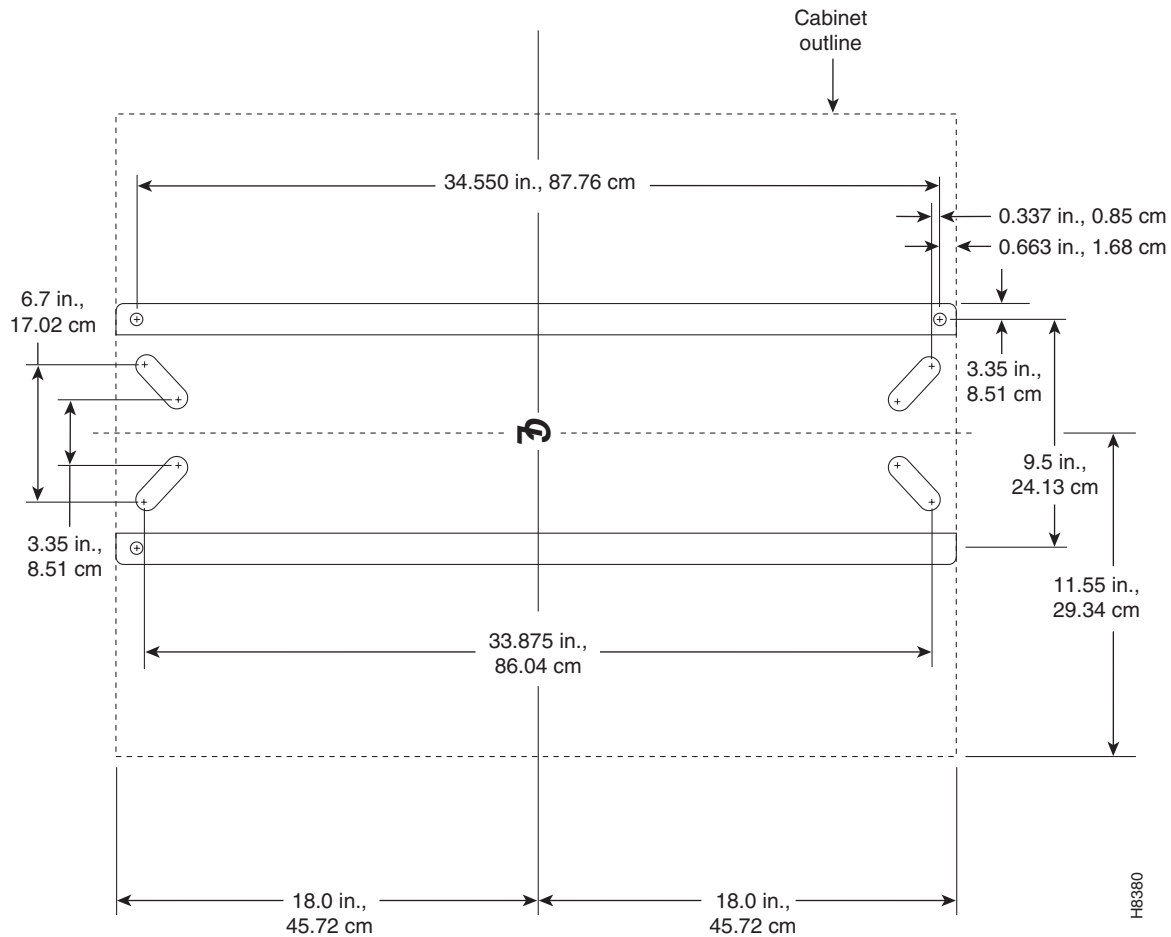
Seismic Anchoring for the Cisco Rack

This section describes installing the Cisco cabinet with the optional stability plate for seismic anchoring. If the stability plate is not present, go to either the [“IGX 8410 Enclosure Installation” section on page 2-14](#) or the [“IGX 8420 or IGX 8430 Enclosure Installation” section on page 2-18](#).

To set up the Cisco cabinet with the stability plate:

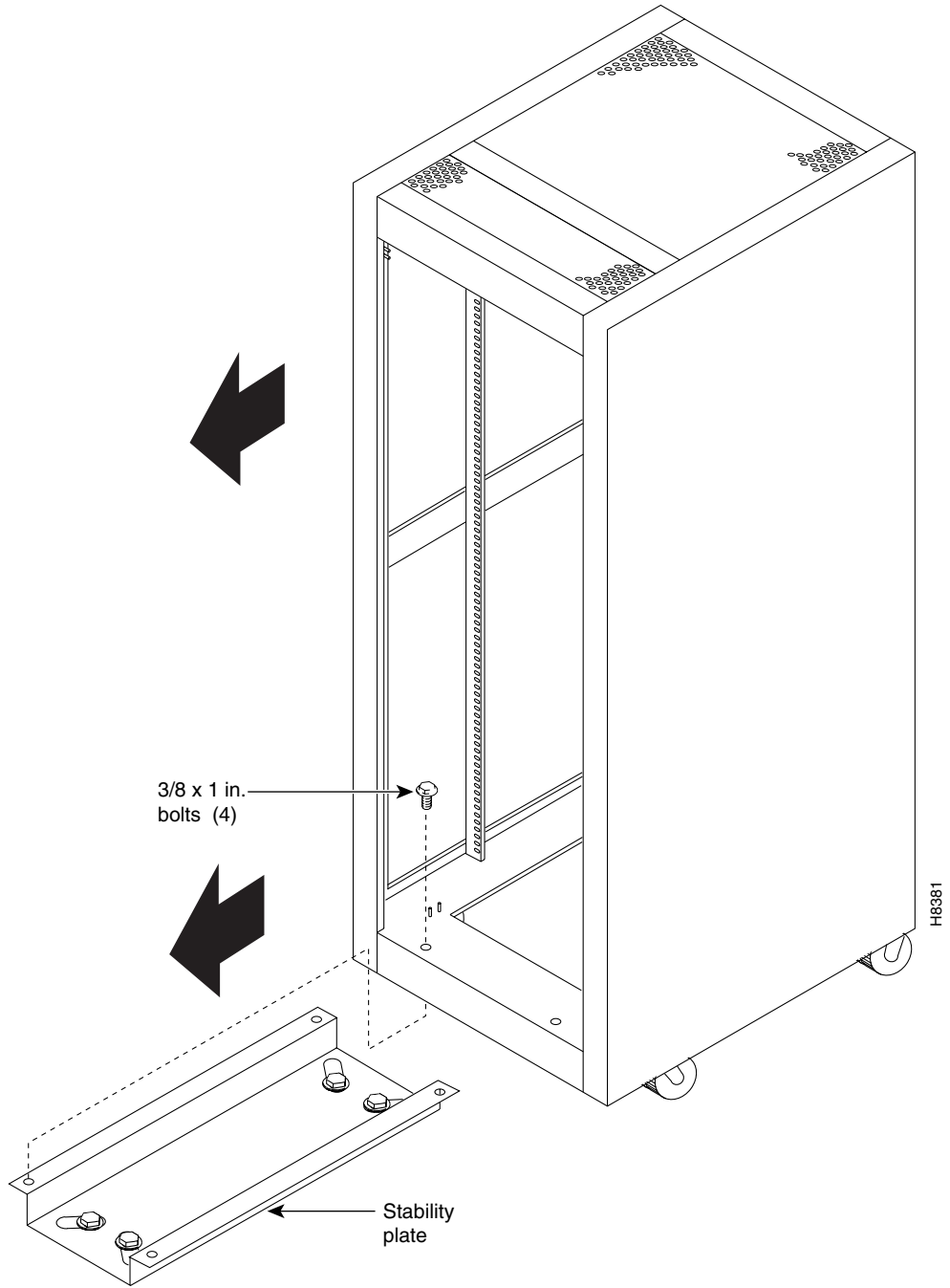
- Step 1** Use the dimensions in [Figure 2-1](#) to drill the holes for installing the stability plate.

Figure 2-1 Stability Plate Dimensions



- Step 2** Remove the stability plate from the base of the Cisco cabinet. Save the nuts and bolts.
- Step 3** With the user-provided anchoring bolts, attach the stability plate to the floor.
- Step 4** Roll the Cisco cabinet over the stability plate, as [Figure 2-2](#) illustrates.
- Step 5** Using the nuts and bolts from the shipping setup, secure the Cisco cabinet to the stability plate.

Figure 2-2 Installing a Cisco-Supplied Rack over the Stability Plate



IGX 8410 Enclosure Installation

Tools and Equipment

Installing an IGX 8410 switch requires the following tools and equipment:

- Box knife (or equivalent)
- Flat-blade screwdriver set
- Phillips screwdriver set, which must include a No. 1 size for front card installation
- Grounding wrist strap
- A variety of wrenches, possibly including an adjustable wrench or channel locks, for raising and lowering cabinet feet (for example, a Cisco cabinet requires a 1 3/8-in. wrench)
- 5/32-in. Allen wrench for opening the IGX 8410 door (Cisco provides a wrench)

Standalone System Installation

The installation steps consist of placing the standalone IGX 8410 node at its operating location, unpacking it, and verifying the integrity of the enclosure and power connections. Note that the cabinet is 19.9 in. wide.

After the system is at its operational location, follow the steps for connecting power. If the system has an AC power source, go to the [“AC Power Connections” section on page 2-39](#). If the system has a DC power source, go to the [“DC Power Connections” section on page 2-41](#).

Rack-Mount Installation

The rack-mount IGX 8410 node fits in a 19-in. (48.25-cm) rack with a minimum of 17.75 in. between rails. For mounting the chassis in a rack, brackets are attached to the front of the chassis. A pair of mounting brackets are attached at the back of the chassis after it is placed in the rack. Brackets for a mid-rack mounting also come with the kit.

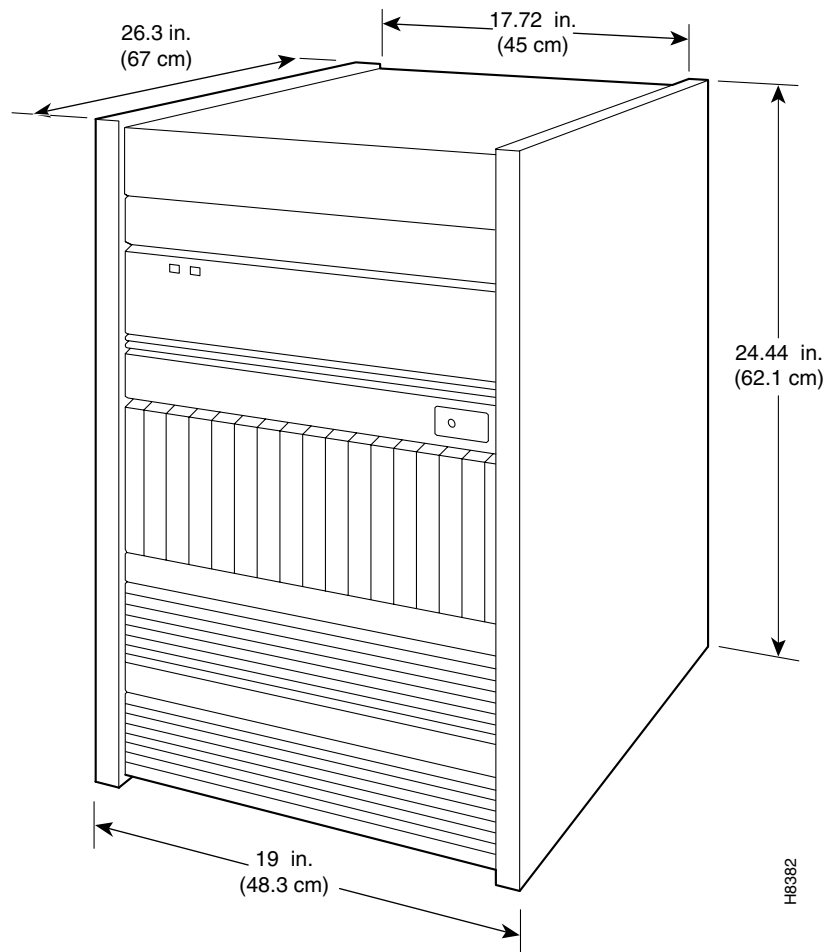
To support the weight of the IGX 8410 node during installation, Cisco includes two temporary spacer brackets and a temporary mounting bracket. You remove these pieces after installation. The spacer brackets stabilize the rack. Also, the temporary mounting bracket together with the spacer brackets create a partial shelf onto which you can slide the node. These pieces support the system while you secure the permanent front and back mounting brackets to the rack.

**Caution**

If an IGX node is mounted in a cabinet, be sure that an unrestricted air flow is available in and out of the enclosure.

To install an IGX 8410 node in a rack:

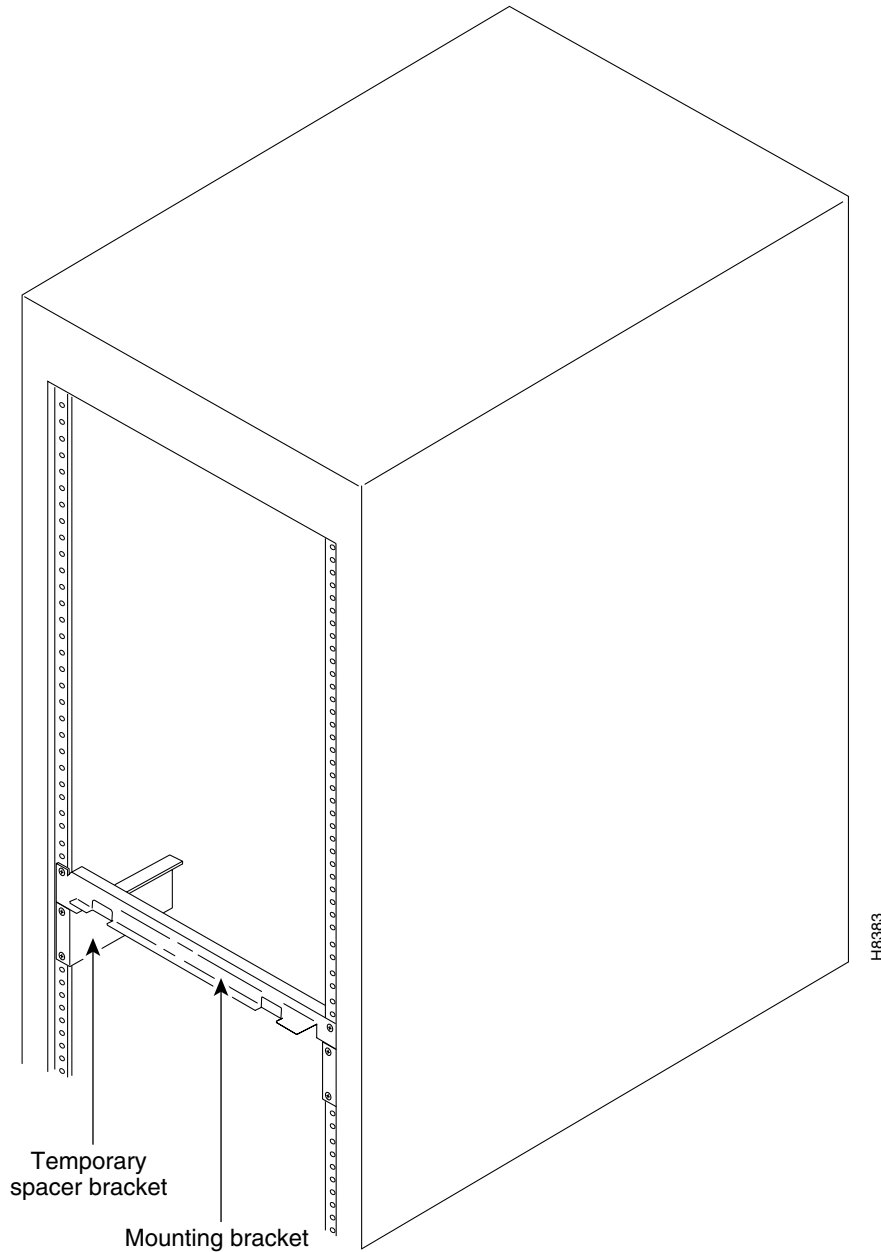
- Step 1** Decide on the position of the IGX 8410 node in the rack. See [Figure 2-3](#) for external dimensions. Note that vertical spacing between the IGX 8410 node and other components (such as a BPX or MGX 8220) must be in the range 0.047–0.077 in. (0.119–0.196 cm).

Figure 2-3 IGX 8410 Rack-Mounting Dimensions

- Step 2** At the front of the rack, attach the temporary spacer bracket and temporary mounting brackets so that the uppermost portion of these pieces are at the bottom of the intended location of the IGX 8410 node. [Figure 2-4](#) shows a temporary spacer and mounting bracket in a cabinet supplied by Cisco.

**Caution**

If you must move a Cisco cabinet to install an IGX switch, do not push the cabinet at its sides. Instead, grip the cabinet at the front or back edges to maneuver it to the setup location.

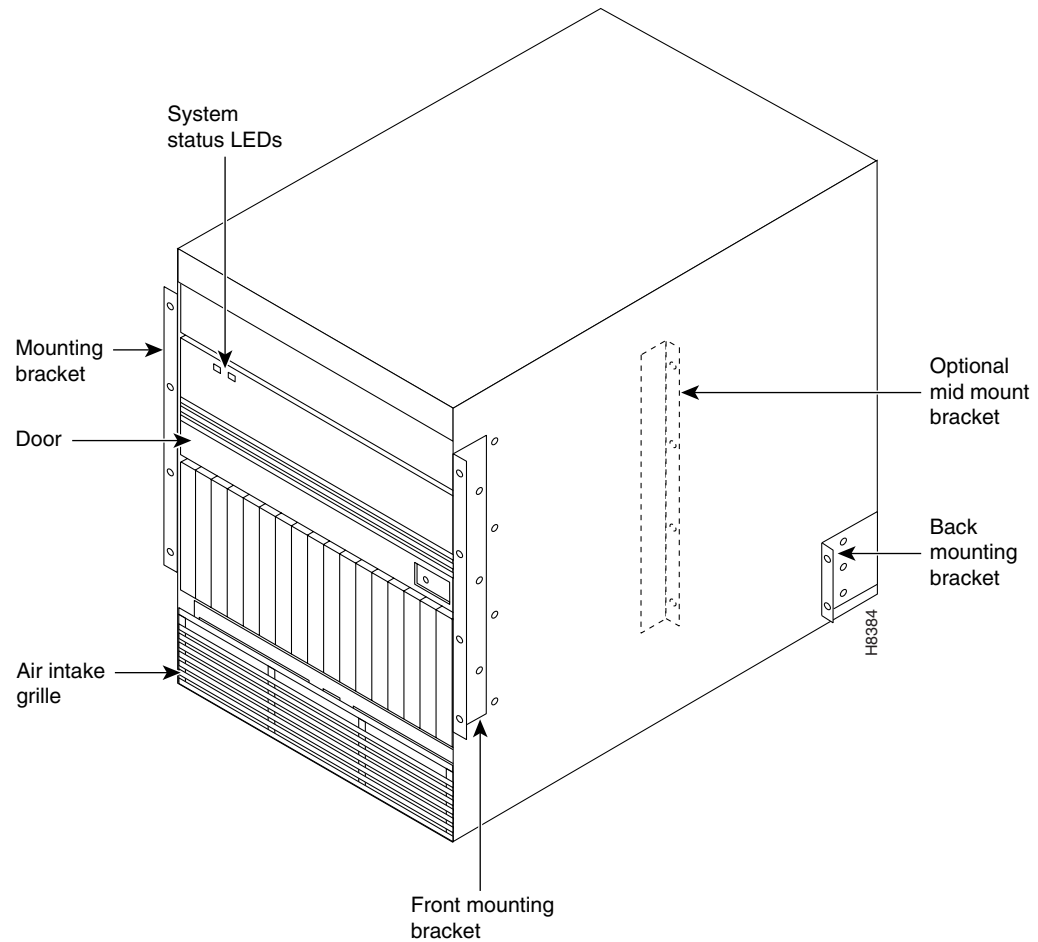
Figure 2-4 Temporary Spacer Bracket and Mounting Bracket

- Step 3** Position the IGX 8410 node in front of the cabinet. This position should be such that the back of the IGX card cage faces the front of the rack. If you have not already done so, remove the foam strips from the sides, front, and back.
- Step 4** Remove the attached mounting brackets (filler plates) for the standalone version. The mounting brackets for the rack-mount go in these places. See [Figure 2-5](#) for the locations of the mounting brackets.
- Step 5** Attach the front mounting brackets to the IGX 8410 node.

**Caution**

An IGX 8410 node requires two or three people to lift it into the rack.

Figure 2-5 Rack-Mount Cabinet



- Step 6** This step requires one person on each side of the IGX card cage. Lift and slide the card cage into the rack at the front of the rack. Slide the IGX 8410 node to the back and rest the rear of the system on the temporary mounting brackets and spacer.
- Step 7** Secure the front bracket (or mid-mount bracket) to the rack. The mid-mount brackets require the threaded rolling screws that the IGX 8410 kit includes. Attach the IGX 8410 node to the rack with eight #10-32 machine screws.

**Caution**

Make sure that mounting the equipment does not create a hazardous condition due to uneven mechanical loading. The equipment rack should be securely supported.

- Step 8** Attach the permanent rear mounting brackets to the rack.
- Step 9** Remove the temporary mounting brackets and temporary spacer bracket.
- Step 10** If this is a DC-powered system, go to the “[DC Power Connections](#)” section on page 2-41.
- Step 11** Go to the procedures in [Chapter 3, “Installing the IGX.”](#)

IGX 8420 or IGX 8430 Enclosure Installation

Tools and Equipment

Installing an IGX 8420 or IGX 8430 node requires the following tools and equipment:

- Box knife (or equivalent)
- Flat-blade screwdriver set
- Phillips screwdriver set, which must include a No. 1 size for front card installation (the No. 1 Phillips screwdriver is included with the combination tool that Cisco provides)
- ESD-preventive wrist strap
- A variety of wrenches—possibly including an adjustable wrench or channel locks—for raising and lowering cabinet feet (for example, the Cisco cabinet requires a 1 3/8-in. wrench, and the standalone requires a 5/8-in. wrench)
- 5/32-in. Allen wrench for opening and closing the door latch (included with the combination tool that Cisco provides)

Rack-mount systems ship with the parts described in the assembly instructions.

Standalone System Installation

Because Cisco standalone systems ship with all components installed in the cabinet, the installation steps consist of placing the unit at its operational location, unpacking it, and verifying the structural and power connection integrity before turning on the power. Note that a standalone cabinet is 19.9-in. wide. The adjustable levelers require a 5/8-in. wrench. If the system has an AC power source, go to the [“AC Power Connections” section on page 2-39](#). If the system has a DC power source, go to the [“DC Power Connections” section on page 2-41](#).

IGX 8420 Rack-Mount Installation

The rack-mount IGX 8420 node fits in a 19-in. (48.25-cm) rack. The front of each assembly has flanges that serve as the front mounting brackets. The assembly kit contains other brackets for different mounting setups. The following order of component installation is the most convenient and efficient. For some of these components, separate sections follow with detailed installation steps.

1. Optional AC power assembly
2. Cooling unit
3. Card cage
4. Exhaust plenum

Note that the vertical spacing between components, such as the card cage and fan tray, must be in the range 0.047–0.077 in. (0.119–0.196 cm).

The miscellaneous parts kit for rack systems contains brackets for both a Cisco cabinet and a user-supplied rack. The kit includes mid-mount brackets for open racks.

The rear-mount brackets attach to the rear vertical rail in a Cisco cabinet. Each of these brackets has a horizontal flange upon which the back of each IGX component rests. The front of each assembly chassis has flanges that serve as the front mounting brackets.

**Caution**

If an IGX node is mounted in a user-supplied cabinet, be sure that air can flow unrestricted in and out of the cabinet. For assistance, see the [“Obtaining Technical Assistance”](#) section on page xxiii.

To install the IGX 8420 node in a rack:

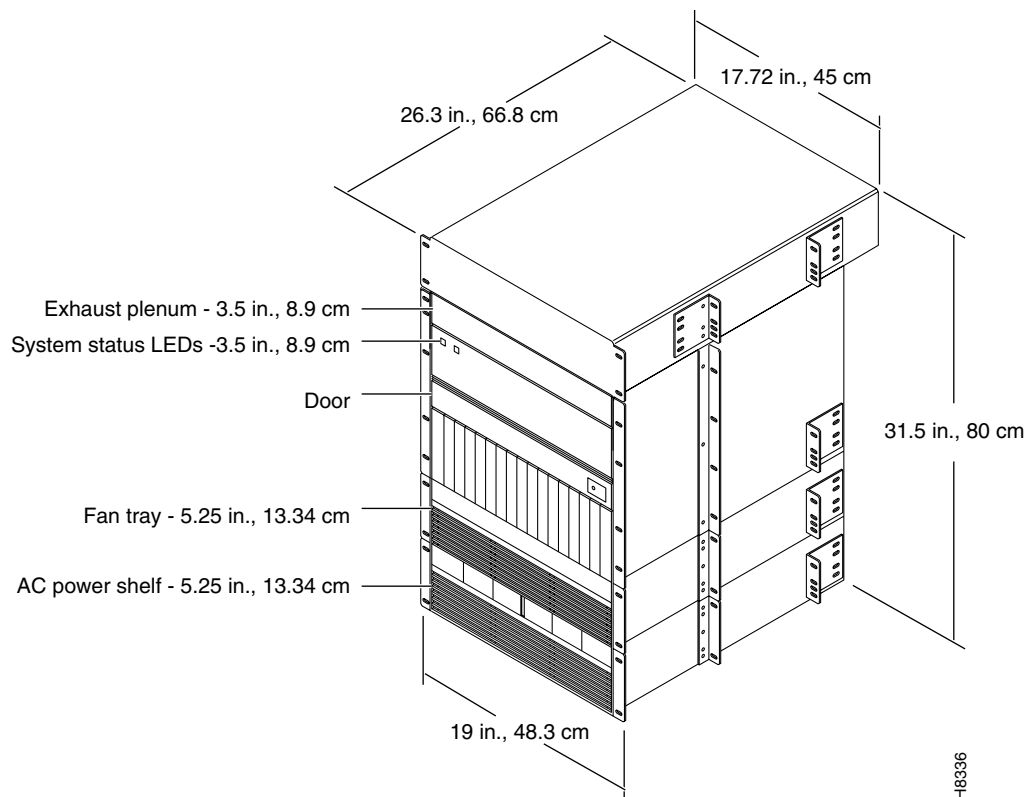
Step 1

Decide on the IGX location. See [Figure 2-6](#) for dimensions.

**Caution**

When moving a Cisco cabinet, do not push the cabinet at its sides. Instead, grip its front or back edges.

Figure 2-6 IGX 8420 Rack-Mounting Dimensions

**Step 2**

To install the optional AC power supply kit, do the steps in the [“Installing the IGX 8420 or IGX 8430 AC Power Supply Assembly”](#) section on page 2-26.

Step 3

To install the cooling unit, do the steps in the [“Installing the Cooling Unit”](#) section on page 2-33.

Step 4

Position the IGX card cage so that the back of it faces the rack.

**Caution**

An empty IGX card cage requires a two or three people to move it into place.

- Step 5** With one person on each side of the card cage, lift and slide it into the rack.
- Step 6** Attach the cabinet to the rack with 8 #10-32 machine screws (from the kit).
- Step 7** For system DC-powered systems, see the “[DC Power Connections](#)” section on page 2-41. For AC-powered systems, see the “[Installing the IGX 8420 or IGX 8430 AC Power Supply Assembly](#)” section on page 2-26.

**Caution**

Make sure that mounting the equipment does not create a hazardous condition because of uneven mechanical loading. The equipment rack should be securely supported.

IGX 8430 Rack-Mount Installation

The IGX 8430 is designed for mounting in a 19-in. (48.25-cm) equipment rack. The following order of component installation is the most convenient and efficient. For some of these components, separate sections follow that contain detailed installation steps.

1. Optional AC power assembly
2. Lower cooling unit
3. Lower card cage
4. Upper card cage
5. Ribbon cables for connecting upper and lower backplanes
6. Card cage tunnel around backplane ribbon cables
7. Upper cooling unit (also called booster fan unit)
8. Exhaust plenum

The miscellaneous parts kit contains brackets for rack-mounting in either a Cisco cabinet or a user-supplied rack. The kit includes mid-mount brackets for open racks. For a Cisco cabinet, the rear-mount brackets attach to the rear vertical rail. Each of these brackets has a horizontal flange upon which the back of an individual component rests. The front of each assembly chassis has flanges that serve as front mounting brackets.

**Caution**

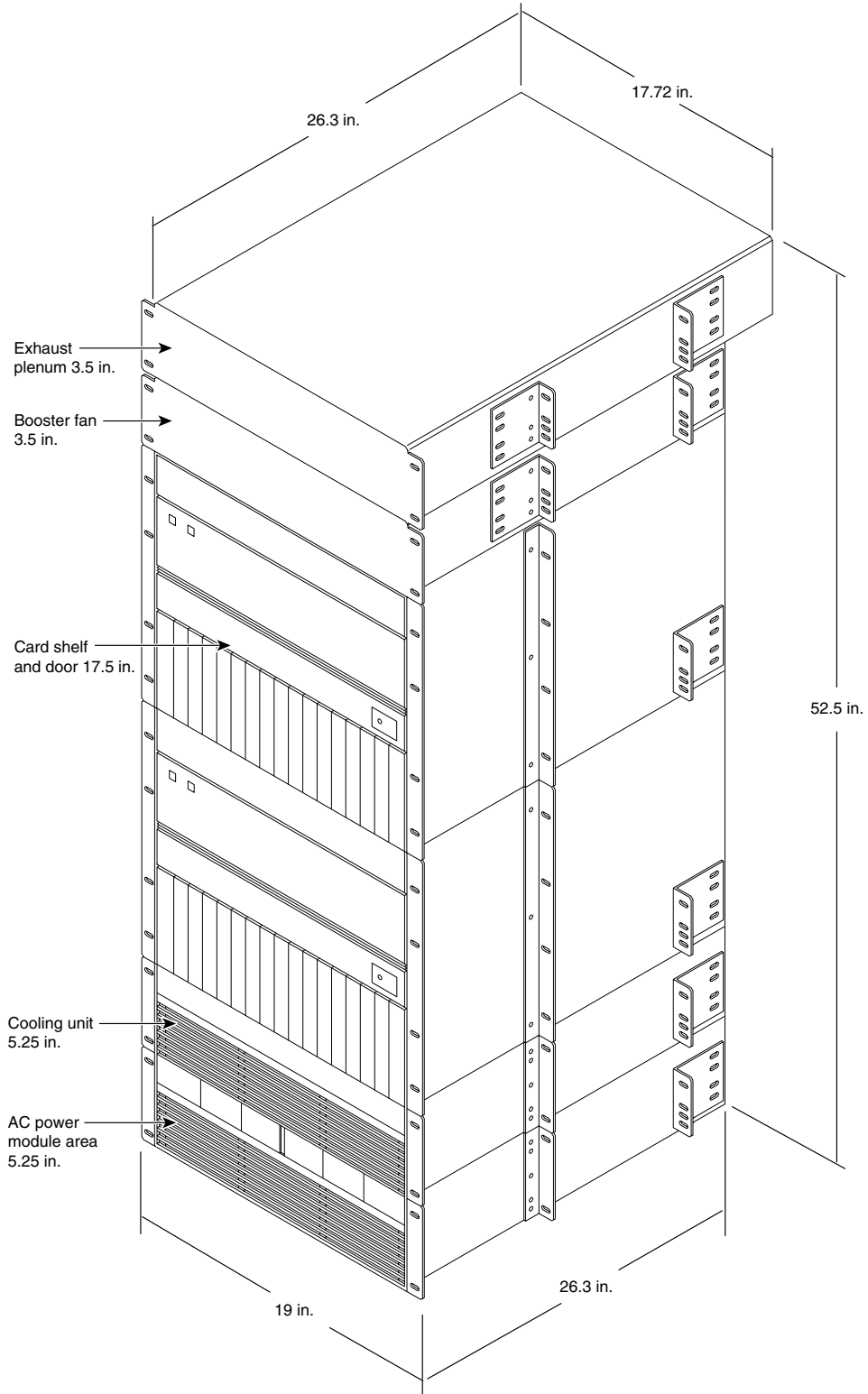
If an IGX 8430 node goes in a user-supplied cabinet, be sure that air can freely flow in and out of the enclosure. Note also that the vertical spacing between components, such as the card cage and fan tray, must be in the range 0.047–0.077 in. (0.119–0.196 cm).

**Caution**

When moving a Cisco cabinet, do not push the cabinet at its sides. Instead, grip the front or back edges.

- Step 1** Refer to [Figure 2-7](#) for component dimensions. Note that, although [Figure 2-7](#) shows mid-mount and rear-mount brackets, these brackets are not normally used together.

Figure 2-7 IGX 8430 Rack-Mounting Dimensions



- Step 2** To install the optional AC power supply kit, complete the steps in the [“Installing the IGX 8420 or IGX 8430 AC Power Supply Assembly”](#) section on page 2-26.
- Step 3** To install the cooling unit, complete the steps in the section titled [“Installing the Cooling Unit”](#) section on page 2-33.
- Step 4** Install the brackets for the card cages.
- Step 5** Position the IGX card cage so the back of it faces the front of the cabinet.



Caution An empty card cage requires two or three people to move it.

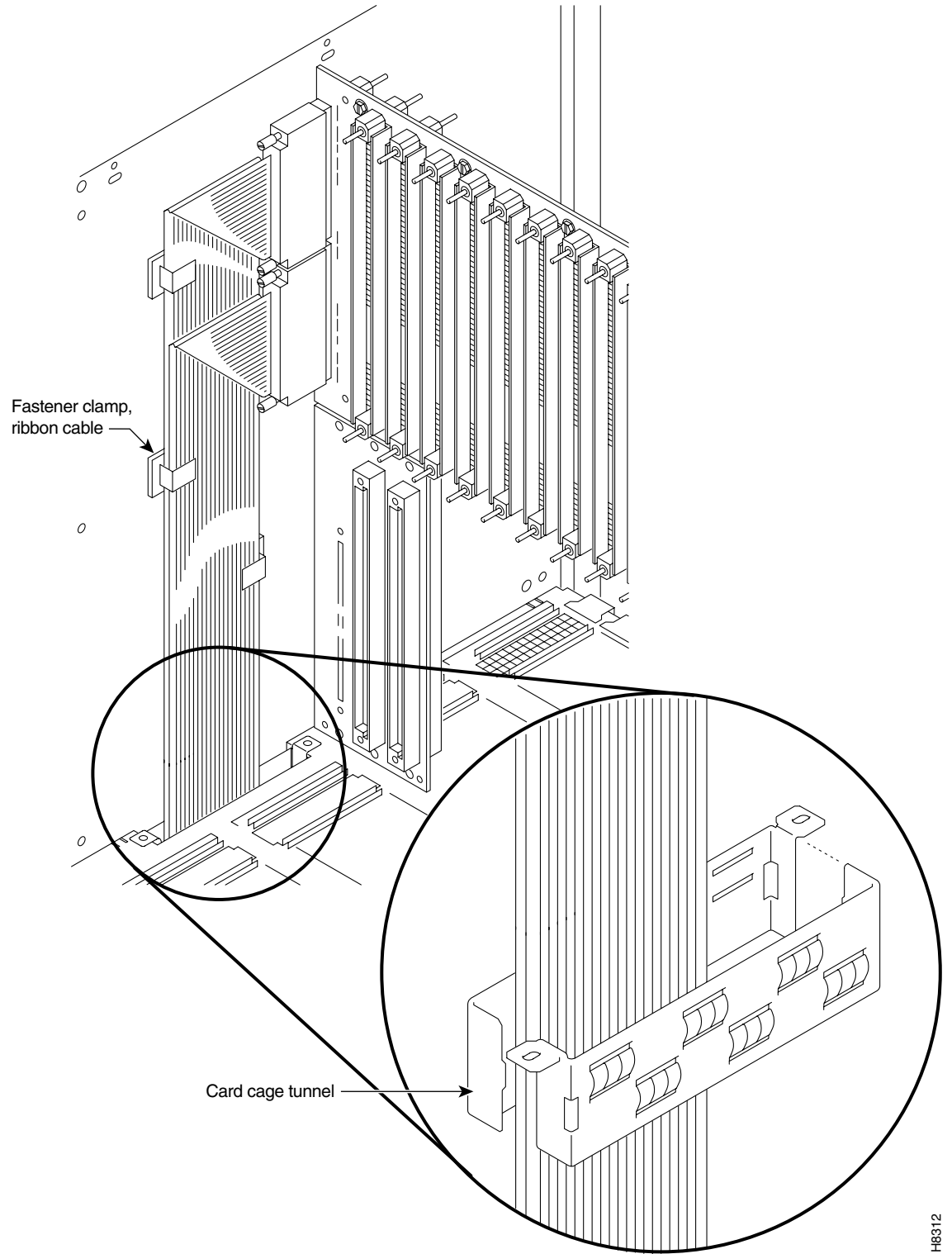
- Step 6** With one person on each side of the card cage, lift it into the rack. In a Cisco cabinet, rest the back of the card cage on the rear-bracket flange.
- When mid-mount brackets are used, screw the card cage to the brackets with #10-32 machine screws from the miscellaneous parts kit.
- Step 7** Secure the front of the card cage to the front of the rack with #10-32 machine screws from the miscellaneous parts kit.



Caution Make sure that mounting the equipment does not create a hazardous condition because of uneven mechanical loading. The equipment rack should be securely supported.

- Step 8** The folded ribbon cables that connect the upper and lower backplanes pass through a cut-out space in the card cages. The cables connect to two 100-pin connectors on the front of each backplane. See [Figure 2-8](#). If nodal processor module (NPM) cards are present, these and possibly other front cards must be removed prior to ribbon cable installation.
- Connect the cable from the upper connector of the upper backplane to the upper connector in the lower backplane.
- Connect the cable from the lower connector of the upper backplane to the lower connector in the lower backplane.
- Step 9** A two-piece conduit called the *card cage tunnel* surrounds the ribbon cables and sits in the cut-out space of the card cages. Fit the pieces of the card cage tunnel around the ribbon cables and screw this unified piece into the cut-out space. [Figure 2-8](#) shows the card cage tunnel in its normal location and prior to assembly.
- Step 10** Slip the ribbon cables through the fastener clamps, then attach the fastener clamps (which include a self-adhesive base) to the side of the card cage. See [Figure 2-8](#).
- Step 11** If this is an AC-powered system, complete the procedures in the [“Installing the IGX 8420 or IGX 8430 AC Power Supply Assembly”](#) section on page 2-26.
- Step 12** If this is a DC-powered system, go to the [“DC Power Connections”](#) section on page 2-41.

Figure 2-8 IGX 8430 Backplane Connector Cables



Installing AC Power

AC Power in the IGX 8410 Node

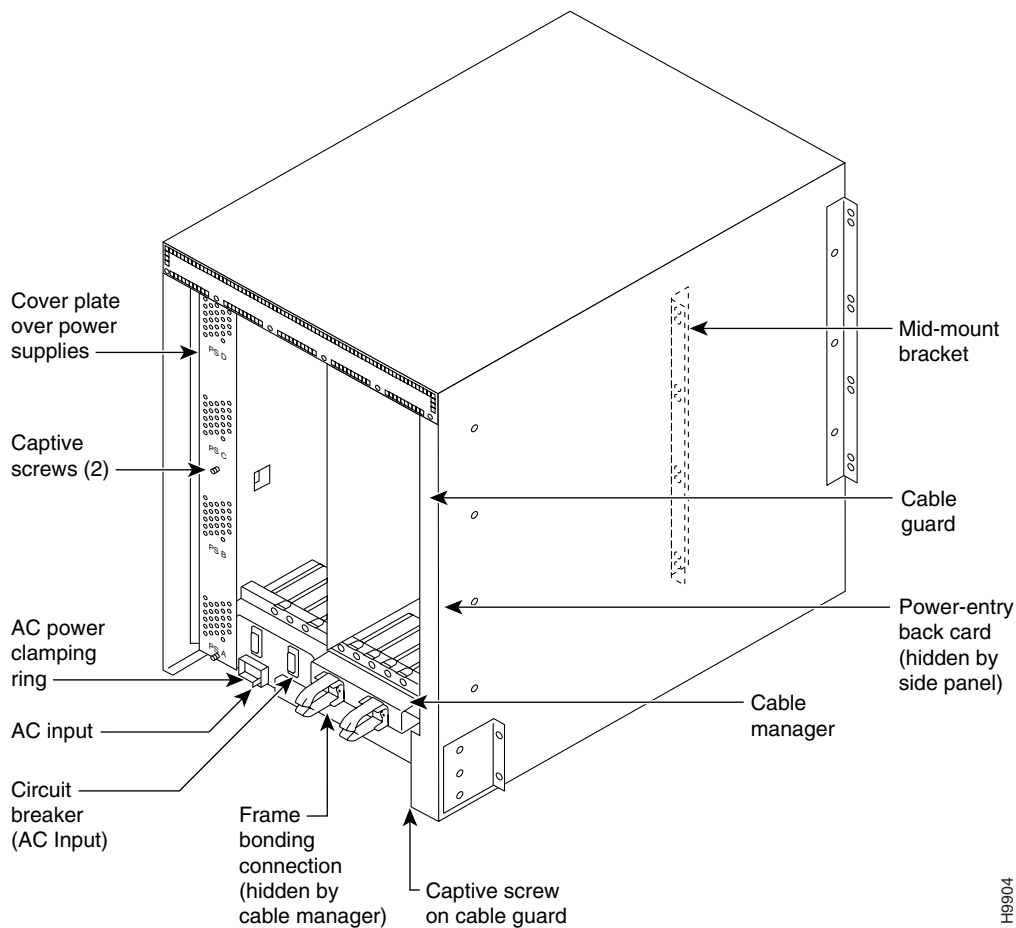


Tip

To develop the most accurate IGX power budget, use [Table 2-1 on page 2-1](#) and [Table 2-2 on page 2-2](#) or the interactive power worksheets. If you decide to use the general guidelines mentioned in this section during network planning stages, confirm your results by using the power worksheets before bringing the node live in an operational environment.

For an IGX 8410 node to use an AC power source, an AC power supply system is necessary. The IGX 8410 power supply housing holds up to four 400-watt (W) power supplies. The AC system provides the system with -48 VDC from 100 to 240 VAC input. The AC power supply housing is between the card cage and the side wall of the node. The IGX 8410 node has one or, with AC redundancy, two AC power inputs. [Figure 2-9](#) shows two AC inputs.

Figure 2-9 IGX 8410 Power Supply Area Back View, AC System



The minimum requirement for an AC-powered system is one AC source and one power supply. One supply is adequate for four cards unless you specify power supply redundancy.

Two types of redundancy exist in the AC-powered system. One redundancy is that of AC power inputs. A redundant AC power source from a building circuit that is independent of the other AC circuit provides backup if one AC circuit at the site fails. The other redundancy is that of the 400 W power supply modules. Redundancy of the 400 W power supplies provides a backup if a power supply fails.

In supporting single and dual AC inputs, power supply arrangements differ, as follows:

- When a system uses two AC inputs, the number of supplies that receive power from AC input A must be the same as the number of supplies that receive power from AC input B. See [Figure 2-10](#).
- When a system uses one AC source, the number of supplies must be installed in a contiguous arrangement, beginning with slot A, then slot B, and so on. Because only one AC input is present, the input connection has no alphanumeric designation.

[Figure 2-10](#) shows a dual-input system. Facing the back of a dual-input system, AC input A is on the left. AC input B is on the right. In a dual-input system, the input A supplies power supply slots A and B. Input B supplies power to slots C and D. A single AC input system does not have these distinctions: the single input receives AC power for supplies A–C. See [Table 2-4](#) for power supply requirements.

Table 2-4 Locations of Primary and Additional Power Supplies in an IGX 8410 Node

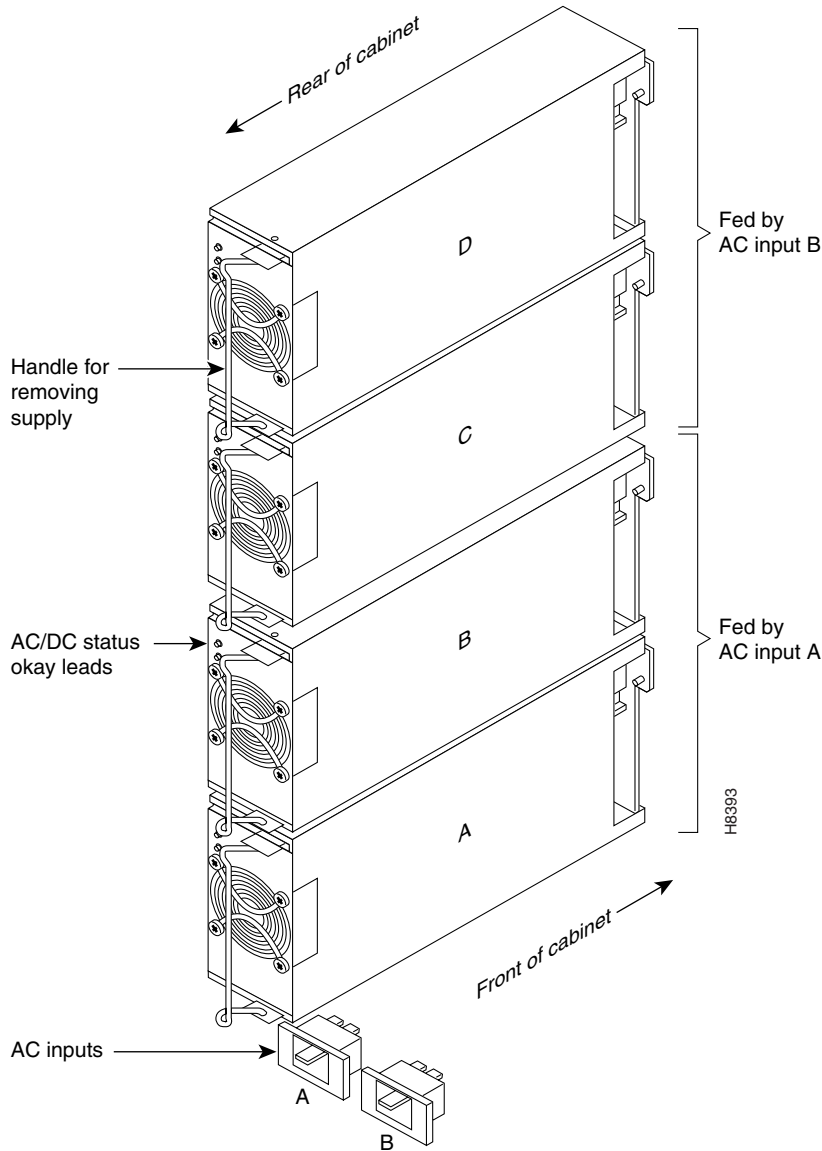
System	Number of Cards	N+1 Supply Redundancy	A	B	C	D
1 AC Input	4 or less	No	X			
	4 or less	Yes	X	X		
	more than 4	No	X	X		
	more than 4	Yes	X	X	X	
2 AC inputs	4 or less		X		X	
	more than 4		X	X	X	X

[Table 2-4](#) shows the minimal 400W unit requirements for different IGX 8410 configurations. The factors that determine the number of supplies are as follows:

- The number of AC inputs
- The number of cards (one supply can power four cards)
- Power supply redundancy for backup

In [Table 2-4](#) the System column shows the number of AC inputs. The Number of Cards Column shows the number of cards at the cutoff point for more supplies. The Supply Redundancy Column indicates whether the configuration includes a redundant supply for backup. For columns A through D, an X shows that the corresponding slot in the power supply housing must have a power supply to meet the configuration requirements. The part number for a power supply is IGX8410-PS-AC.

Figure 2-10 Power Supply Slot Designations, Dual AC System



Installing the IGX 8420 or IGX 8430 AC Power Supply Assembly

If the IGX 8420 or IGX 8430 node uses an AC power source, proceed with this section. In a rack-mount system, the AC power supply assembly is shipped separately (as are all the other assemblies). The first assembly to install in a rack-mount system is the AC power supply assembly.

The AC power supply assembly for an IGX 8420 or IGX 8430 node consists of the following items:

- Power supplies—up to six
- Power supply tray
- Power and sense cables between the AC power module and power-entry back card (PE-BC)
- Dummy cover panels for unused power supply slots

- Mounting brackets and screws
- Air inlet bezel

Power supply installation or replacement requires the following tools:

- Flat-blade screwdriver set
- Phillips screwdriver set

Understanding the AC Power Supply Configuration

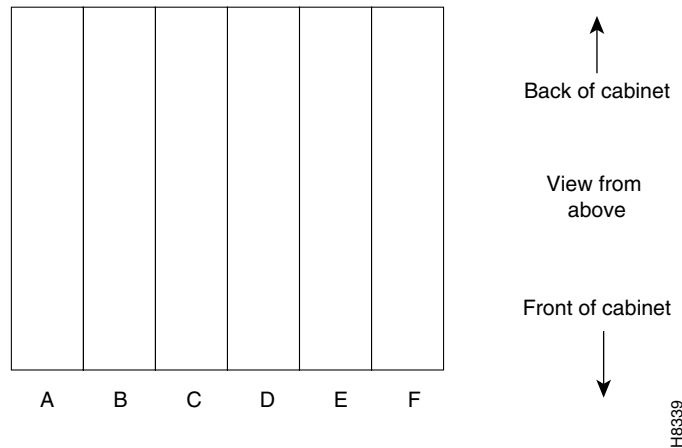


Tip

To develop the most accurate IGX power budget, use [Table 2-1 on page 2-1](#) and [Table 2-2 on page 2-2](#), or the interactive power worksheets. If you decide to use the general guidelines mentioned in this section during network planning stages, confirm your results by using the power worksheets before bringing the node live in an operational environment.

The setup for power supplies depends on the number of AC power inputs, the IGX model, and the number of cards in the system. The minimum configuration is one AC source and one supply. This minimum number applies to the IGX 8420 node with 12 or fewer cards. [Figure 2-11](#) illustrates the alphanumeric slot designations in a full tray.

Figure 2-11 Power Supply Slot Designations



Redundancy

Two types of redundancy exist in the AC power supply configuration. One redundancy is that of AC power inputs. A redundant AC power source from a building circuit that is separate from the other AC circuit provides backup if one AC circuit at the site fails. The other redundancy is that of the 875 W power supply modules. Redundancy of the 875 W supplies provides a backup if one supply fails.

In supporting the two types of redundancy, power supply arrangements differ, as follows:

- When a system uses two AC inputs, the number of supplies on the left and right sides must match. For example, if a system with dual AC inputs has four supplies, the supplies must occupy slots A, B, D, and E.
- When a system uses one AC source, the number of supplies on the left and right sides can differ. For example, three supplies on the left and one on the right is permissible.

Power Supply Quantities

Table 2-5 shows the required number of power supplies for the different IGX systems. In Table 2-5, the locations for primary (or minimal) power supplies are marked with an X. The primary supplies reflect redundancy of AC inputs and backup supplies. An O indicates a slot that must have a supply, because the card cage contains more than 12 cards.

In Table 2-5, the System column lists the IGX model number coupled with the number of AC inputs and whether the single-AC input models have power supply redundancy. The table also shows the slot locations A through F and the part number of the kit that contains all the pieces for the item in the System column. Extra supplies for more than 12 cards (O) are not a part of a kit under Kit Part No. but have another part number. The part number of a supply ordered to fill extra power demands is IGX-AC-PS.

Table 2-5 Locations of Power Supplies in an IGX 8420 or IGX 8430 Node

System	A	B	C	D	E	F
IGX 8420: 1 AC input, no power supply redundancy	X	O				
IGX 8420: 1 AC input, with power supply redundancy	X	X	O			
IGX 8420: 2 AC inputs	X	O		X	O	
IGX 8430: 1 AC input, no power supply redundancy	X	X	O			
IGX 8430: 1 AC input, with power supply redundancy	X	X	X	O		
IGX 8430: 2 AC inputs	X	X	O	X	X	O

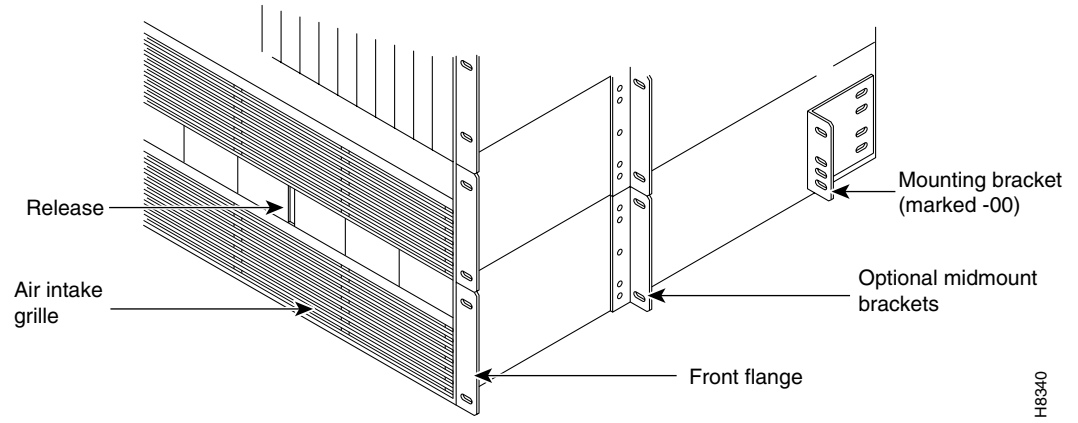
Note that, with all power supply configurations, locations for the power supplies begin at the lowest lettered slot on either side, and the occupied positions are contiguous. For example, in a dual AC system, insert a supply in A, B, D, and E.

AC Installation in a Rack-Mount Cabinet

The procedures in this section apply to both the IGX 8420 and the IGX 8430 switch in a rack. (For standalone systems, the power supplies are already installed.) To replace a power supply, follow the steps in Chapter 5, “Replacing Parts on the IGX.”

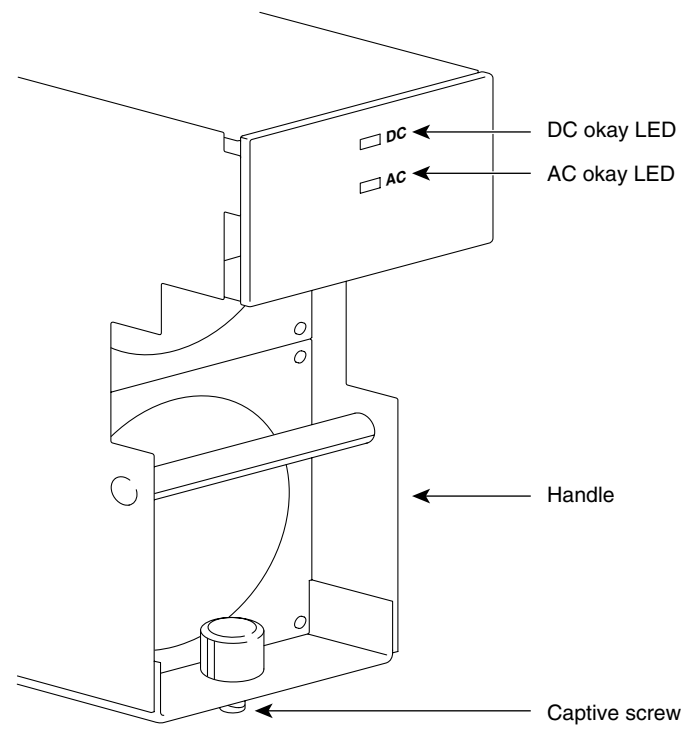
-
- Step 1** Attach the mounting brackets to the frame. For illustrative purposes, Figure 2-12 shows mounting brackets at mid-frame and the back (using rear and mid-mount brackets is not a likely configuration). In this view of the cabinet, the rear bracket shown is labeled with a -00. Brackets on the other side of the system are labeled with a -01.
- Step 2** This step might require more than one person. If rear-mount brackets are used, slide in the power supply tray so that its back rests on the rear bracket.
- For a mid-mount rack only, attach the tray to the mounting brackets with the head of each mounting screw on the inside of the tray and each associated nut on the outside of the bracket.
- Step 3** Secure the front of the power supply tray with the front screws. When tightening each of the front screws, hold the adjacent front flange of the tray slightly to the outside so that the hinged door can freely open and close. See “Front flange” in Figure 2-12. The space between the right-angle edge of the flange and the edge of the hinged door should be approximately the width of a thumbnail.

Figure 2-12 Front of Rack-Mount System



H8340

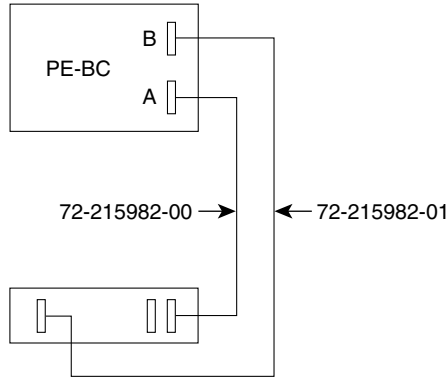
Figure 2-13 Power Supply (Viewed from Front and Left)



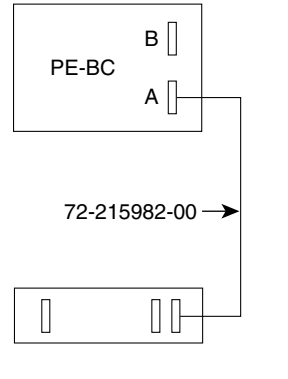
H8341

- Step 4** Install the power supplies. See [Figure 2-13](#) for an illustration of a power supply. When a power supply almost reaches the end of the slot in the tray, a slight resistance is encountered. Push the power supply slightly farther in to achieve the final position and full connector mating.
- Step 5** At the front of each supply, secure the supply to the tray by tightening the captive screw at the bottom front of the supply.
- Step 6** For slots without a power supply, the hinged door has a removable, dummy panel.
- Step 7** Close the hinged door and secure it with the screw at the top-center of the door. For the next step, refer to [Figure 2-14](#), [Figure 2-15](#), and [Figure 2-16](#).
- Step 8** Connect the power cables according to the applicable AC configuration shown in [Figure 2-14](#). The cables in [Figure 2-14](#) differ only in length; pinouts are identical. Attach cable 215982-01 from the far right connector—labeled A 1-16 in [Figure 2-15](#)—to the lower connector on the upper PE-BC. [Figure 2-16](#) shows where system power connects to the PE-BC. It also shows the blank plate over an unused connection. If power supply trays D–F contain one or more supplies, run cable 215982-02 from the connector on the far left (B 1-16) to the upper connector on the PE-BC. See [Figure 2-14](#) and [Figure 2-15](#). For an IGX 8430, run cable 215982-00 from the connector labeled 17-32 to the lower connector on the lower PE-BC.
- Step 9** Attach the cable guard and tighten the captive screw at its base.
- Step 10** Go to the [“Installing the Cooling Unit”](#) section on [page 2-33](#).
-

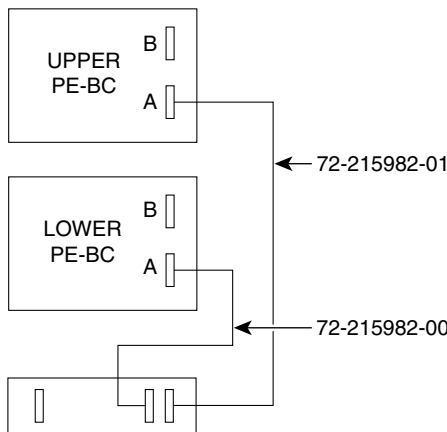
Figure 2-14 Wire Diagrams for Different Power Configurations



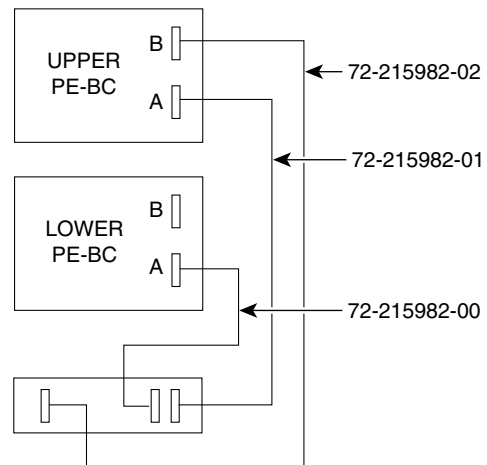
Cabling for PS to PE-BC for IGX 8420, dual AC input



Cabling for PS to PE-BC for IGX 8420, single AC input



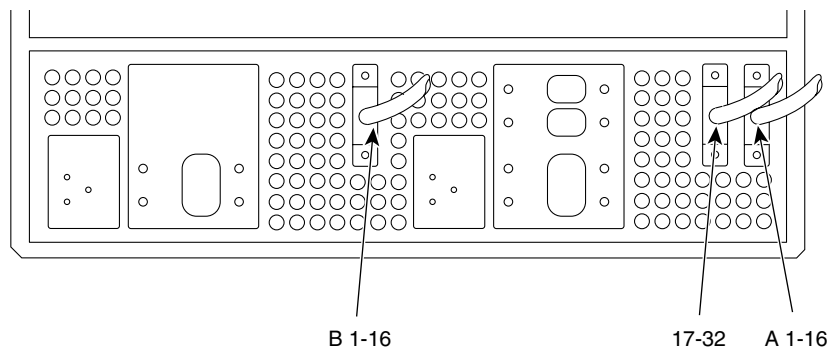
Cabling for PS to PE-BC for IGX 8430, single or dual AC input, three or fewer supplies



Cabling for PS to PE-BC for IGX 8430, single or dual AC input, four or more supplies

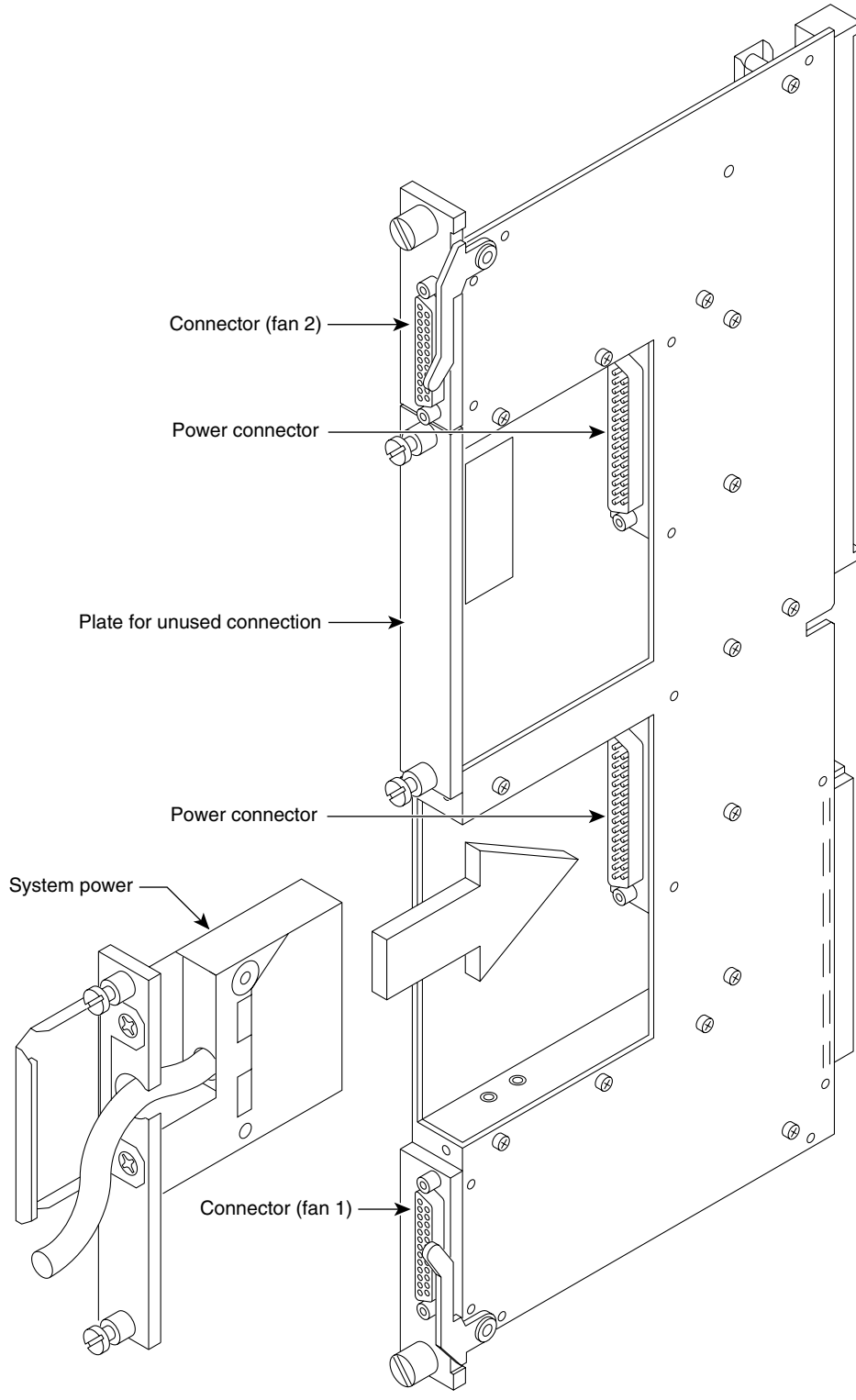
H8342

Figure 2-15 AC Power Supply Shelf Back View



H8343

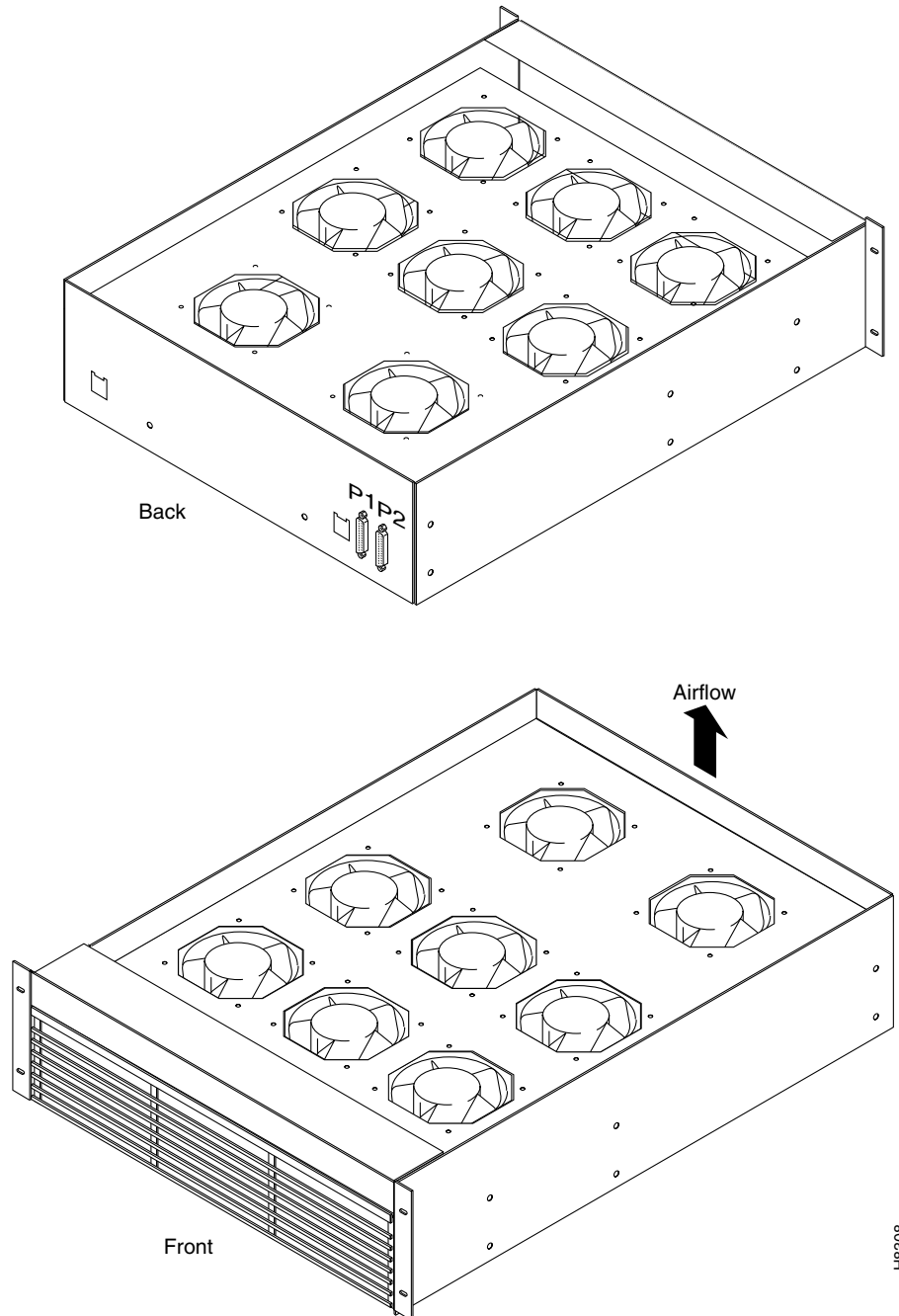
Figure 2-16 Inserting System Power Connector to E-Card, AC-Powered System



Installing the Cooling Unit

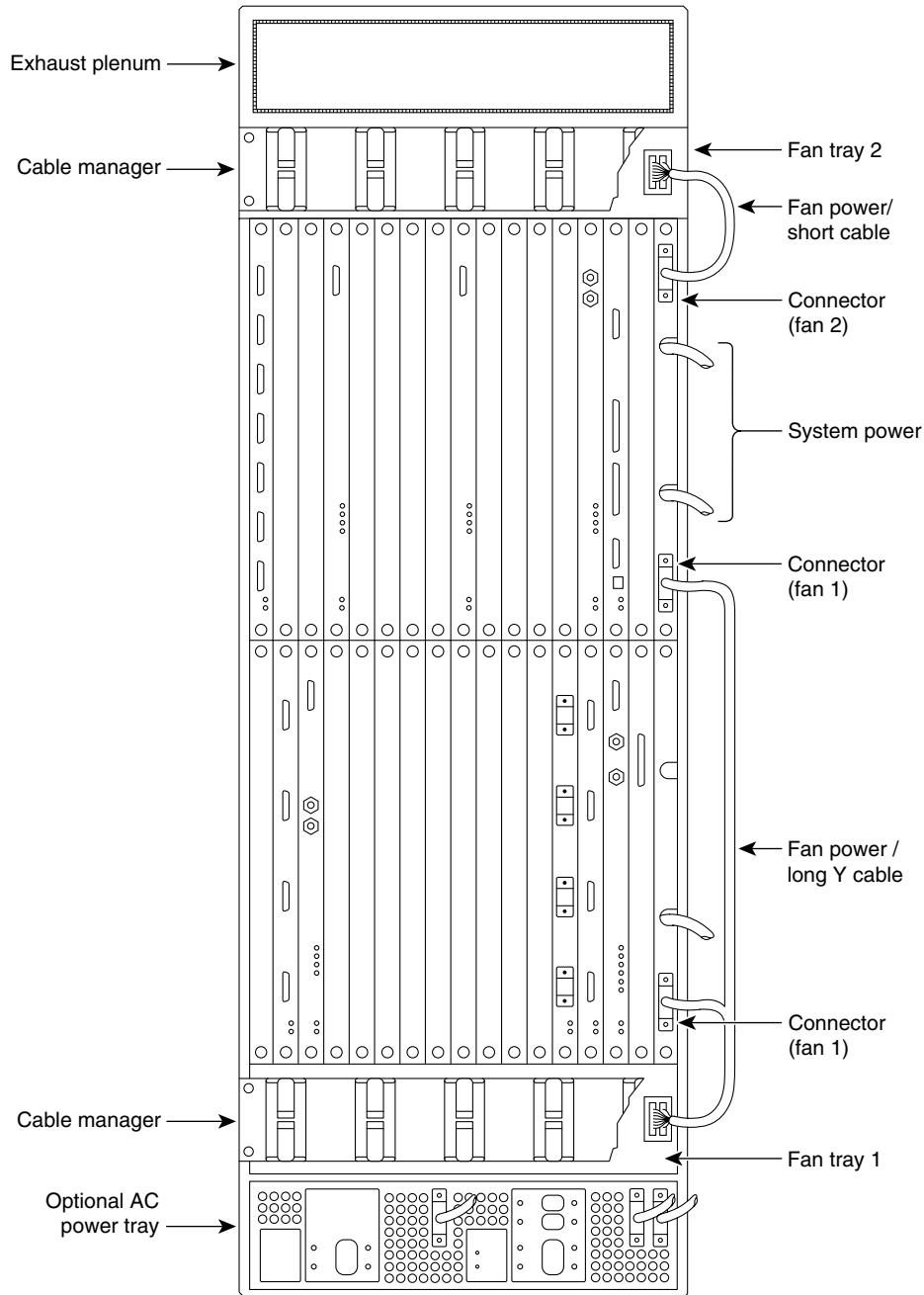
This section describes how to install the main fan tray (Fan Tray 1) in an IGX 8420 or IGX 8430 node and the upper or booster fan tray (Fan Tray 2) in an IGX 8430 node. [Figure 2-17](#) shows the main fan tray. [Figure 2-18](#) shows the locations of Fan Tray 1 and Fan Tray 2 in an IGX 8430 node.

Figure 2-17 Fan Tray Assembly



Two cables exist for supplying power to the fans. The short fan power cable is used in both the IGX 8420 and the IGX 8430 nodes. The long Y cable is used in the IGX 8430 only. See [Figure 2-18](#). In an IGX 8420, the short cable connects to connector Fan 1 of the PE-BC.

Figure 2-18 IGX 8430 Back View



H8347

In an IGX 8430 node, the short cable goes from the Fan 2 connector of the upper PE-BC to the power connectors on Fan Tray 2. One branch of the Y cable for Fan Tray 1 is significantly longer than the other branch. The longer branch connects to the Fan 1 connector of the upper PE-BC. The shorter branch connects to the “Fan 1” connector of the lower PE-BC.

To install the cooling unit assembly:

-
- Step 1** Examine the front and back of the fan tray to become familiar with the setup. Note that, for the bottom fan tray, the captive screws that secure the fan tray are in the front. For the booster fan tray, the captive screws are at the back of the cabinet.
 - Step 2** Slide in the cooling unit and secure it by tightening the four rack screws.
 - Step 3** On the PE-BCs, plug each D-connector of the appropriate fan power cable into the appropriate PE-BC connector.
 - Step 4** Plug the power connectors into the fan trays. At the power receptacles on each fan tray, the power connector is a latched housing. Plug P1 into connector P1. Plug P2 into connector P2. Refer to [Figure 2-17](#).
 - Step 5** Attach the clamp for the fan power cord to the chassis.
 - Step 6** For lower fan tray installation, attach the air intake bezel.
 - Step 7** When power is turned on, make sure that all fans are running, and run the `dsppwr` command.
-

Making Power and Ground Connections



Warning

Before performing any of the following procedures, ensure that power is removed from the DC circuit. To see translations of this warning, refer to the Regulatory Compliance and Safety Information document that accompanied this product.

This section contains information on making connections to AC and DC-powered systems.



Caution

Remember that this is a positive ground system. Ensure that polarity of the DC input wiring is correct. Under certain conditions, connections with reversed polarity might trip the primary circuit breaker and damage the equipment.

Making the Frame Bonding (Ground) Connection

The Cisco cabinet comes with attached studs (with hardware for securing a ground conductor to the studs) at the top and bottom of the cabinet for securing the grounding conductors. These studs are 1/4 in. by 20 threads per inch. [Figure 2-19](#) shows the Cisco cabinet with the ground attachment studs in the upper and lower parts of the cabinet.

A standalone cabinet has provisions for mounting grounding conductors on the chassis by screws. In the standalone cabinet, this provision is a pair of captive nuts (threaded holes) for the screws on the mounting rail of the chassis (1/4 in. by 20 threads per inch). [Figure 2-19](#) shows the location of the captive nuts and screws in a standalone cabinet for securing in the ground attachments.

The attachment points in the Cisco rack and standalone cabinets for the Cisco IGX 8400 series switches are indicated by a ground symbol on the cabinet near the point of attachment.

Cisco Cabinet Connections

Cisco recommends the following stacking order for attaching a ground conductor to the frame of a Cisco cabinet:

-
- Step 1** Place an external, toothed starwasher onto the stud.
 - Step 2** Place the connector terminating the grounding conductor closed-loop ring or two-hole compression fitting onto the stud.
 - Step 3** Place another external, toothed starwasher or lockwasher onto the stud.
 - Step 4** Screw a nut onto the threaded stud.
-

Standalone Cabinet Connections

Cisco recommends the following stacking order for attaching a ground conductor to the frame of a standalone enclosure:

-
- Step 1** Place an external, tooth starwasher onto the screw.
 - Step 2** Place the connector terminating the grounding conductor closed-loop ring or two-hole compression fitting.
 - Step 3** Place another external, tooth starwasher or lockwasher.
 - Step 4** Screw the entire assembly into the captive nut in the mounting rail beneath the cover plate. See [Figure 2-20](#) for an illustration of this stacking order in an IGX 8420 node. [Figure 2-21](#) shows the location of the frame bonding connection on an IGX 8410 node.
-

Figure 2-19 Frame Bonding Connection a in Cisco Rack

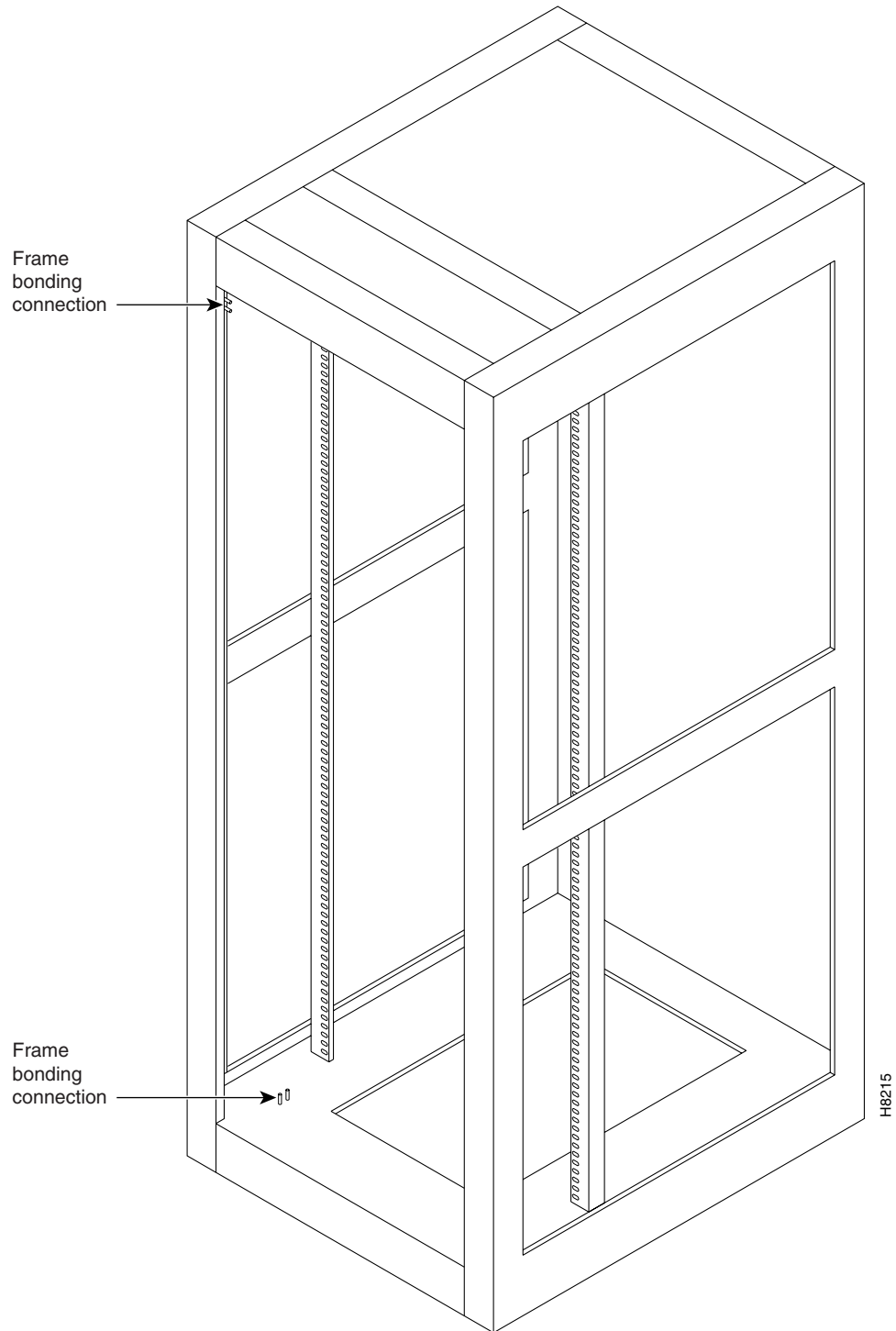


Figure 2-20 Frame Bonding Connections in an IGX 8420 Standalone Switch

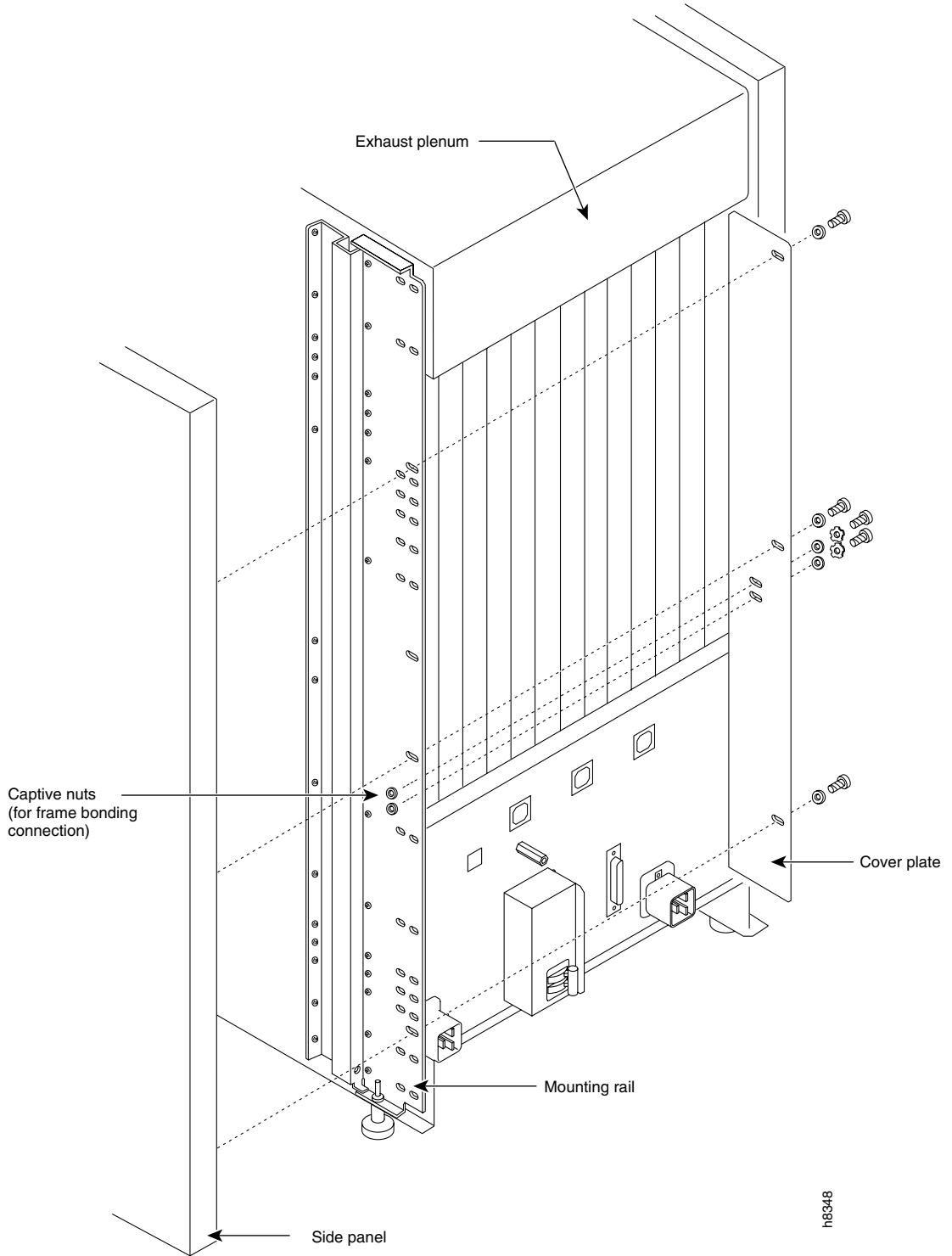
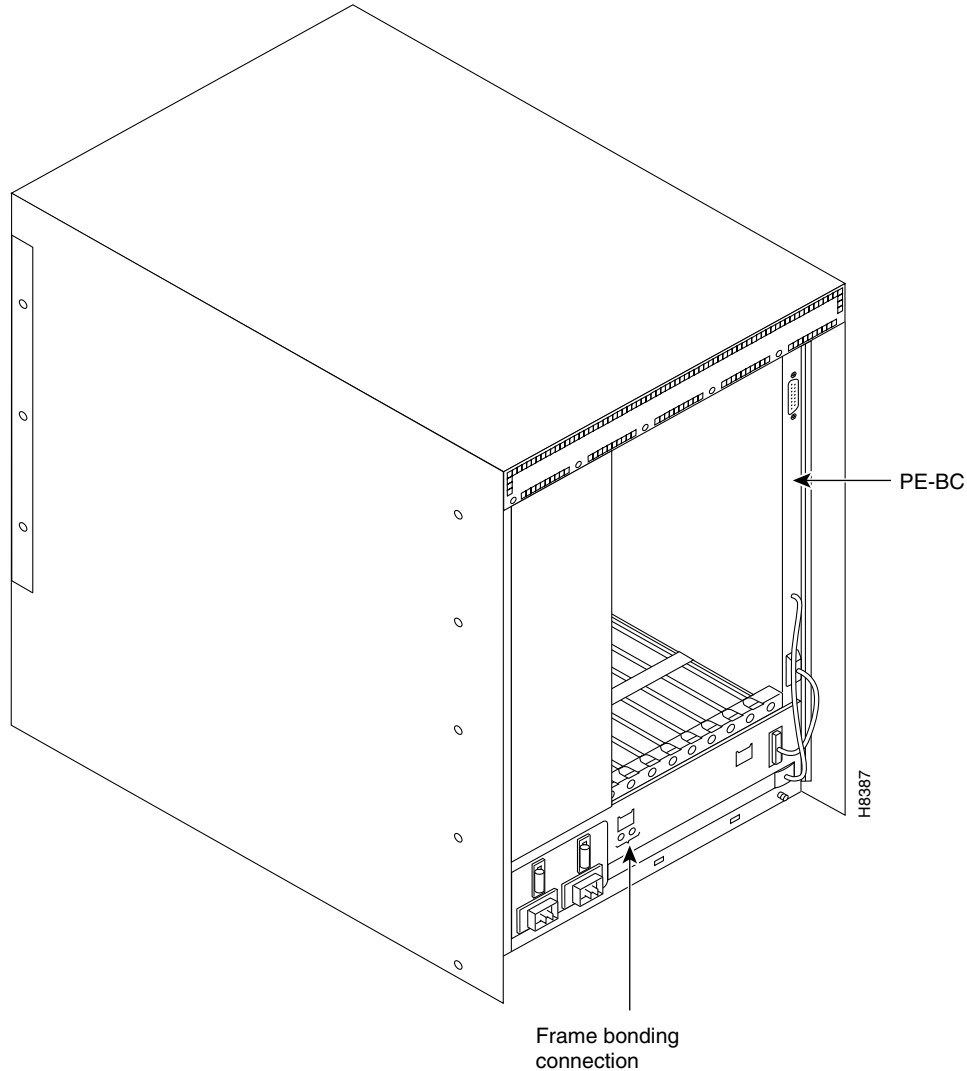


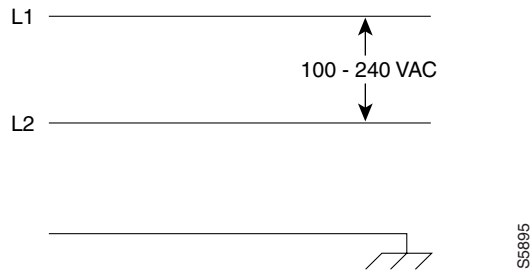
Figure 2-21 IGX 8410 Frame Bonding Connections



AC Power Connections

Cisco provides at least one, 8-ft (3-m) power cord with each AC power supply assembly. To make AC power connections to the IGX:

-
- Step 1** Make sure that all AC and system power circuit breakers are in the OFF position.
 - Step 2** Make sure that the AC plug wiring has the correct relationship. [Figure 2-22](#) shows the voltage across the wires in an IGX 8410 plug. [Figure 2-25](#) shows the voltage across the wires in an IGX 8420 or IGX 8430 plug.

Figure 2-22 IGX 8410 AC Connection Wiring

- Step 3** Plug the power cord into the IEC connector and tighten the screw on the clamping ring. See [Figure 2-23](#) for an example of the IGX 8410 AC power area, [Figure 2-24](#) for the IGX 8420 AC power area, and [Figure 2-25](#) for information on IGX 8420 or IGX 8430 AC connection wiring.

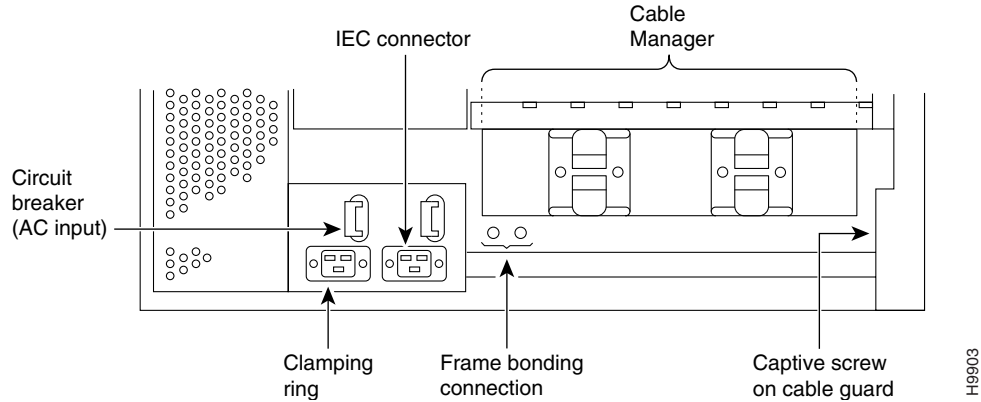
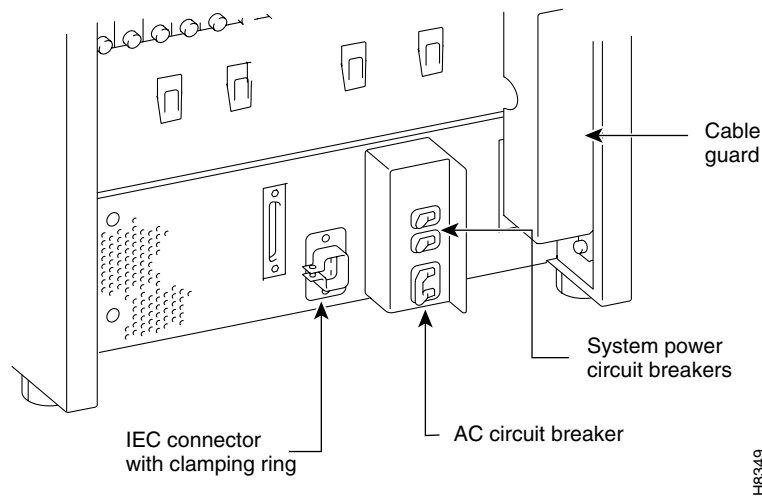
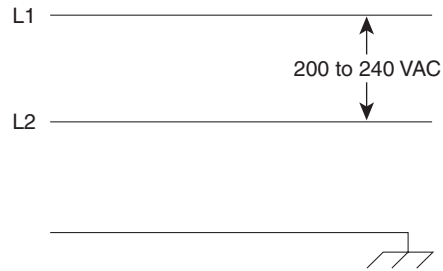
Figure 2-23 IGX 8410 Circuit Breakers**Figure 2-24 IGX 8420 Circuit Breakers**

Figure 2-25 IGX 8420 or IGX 8430 AC Connection Wiring

- Step 4** Plug the AC power cord into a single-phase wall outlet rated for a nominal voltage. For an IGX 8410 node, the AC voltage should be from 200 to 240 VAC or 100 to 120 VAC. The outlet must also be capable of supplying up to 12 amperes (A) (13 A in the UK). The building circuit should be protected with a 15 A or 20 A circuit breaker. For an IGX 8420 or 8430, the AC voltage should be between 200 and 240 VAC. Each outlet must also be capable of supplying up to 16 A (13 A in the UK, where the plug has a built-in, 13 A fuse). In North America, the building circuit should be protected with a 20 A circuit breaker.
- Step 5** For the dual power feed version, plug each power cord into a receptacle that connects to a separate building circuit to provide backup if one building circuit fails. Each building circuit should have a 15 A or 20 A circuit breaker.
- Step 6** The ground (green) wire of the AC power cord is connected to the IGX for safety ground. Make sure that each AC receptacle in the building is grounded.
- Step 7** In addition to the preceding, Cisco recommends that you provide an AC power strip with at least four outlets. Place the strip near the IGX to supply optional modems, CSUs, DSUs, or test equipment. Be sure to connect this power strip to an AC source voltage that is standard for the region (for example, 115 VAC in North America or 230 VAC in Europe).

**Note**

Neither the AC power supplies nor any other components have test points for checking power supply voltages. For a visual check when power is on, observe whether the AC OK LED and DC OK LED are lit. Also, use the **dsppwr** command to check the state of power supplies.

DC Power Connections

A system that uses a DC power source has one or two configurations, as follows:

- IGX 8410 node
 - Single power source
 - Dual power source (a separate branch circuit supplies each source)
- IGX 8420
 - Single power source
 - Dual power source (a separate branch circuit supplies each source)

- IGX 8430
 - Single power source for each shelf
 - Dual power source for each shelf (a separate branch circuit supplies each source)

Wiring is connected from one or two –48-VDC power sources to one or two DC PEMs per shelf. Cisco does not provide the wire between the node and the source. Instead, the installer or customer must supply it. These wires should be capable of carrying 20 A. The diagrams on the pages that follow show DC wiring for single and redundant DC sources for all IGX models.

- For an IGX 8410 or IGX 8420 node with a single DC power source, see [Figure 2-26](#).
- For an IGX 8410 or IGX 8420 node with redundant DC power sources, see [Figure 2-27](#).
- For an IGX 8430 node with a single DC power source, see [Figure 2-28](#).
- For an IGX 8430 node with redundant DC power sources, see [Figure 2-29](#).

Figure 2-26 Single Shelf with Single DC Source

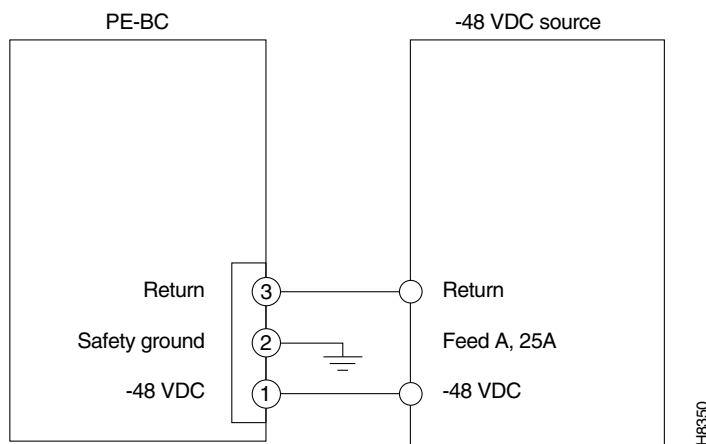


Figure 2-27 Single Shelf with Dual DC Sources

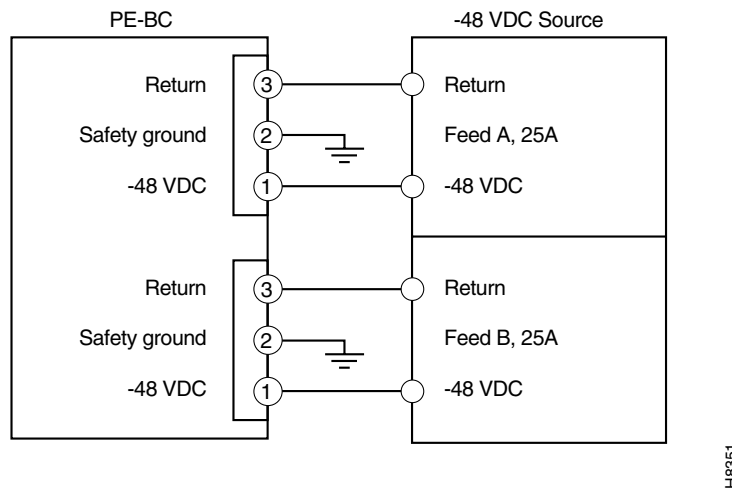
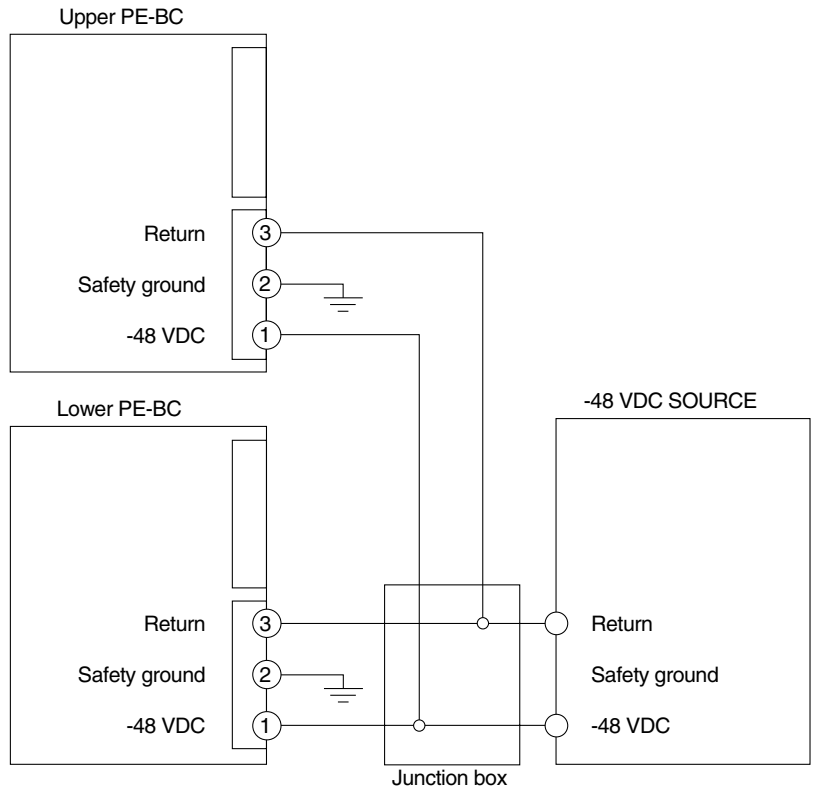
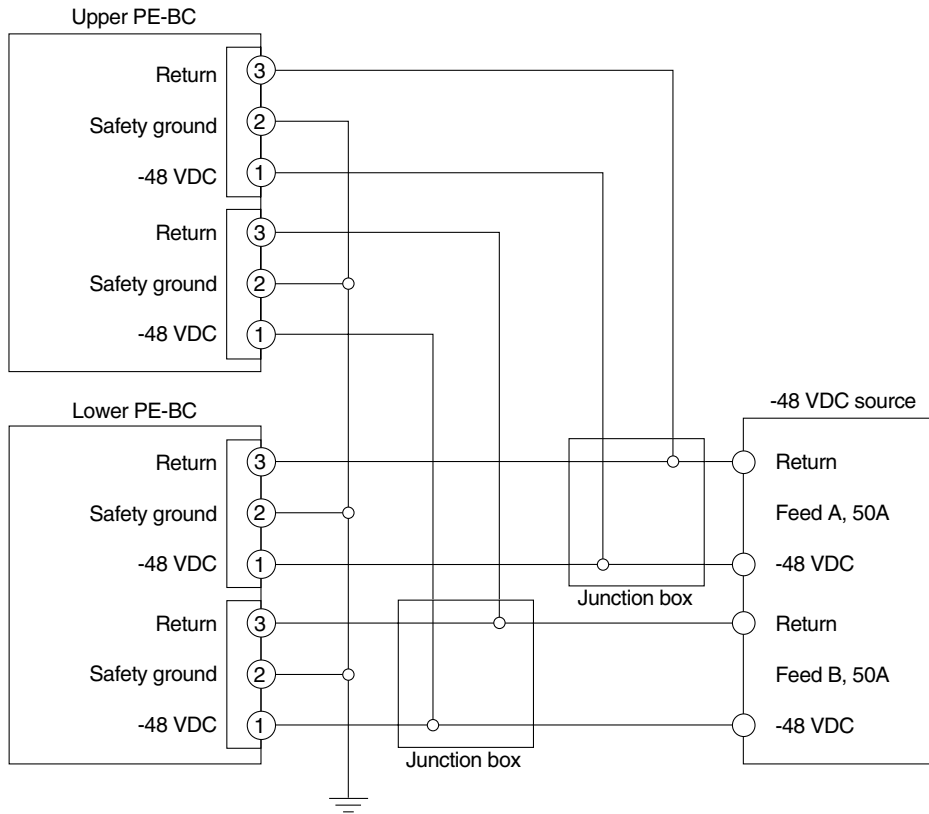


Figure 2-28 IGX 8430 with a Single DC Source



H8352

Figure 2-29 IGX 8430 with Redundant DC Sources



H6353



Tip

The single-shelf IGX 8410 and IGX 8420 have a total primary power limitation of 1050 W. The dual-shelf IGX 8430 has a total primary power limitation of 2100 W. Primary power consumption cannot exceed these limitations. Consult the power worksheets (see the “Power Worksheets” section on page 2-1) to verify that your power configuration is within budget.

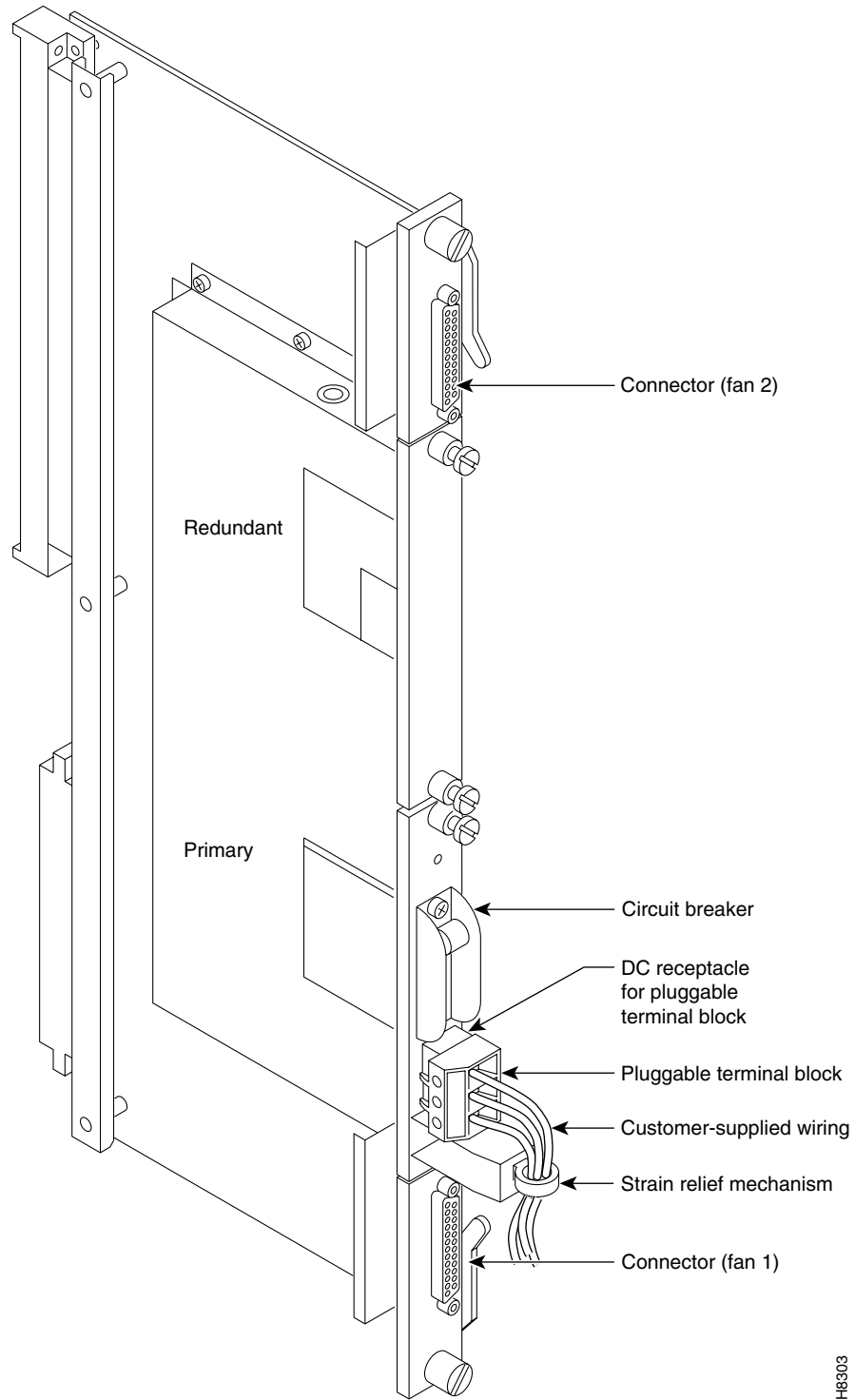
As the detailed steps on the following pages explain, installing DC power consists of attaching the three wires of the DC power source to a removable wiring block, then plugging that block into the connector on the PEM. The PEM is plugged into the PE-BC. Figure 2-30 is a view of a PE-BC (out of the card cage) with the PEM wired up and plugged into the PE-BC. Figure 2-30 shows a nonredundant DC power configuration. Note the blank plate that covers the unused connection.



Note

A DC-powered system makes no distinction between a primary and redundant PEM (unlike the redundancy scheme in an AC-powered system). However, Cisco suggests putting a label of some type on the PEM to identify the branch circuit to which it goes.

Figure 2-30 PE-BC and DC PEM with Plug



**Warning**

Before performing any of the following procedures, ensure that power is removed from the DC circuit. To see translations of this warning, refer to the Regulatory Compliance and Safety Information document that accompanied this product.

To make a DC power connection:

- Step 1** For both standalone systems, the cable guard (located at the right edge of the chassis) remains off until the system is ready to power up. Remove the cable guard by loosening the captive screw at its base then swinging it away from the chassis (do this latter movement holding the top of the cable guard in place while moving the bottom of it away from the chassis).
- Step 2** Insert and secure the stripped ends of the wire in the wiring block according to the scheme in [Figure 2-31](#) and [Figure 2-32](#). [Figure 2-31](#) illustrates the polarity of each connection on the pluggable terminal block. The numbers start with 1 at the bottom and go to 3. The connection at the bottom is for the –48 VDC wire. The middle wire is the safety ground. The connection at the top is for the positive return wire (for the –48 VDC). [Figure 2-32](#) shows the assembly with an example wire and the screw that secures it in the pluggable wire block.

Figure 2-31 Polarities at Pluggable Terminal Block

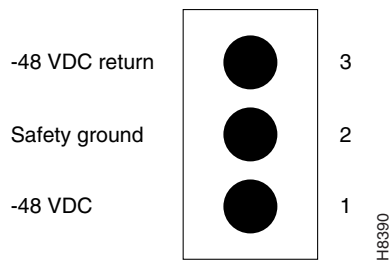
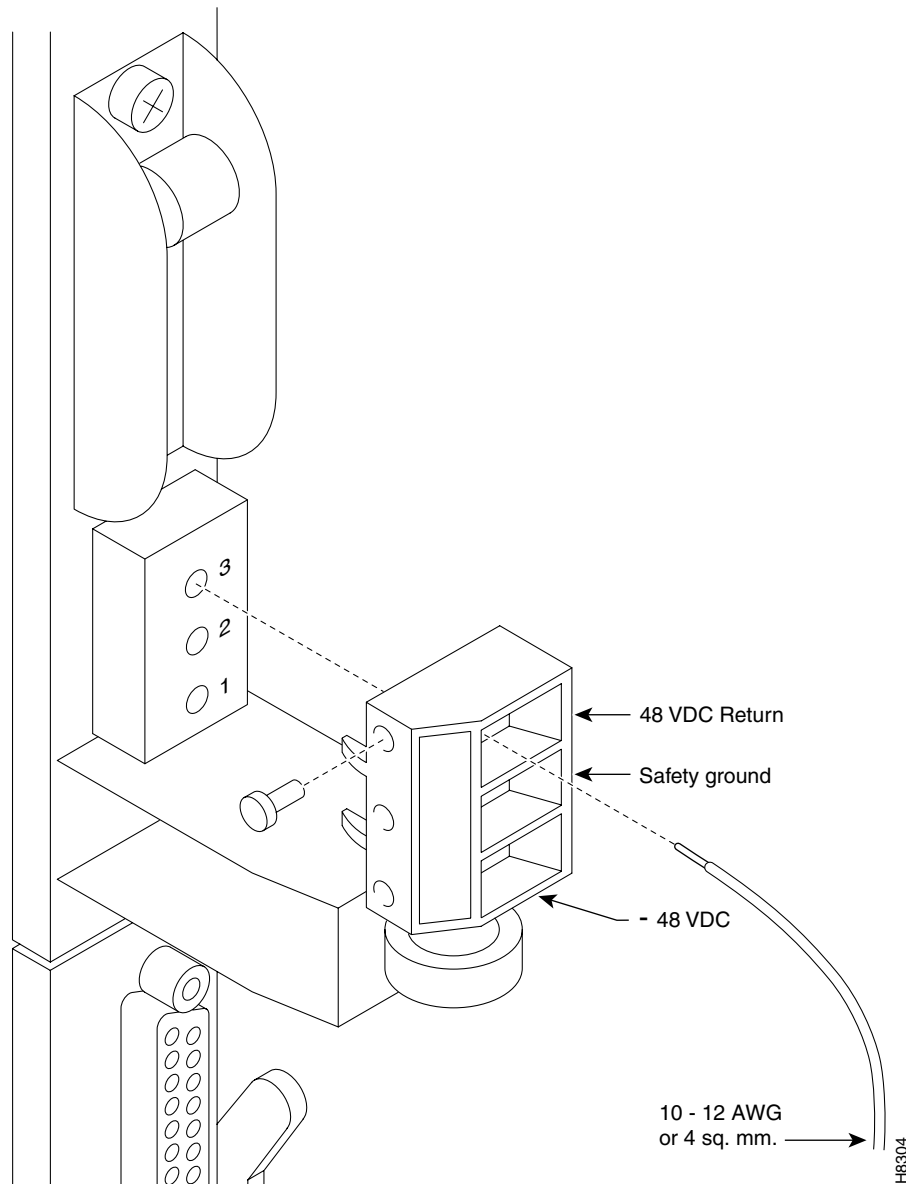


Figure 2-32 Pluggable Terminal Block



Warning

This equipment is intended to be grounded. Ensure that the host is connected to earth ground during normal use. To see translations of this warning, refer to the Regulatory Compliance and Safety Information document that accompanied this product.

- Step 3** Attach the pluggable terminal block to the receptacle on the PEM.
- Step 4** Loop the DC wiring through the strain relief clamp.
- Step 5** Connect the DC input wiring to a DC source capable of supplying at least 20 A (typical). The -48 VDC power source in the building should have a 25-A DC circuit breaker. The building's wiring should include an easily accessible disconnect device. Make sure that the ground wire connects to a reliable building (earth) ground.

- Step 6** Leave the cable guard off until power is on.
- Step 7** Before you turn on the system power, check the supply voltage. Use the screws at positions 1 and 3 on the pluggable terminal block as a convenient measuring point. Also, check the impedance between the safety ground (screw at location 2 on the pluggable terminal block) and the chassis. It should be close to 0.
- Step 8** Turn on the power, and check the voltage at the screws at positions 1 and 3 on the pluggable terminal block.
- Step 9** Turn off the power, and go to [Chapter 3, “Installing the IGX.”](#)

**Note**

In slots where no back card exists, a blank faceplate must reside to block electromagnetic interference (EMI) and radio frequency interference (RFI) and to ensure correct air flow.

Where to Go Next

For introduction on installing the IGX, see [Chapter 3, “Preparing the Cards.”](#)

For software configuration and service provisioning information, see the *Cisco IGX 8400 Series Provisioning Guide*, Chapter 1, [“Introduction to the Cisco IGX 8400 Series.”](#)

For more information on switch software commands, refer to the *Cisco WAN Switching Command Reference*, Chapter 1, [“Command Line Fundamentals.”](#)



Installing the IGX

To install the IGX, complete the following tasks:

1. [Preparing the Cards](#)
2. [Inserting the Cards](#)
3. [Making Signal Connections](#)
4. [Attaching Peripherals](#)
5. [Initial Startup of the IGX](#)
6. Performing basic node configuration tasks (see the “[IGX Configuration Summary](#)” section on [page 3-59](#))

For more information on node configuration, see the *Cisco IGX 8400 Series Provisioning Guide*.

For more information on switch software commands, see the *Cisco WAN Switching Command Reference*.



Warning

Hazardous network voltages are present in WAN ports regardless of whether power to the router is OFF or ON. To avoid electric shock, use caution when working near WAN ports. When detaching cables, detach the end away from the router first. To see translations of this warning, refer to the Regulatory Compliance and Safety Information document that accompanied this product.

Preparing the Cards

The locations of the system cards in the IGX node depend on the hardware configuration. Primary and redundant nodal processor modules (NPMs) must reside in front slot 1 and 2. The system clock module (SCM) must reside in back slot 1. Except for these reserved slots, cards can reside in any slot on the appropriate side of the node (but Cisco recommends that the optional alarm relay module (ARM)/alarm relay interface (ARI) card set reside in the slot on the far right).

The SCM card determines whether the IGX node is an IGX 8410 (which has 8 slots), an IGX 8420 (which has 16 slots), or an IGX 8430 (which has 32 slots). Before installing cards in the node or replacing the SCM, verify that the jumpers are set properly. (See [Table 3-1](#).) The two jumpers, W5 and W6, are located near the P2 connector and the strengthening bar on the SCM card. (See [Figure 3-1](#).) Record your setting, so that you don't have to remove the SCM card later to verify the setting.



Caution

Incorrect jumper settings can cause the loss of data and services.

Table 3-1 Valid SCM Jumper Settings

IGX Node Type	Jumper Setting
IGX 8410 (8 slots)	Connect the W5 jumper. Remove the W6 jumper.
IGX 8420 (16 slots)	Remove the W5 jumper. Connect the W6 jumper.
IGX 8430 (32 slots)	Remove the W5 jumper. Remove the W6 jumper.



Note

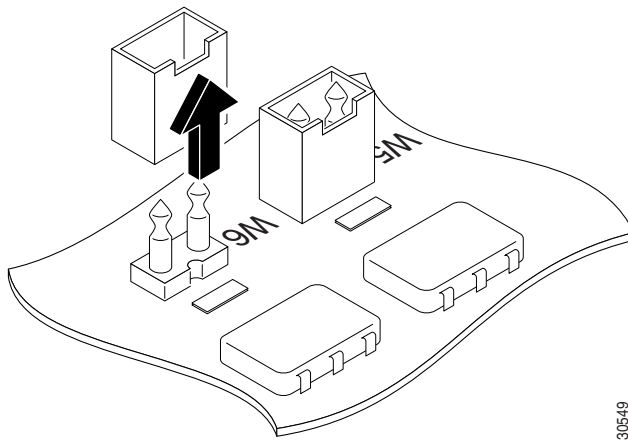
Do not connect both W5 and W6 jumpers. The setting is not supported.



Caution

Turn off the IGX node before removing or inserting the SCM card. Damage to the node can occur if you insert the SCM card while the node is on.

Figure 3-1 W6 Jumper



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Tools and Equipment

Installing an IGX 8420 switch requires the following tools and equipment:

- Box knife (or equivalent)
- Flat-blade screwdriver set
- Phillips screwdriver set, which must include a No. 1 size for front card installation
- ESD-preventive wrist strap
- A variety of wrenches, possibly including an adjustable wrench or channel locks, for raising and lowering cabinet feet (for example, a Cisco cabinet requires a 1 3/8-in. wrench)
- 5/32-in. Allen wrench for opening the IGX 8420 door (Cisco provides a wrench.)

Many card sets support Y-cable redundancy. This feature requires an extra set of cards and a Y-cable. A set of commands exists to specify, delete, and display Y-cable redundancy. For instructions on setting up Y-cable redundancy, refer to the setup section for the specific card set.

**Note**

Frame Relay module (FRM) and network trunk module (NTM) front cards exist in one and two-piece versions. The two-piece card uses an ACM1. Refer to the *Cisco IGX 8400 Series Provisioning Guide* for details.

A Cisco IGX node can support a configuration of up to 32 trunks.

**Caution**

Connector pins must align with receptacles. Before card insertion, make sure that pins are straight and that card connectors and the backplane align. Insert the card gently. It might be necessary to push the edge of the card slightly to one side for alignment. (This might require removing cards.)

The locations for the NPMs and SCMs in a Cisco IGX:

- Nonredundant:
 - NPM in front slot number 1
 - SCM in back slot number 1 behind NPM front slot number 1
- Redundant:
 - NPMs in front slot numbers 1 and 2
 - SCM in back slot number 1 behind NPM front slot number 1

**Note**

Opening the door requires a 5/32-in. Allen wrench. Cisco provides this in a combination tool (part number 218705).

**Caution**

When handling the cards, wear a wrist strap to prevent damage to the cards from electrostatic discharge. The IGX 8410 cabinet has wrist strap attached at both the front and the back.

Figure 3-2 IGX 8410 Cards, Front View

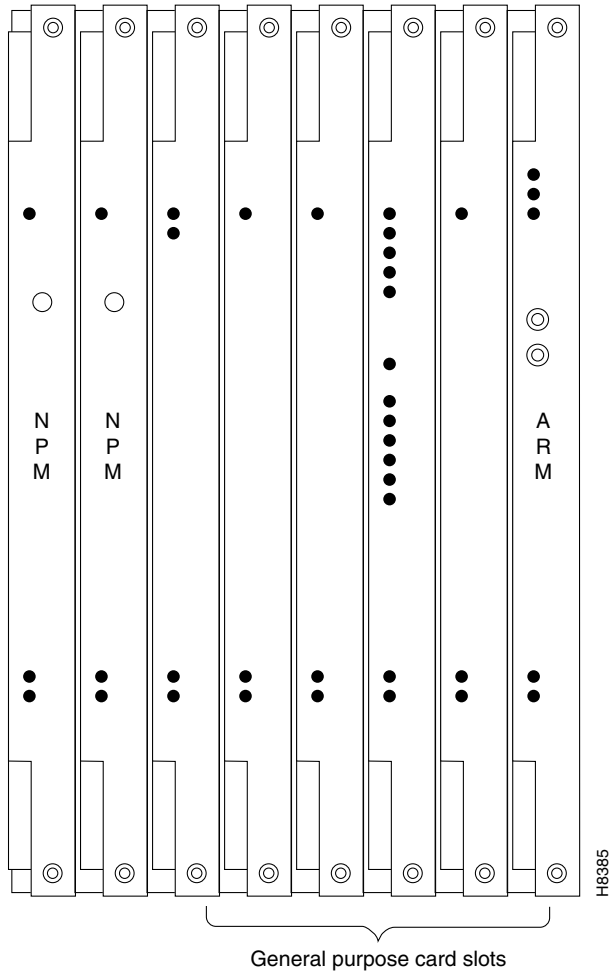


Figure 3-3 IGX 8410 Cards, Back View

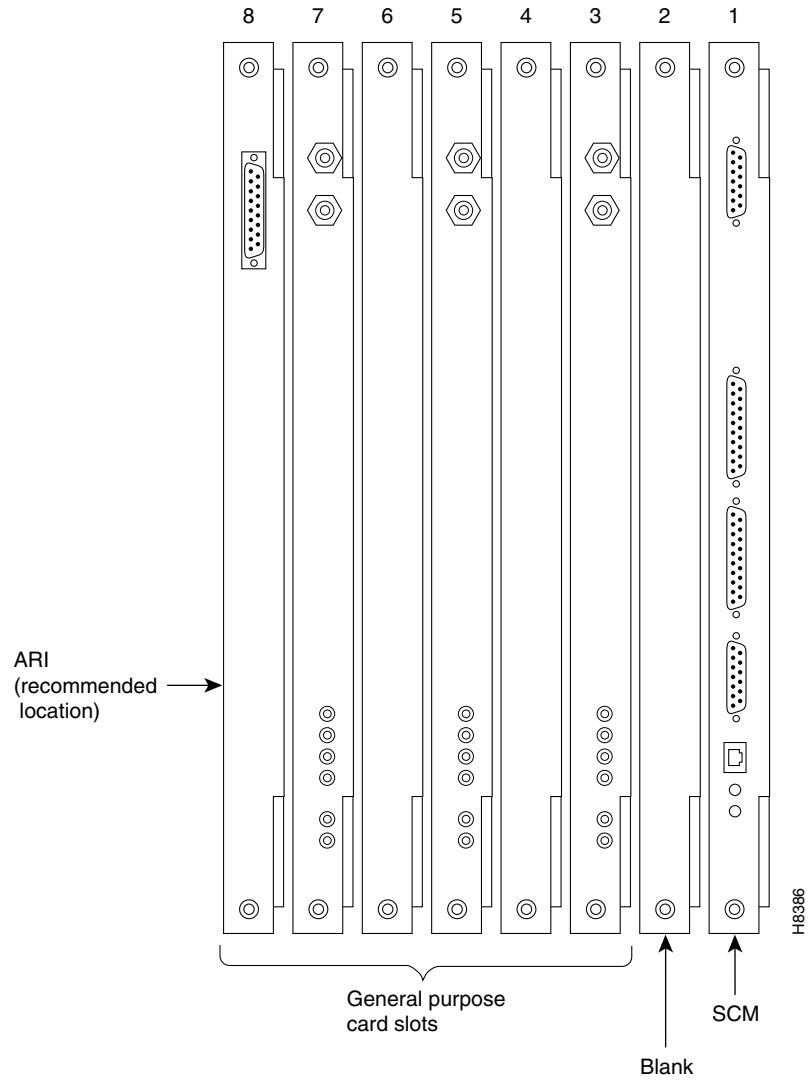
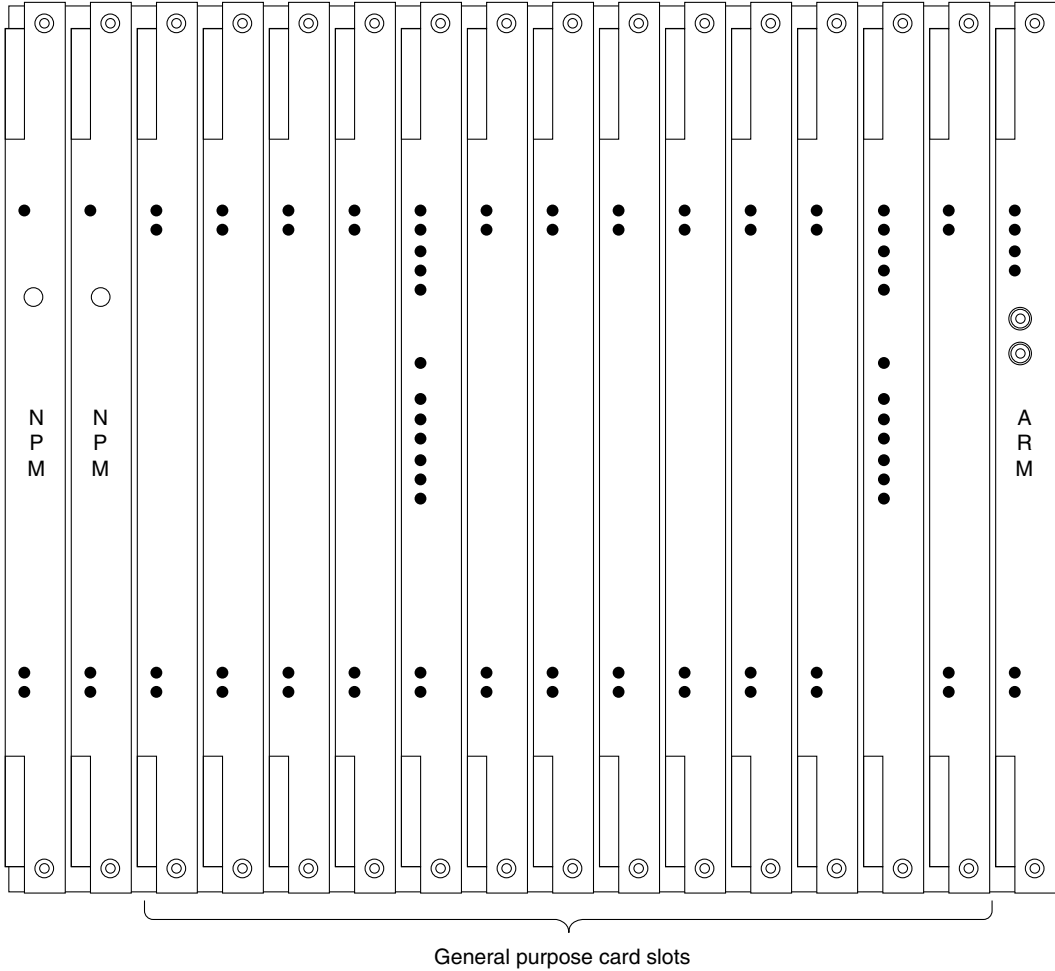
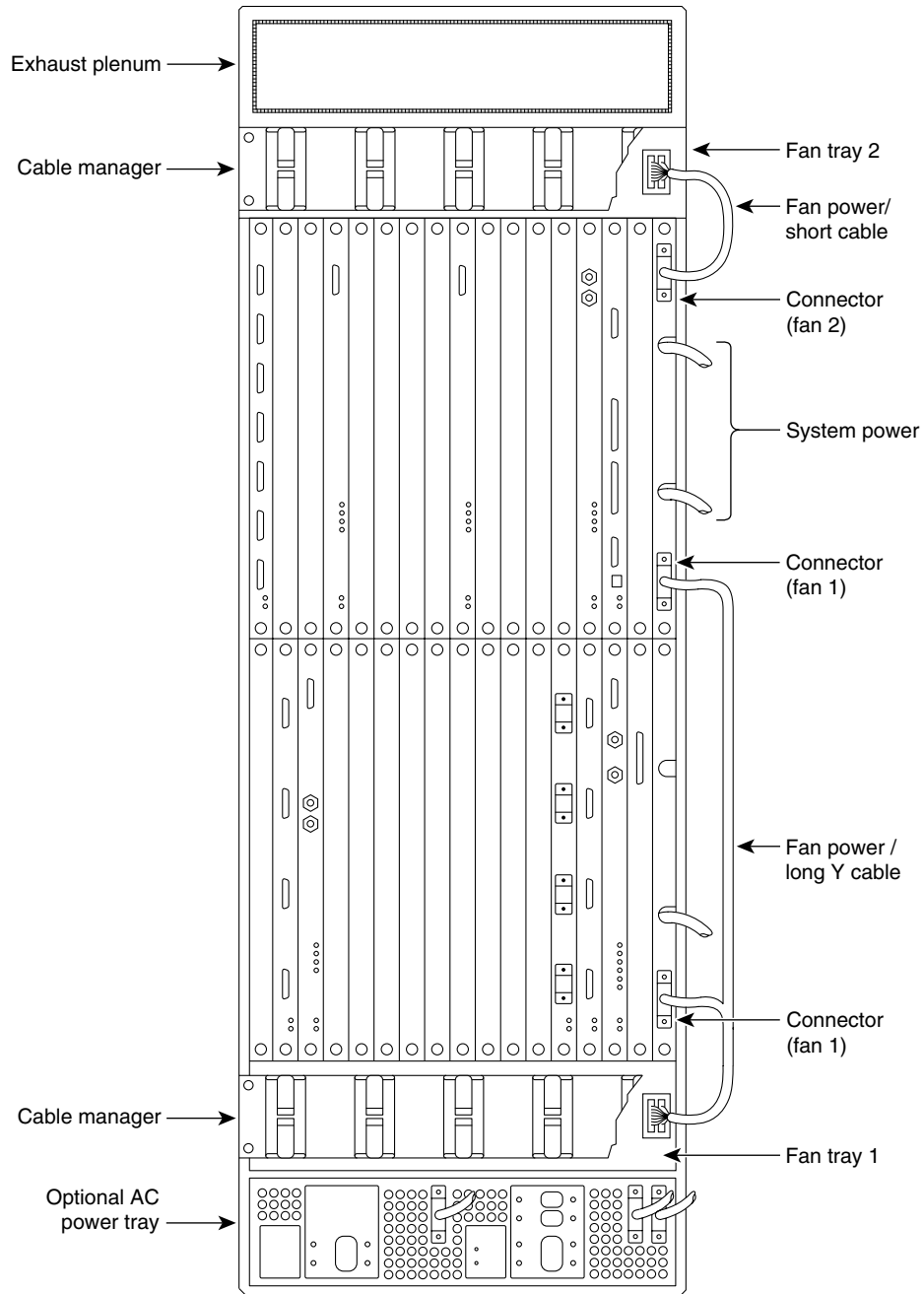


Figure 3-4 IGX 8420 Card Shelf, Front View



H8346

Figure 3-5 IGX 8430 Back View



H8347

Inserting the Cards

To insert a Cisco IGX module:

Step 1 Attach an ESD-preventive wrist strap to handle the cards.



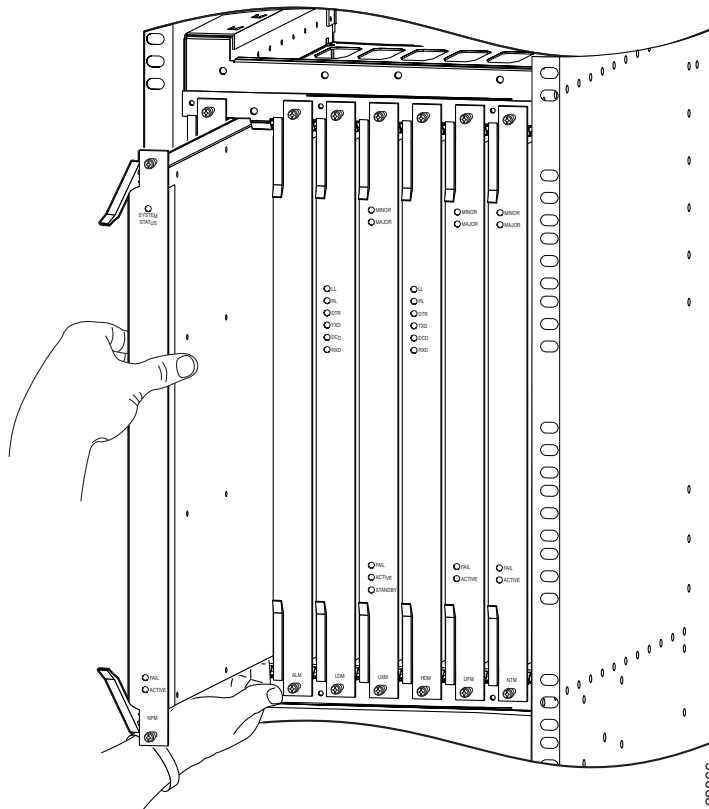
Note The IGX 8410 cabinet has a wrist strap attached at both the front and back.

Step 2 Using the 5/32-in. Allen wrench, open the Cisco IGX 8400 series switch door.

Step 3 Be sure that you are inserting the module into the correct slot.

Step 4 Grasp the card front panel with one hand and place your other hand under the card to balance the weight of the card as you push it vertically into the slot. See [Figure 3-6](#).

Figure 3-6 Inserting Modules



Step 5 Push down on the ejector levers to properly seat the card.



Caution

Always use the ejector levers when disengaging or seating the modules. Failure to do so can cause erroneous system error messages, and indicate card failure. However, do not use the ejector levers to lift or support the weight of the cards.

Step 6 Using the number 1 Phillips screwdriver, tighten the panel fasteners at the top and bottom of the card front panel.

Making Signal Connections

The remaining sections of this chapter describe how to set up physical lines, ports, trunks, and signal connections. The *Cisco WAN Switching Command Reference* and *Cisco WAN Switching SuperUser Command Reference* provide important details on the commands appearing in this chapter.

The following trunk rates are supported:

- OC3 (STM1)
- T3/E3
- T1/E1
- Subrate (less than T1 or E1 rates)
- Y1

The following service module (or circuit line) connections are supported:

- ATM
 - OC3 (STM1)
 - T3/E3
 - T1/E1
- Channelized voice/data
 - T1/E1/J1
- Frame Relay
 - T1/E1
 - V.35
 - X.21
 - HSSI
- Data
 - EIA/TIA-449
 - V.35
 - EIA/TIA-232D
 - EIA/TIA-232C
- Alarm relay

Connecting Trunks

The sections that follow contain basic information on how to set up the two types of trunks on the IGX node. The two trunk types are FastPacket and ATM. The supported line types are OC3/STM1, T3, E3, T1, Y1, and E1. The card sets described in this section are the network trunk module (NTM). The enhanced universal switching module (UXM-E) is a dual-purpose, ATM cell-based card and has its own section that includes information for trunk-mode configuration and port-mode configuration.

Setting Up a UXM-E

To set up a UXM-E attach cables and enter commands at the command-line interface (CLI). For detailed information regarding the UXM-E, refer to the *Cisco IGX 8400 Series Provisioning Guide*.

You can specify the mode of the UXM-E through Cisco WAN Manager or the switch software CLI. The UXM-E card set goes into the mode determined when you activate the first port. If you activate a logical port to be a trunk by using the **uptrk** command, for example, the UXM-E goes into trunk mode. If you use the **upln** command to activate a line as a User-Network Interface (UNI) port to customer premises equipment (CPE) or an Network-to-Network Interface (NNI) to another network, the UXM-E goes into port mode.

For a summary of commands used to bring up an IGX node, refer to the [“IGX Configuration Summary” section on page 59](#).

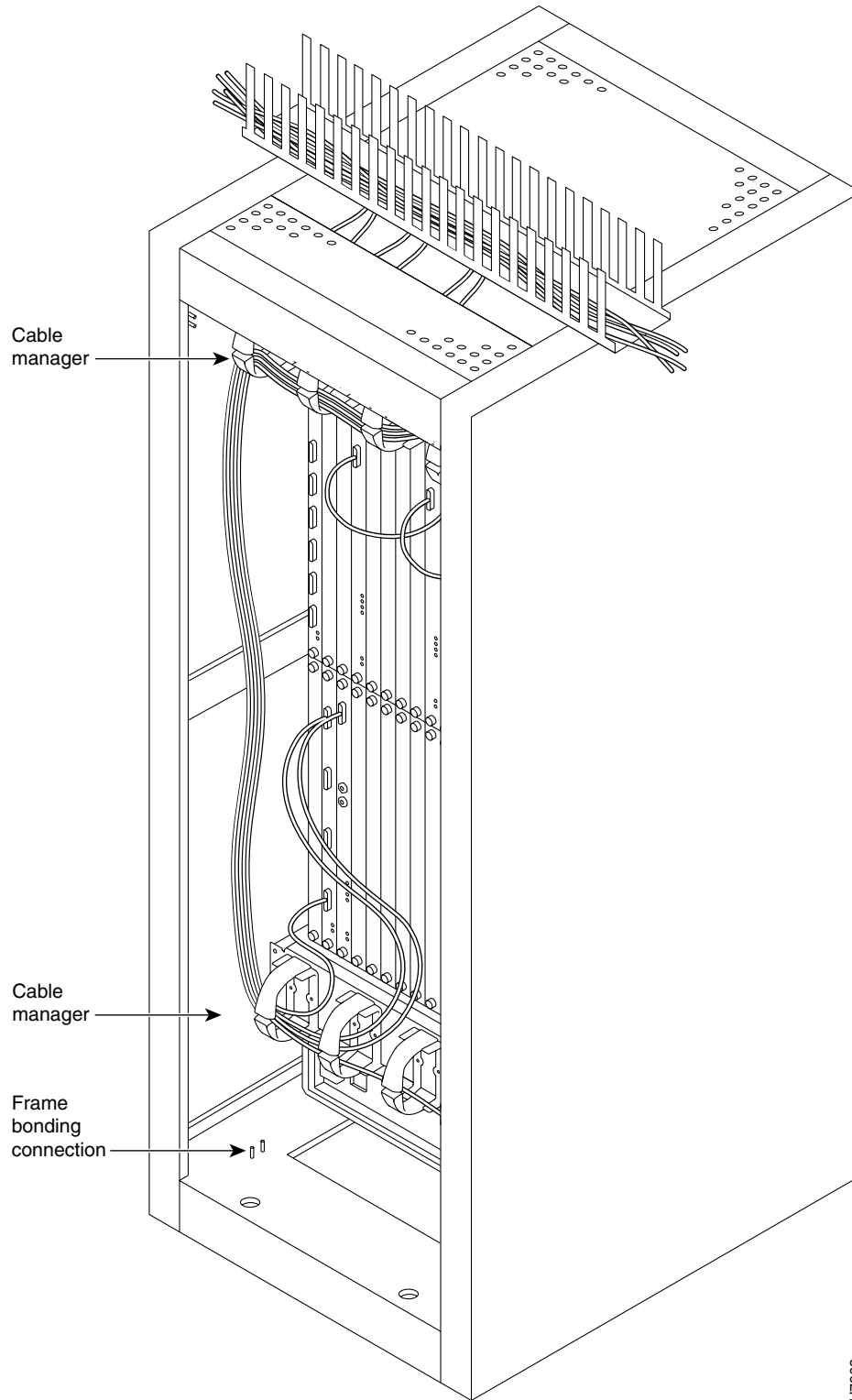
Bringing Up a UXM-E Trunk

If you are not familiar with precautions for card insertion, see the [“Preparing the Cards” section on page 3-1](#).

To attach the cables to a back card:

-
- Step 1** Bring each cable through the opening at the top or bottom of the cabinet (whichever is appropriate) and along the back of the IGX enclosure. See [Figure 3-7](#).
 - Step 2** If the unit has the optional cable manager, you can use it to help route the cables. See [Figure 3-7](#).
 - Step 3** Connect the cables to the connectors on the back card. See [Figure 3-7](#).

Figure 3-7 Cable Management



Use the following command sequence for bringing up the trunk. You must bring up the trunk before you add connections.

For more information on switch software commands, see the *Cisco WAN Switching Command Reference*.

-
- Step 1** To verify the correct card locations in both the local and remote nodes, enter the **dspecds** command.
- Step 2** Configure the cellbus bandwidth allocation for the card if you do not plan to rely on automatic increases from switch software. Use the superuser command **cnfbusbw** on the CLI to see and increase the current allocation.



Note Cisco recommends that you not allow oversubscription. Refer to the *Cisco IGX 8400 Series Provisioning Guide* for the description of cellbus bandwidth allocation and the *Cisco WAN Switching SuperUser Command Reference* for a description of the **cnfbusbw** command. Any user can view the current cellbus bandwidth allocation by using the **dspebusbw** command.

- Step 3** Activate the trunk by using the **uptrk** command. Run this command on the nodes at both ends of the trunk. On the CLI, use the **vt** command to reach the far-end node to run commands. The only trunk cards you can connect to a UXM-E trunk are another UXM-E trunk card or a BXM in trunk mode. The syntax of the single-port trunk specification is *slot.port*.
- To specify an inverse multiplexing over ATM (IMA) trunk through the CLI, enter the **uptrk slot.first_line–last_line** command. The line numbers must be contiguous.
- Step 4** At each end, configure trunk parameters as required by using the **cnftrk** command. Each type of trunk comes up with a default configuration, but you can alter the configuration with the **cnftrk** command. Refer to the description of the **cnftrk** command in the *Cisco WAN Switching Command Reference* for the parameters that apply to each interface.
- Step 5** Use the **addtrk** command to add the trunk. Adding the trunk makes it a usable resource, so you can subsequently add connections through Cisco WAN Manager or the CLI using the **addcon** command. Add the trunk at only one node. If, after you add the trunk, you later determine that changes to the trunk parameters are necessary, you can change certain parameters with the **cnftrk** command without taking the trunk out of service.
- Step 6** Optionally, configure a UXM-E trunk as a clock source by entering the **cnfclksrc** command.
- Step 7** Configure the cellbus bandwidth allocation with the **cnfbusbw** command if you plan to activate many ports or carry a large number of connections on the UXM-E trunk. Use the **dspebusbw** or **cnfbusbw** command to check cellbus usage and changes in bandwidth requirements for the UXM-E. For information on cellbus bandwidth needs, see the *Cisco IGX 8400 Series Provisioning Guide*.
- Step 8** To configure physical and logical trunk statistics, use the **cnfphyslstats** and **cnftrkstats** commands, respectively. See the *Cisco IGX 8400 Series Provisioning Guide* for UXM-E trunk statistics.
-

Inverse Multiplexing over ATM on Trunks

An IMA lets you group physical T1 or E1 lines to form a logical trunk. A logical trunk consisting of more than one T1 or E1 line supports connections with data rates that are much higher than the T1 or E1 rate. System software lets you specify IMA so that one or more physical lines within the logical trunk can serve as backup if a line fails. IMA characteristics are as follows:

- All physical ports of an IMA trunk use the same line configuration.
- The node maintains a set of *retained links* for the IMA trunk to keep it active. The IMA trunk does not fail unless the number of active trunks is less than the user-specified number of retained links.
- The IMA trunk can provide a clock source or clock path (see the **cnftrk** command). The first (the lowest numbered) available physical line is used. If this line fails, the next available line within the IMA provides the clock source or clock path.
- Full support for individual physical line alarms and statistics.

To specify the range of ports for an IMA trunk, you can use either Cisco WAN Manager or the command-line interface (CLI). To define an IMA trunk on the CLI, use the **uptrk** command:

```
uptrk slot.start_port-end_port
```

For example, you could enter **uptrk 8.1–4**. Subsequently, you would refer to this logical trunk by using only the slot number and first port number—8.1 in this example—when you use other commands, such as **addrtrk**, **deltrk**, **cnftrk**, and so on. Commands for viewing IMA information also include **dspportstats**, **dspphyslms**, **dsprkcnf**, **dspfdr**, **dspnode**, and **dspphyslsthst**.

Adding an IMA Feeder Trunk

To add the UXM-E feeder trunk, you can use either Cisco WAN Manager or the CLI. To define an IMA trunk on the CLI:

Step 1 Activate the trunk between the interface shelf and router by specifying the primary link and the IMA group members of a UXM-E feeder trunk on an IGX routing node or an IGX feeder node:

```
uptrk slot.group-members
```

Step 2 Use the **cnftrk** command to configure the activated UXM-E feeder trunk:

```
cnftrk slot.primary link
```

Step 3 Use the **addshelf** command to add the feeder trunk to an IGX routing node:

```
addshelf slot.primary link shelf type
```



Note The routing node can be one of the following: IGX, BPX, or BPX-BXM/IMATM.

Adding Links to an IMA Feeder Group

To add links to an IMA group, you can use either Cisco WAN Manager or the CLI. To add a link to an IMA on the CLI:

-
- Step 1** Find the nodes configured as trunks connected to the IMA feeder:
- ```
dsptrks
```
- Step 2** Increase the IMA group members on both trunk and feeder nodes by manually entering the number of group members. Enter:
- ```
cnftrk slot.primary link
```
- Step 3** Increase the receive rate using the DS0 calculation on both trunk and feeder nodes.
- Step 4** Increase the number of retained links on both trunk and feeder nodes.
-

Removing Links from an IMA Feeder Group

To remove links from an IMA group, you can use either Cisco WAN Manager or the CLI. To remove a link from an IMA group on the CLI:

-
- Step 1** Find the nodes configured as trunks connected to the IMA feeder by using the **dsptrks** command.
- Step 2** Reduce the number of retained links on the IMA feeder node.
- Step 3** Reduce the receive rate using the DS0 calculation on the IMA feeder node.
- Step 4** Repeat Step 2 and Step 3 on the IMA trunk.
- Step 5** Reduce the number of IMA group members on both trunk and feeder nodes by manually entering the number of group members:

```
cnftrk slot.primary link
```



Note The primary link cannot be removed from an IMA group.

UXM-E Inverse Multiplexing ATM IMA Lines

This feature allows the extension of the IMA protocol to UXM-E line interfaces, which substantially reduces equipment and interface costs for customers requiring IMA line interfaces and trunks and high bandwidth demand for ATM. It reduces costs by bundling multiple physical T1/E1 lines into a logical line enlarging traffic bandwidth. This makes it unnecessary to upgrade access lines to higher-speed services such as T3/E3.



Note Both ends of the UXM-E IMA lines require you to install UXM-E Firmware Model B (Release 9.2 and later releases). If the UXM IMA line is connected to another device, that device must support ATM Forum Compliant IMA Protocol, Version 1.0. To verify the UXM firmware version, use the **dspcd** command.

To specify the range of ports for an IMA line, you can use either Cisco WAN Manager or the command-line interface (CLI). To define an IMA line on the CLI, use the **upln** command:

```
upln slot.group-member
```

For example, you could enter **upln 8.1–4**. Subsequently, you would refer to this physical line by using only the slot number and first group member—8.1 in this example—when you use commands, such as **upln**, **dnln**, **cnfln**, and so on. Following the activation of an IMA line group, the logical port will be created with the primary line port as the port number.

Commands for viewing IMA line information also include **dsplncnf**, **dsplns**, **dsports**, **dsport**, **dsphyslnstathist** and **dsphyslnstatcnf**.


Note

The UXM-E IMA ports on an IGX, will interoperate with an IMA compliant router or a device that supports the ATM Forum Compliant IMA Protocol, Version 1.0.

Bringing Up a UXM-E in UNI or NNI Port Mode

If you are not familiar with card insertion, see the “[IGX Configuration Summary](#)” section on page 3-59.

To attach the cables:

-
- Step 1** Bring each cable through the opening at the top or bottom of the cabinet (whichever is appropriate) and along the back of the IGX enclosure.
 - Step 2** If the unit has the optional cable manager, you can use it to help route the cables.
 - Step 3** Connect the cables to the connectors on the back card.
-

To activate a port-mode UXM-E:

-
- Step 1** Verify the correct card locations in both the local and remote nodes (using the **dspcds** command).
 - Step 2** Activate each line by using the **upln** command. Run this command on the nodes at both ends of the line. Use the **vt** command to reach the far-end node to run commands. When you activate the first line with the **upln** command, the UXM-E goes into port mode.
 - Step 3** At the near-end and far-end nodes, use the **cnfln** command to configure line parameters as required. Each line comes up with a default configuration, but you can change the configuration with the **cnfln** command.
 - Step 4** Optionally, you can specify Y-cable redundancy with the **addyred** command.
 - Step 5** Use the **upport** command at the near-end and far-end nodes to activate (up) the logical port. Use **vt** to reach the far-end node. Activating the port makes it a usable resource, so you can subsequently add connections through Cisco WAN Manager or the CLI (using the **addcon** command).
 - Step 6** Use the **cnfport** command at the near-end and far-end nodes to configure each logical port. Applicable parameters are the choice of UNI or NNI cell header, an enable for Local Management Interface (LMI) or Interim Local Management Interface (ILMI) protocol or no protocol, and an enable for the *%util* parameter.
 - Step 7** If you do not want the defaults for the queue depths and high and low discard eligibility thresholds, use the **cnfportq** command to configure parameters for the CBR, VBR, and ABR queues.

- Step 8** Optionally, you can use the **cnfabrparm** command to configure additional parameters for ABR traffic. The **cnfabrparm** command parameters are CI control and egress explicit rate stamping.
- Step 9** Optionally, you can configure a UXM-E port as a clock source. Use the **cnfelksrc** command.
- Step 10** Configure the cellbus bandwidth allocation with the **cnfbusbw** command if you plan to activate a large number of ports on the UXM-E. Use the **dspbusbw** or **cnfbusbw** command to check cellbus usage and changes in bandwidth requirements for the UXM-E. For an explanation of cellbus bandwidth allocation, see the *Cisco IGX 8400 Series Provisioning Guide*.



Note Cisco recommends that you not allow oversubscription. Refer to the *Cisco IGX 8400 Series Provisioning Guide* for the description of cellbus bandwidth allocation and the *Cisco WAN Switching SuperUser Command Reference* for a description of **cnfbusbw**. Any user can view the current cellbus bandwidth allocation by using the **dspbusbw** command.

- Step 11** To check the status of the lines, use the **dsplns** command.
- Step 12** To configure the duration, sample count and size, and peak values for historical port statistics, use the **cnfportstats** command. Use the **dspportstats** command to display the summary statistics for cell count, CLP cell count, OAM cell count, RM cell count, OAM cell count, unknown VPI/VCI cell count, and optional LMI/ILMI status. Other applicable commands are **dsplnerrs**, **dspportstatcnf**, and **dspportstathist**.
-

Connecting an NTM T1 or Y1 Trunk

The T1 trunk connections use the NTM front card and the BC-T1 back card. Japanese Y1 connections use the NTM front card and the BC-Y1 back card. The procedure for making Y1 connections is the same as for T1 connections described below.

Make the T1 connections as follows:

-
- Step 1** Bring each T1 cable through the opening at the bottom of the cabinet (if applicable) and up the back of the unit.
- Step 2** Use the cable management feature to help route the cables.
- Step 3** Connect the trunks to the connectors on the BC-T1s that are part of NTM/BC-T1 card sets. The T1 lines are attached to DB-15, subminiature, 15-pin connectors on the BC-T1 cards.

The back slot line numbers correspond to the back slot number in which the BC-T1 card resides. Record the back slot number of each line. These numbers are necessary for configuring the system after you complete hardware installation.



Note If the number of trunks is odd, connect as many as possible in pairs, and connect the remaining lines in ascending order.

Connecting an NTM E1 or Subrate Trunk

The E1 trunk connections use the NTM front card and the BC-E1 back card. Subrate E1 connections use the NTM front card and the BC-SR back card. The E1 trunk interface card BC-E1 contains the E1 trunk connector (G.703 Input/Output) that is located at the top of the back card. The BC-E1 faceplate has four 75-ohm BNC connectors.

**Note**

The BC-E1 faceplate provides two connector arrangements for attaching E1 lines. Use either the two BNC (RX and TX) connectors or the 15-pin DB connector.

Make the E1 connections as follows:

- Step 1** Bring each E1 BNC patch cable (or 15-pin cable) through the opening at the top or bottom of the cabinet (whichever applies) and along the back of the unit.

**Note**

Some versions of the BC-E1 use a metal BNC connector instead of a plastic BNC. For terminating 75- or 120-ohm balanced E1 lines at the metal BNC connectors, remove the BNC mounting nuts. This removes the ground that normally appears on one side of the connector shell.

- Step 2** Use the cable management feature to help route the cables.

- Step 3** Connect the cables to connectors on the BC-E1s that are part of an NTM/BC-E1 card sets.

Record the slot numbers of the NTM/BC-E1 card set. You need these numbers when you configure the system.

Installing a URM

The universal router module (URM) is a dual-processor card, featuring both a modified Cisco IGX 8400 series UXM-E processor and a modified Cisco 3660 modular-access router processor. Each processor uses a different operating system. See documentation for both Cisco IOS software and switch software while working with the URM.

For more information on the URM, see the *Cisco IGX 8400 Series Provisioning Guide*.

Installing the Encryption Advanced Interface Module

The following procedure describes the installation of an encryption advanced interface module (AIM) module on the URM front card. This encryption AIM module is required for implementation of a virtual private network (VPN) using the IGX.

**Timesaver**

To avoid having to redo tasks, install the encryption AIM on the URM front card before installing the URM in the IGX chassis.

Step 1 Attach an ESD-preventive wrist strap before handling either the front card or the encryption AIM.



Tip

Use the anti-static bag used to ship the URM as a ground cloth to prevent ESD.

Step 2 With the flat-blade screwdriver, remove the three metal screws nearest the AIM connector while holding down the URM front card.

Step 3 Place the encryption AIM in the plastic stand-off that comes with the encryption AIM.

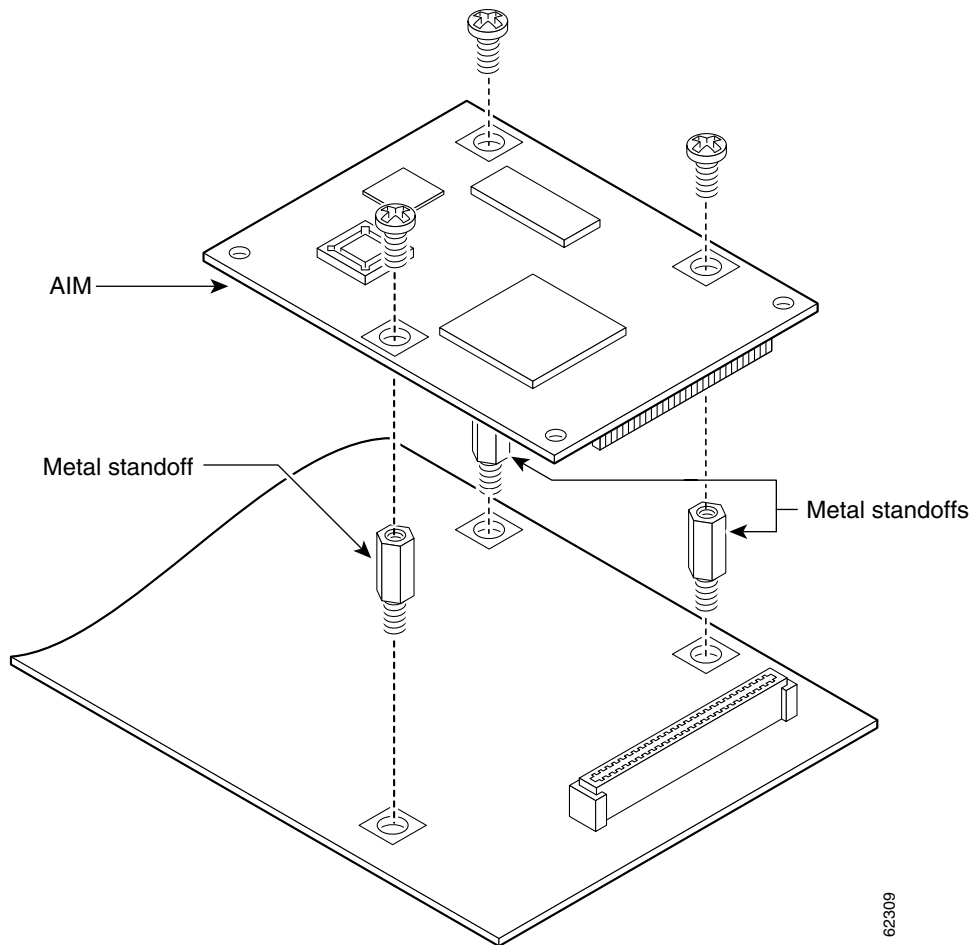
Step 4 Align the legs on the plastic stand-off with the screw holes on the URM front card and insert the encryption AIM into the AIM connector on the URM front card (see [Figure 3-8](#)).



Note

Be sure to firmly seat the encryption AIM in the connector. Also, make sure that the metal stand-offs align with the screw holes on the URM front card.

Figure 3-8 Encryption AIM Installation on the URM



62309

- Step 5** Insert the three metal screws into the holes in the encryption AIM. Tighten each screw with the flat-blade screwdriver.
- Step 6** Confirm that the encryption AIM is correctly installed, then continue with the “[Configuring Internet Encryption](#)” section.
-

Configuring Internet Encryption



Note

There are no commands specific to configuring the encryption hardware. Both software-based and hardware-based encryption are configured in the same way. The system automatically detects the presence of an encryption module at bootup and uses it to encrypt data; if no encryption hardware is detected, software is used to encrypt data.

Whenever you install a new interface, or if you want to change the configuration of an existing interface, you must configure the interface. If you replace a module that was already configured, the router recognizes it and brings up the interface in the existing configuration.

Before you configure an interface, have the following information available:

- Protocols you plan to route on the new interface
- IP addresses, subnet masks, network numbers, zones, or other information related to the routing protocol
- Static address mappings (address lists)
- Location and type of interface through which encrypted data will enter and exit the router



Timesaver

Obtain this information from your system administrator or network plan before you begin router configuration.

This section describes basic encryption configuration including:

- “[Configuring Internet Key Exchange Security Protocol](#)” section on page 3-20
- “[Configuring IPsec Network Security](#)” section on page 3-20
- “[Checking the Configuration](#)” section on page 3-21

For more information about configuring IPsec, see the “IP Security and Encryption” sections in Cisco IOS software documentation (see the “[Cisco IOS Software Documentation](#)” section on page xix).



Note

Depending on your own requirements and the protocols you plan to route, you might also need to enter other configuration commands.

Configuring Internet Key Exchange Security Protocol

To configure the Internet Key Exchange Security Protocol, complete this procedure:

	Command	Purpose
Step 1	Router(config)# crypto isakmp policy <i>priority</i>	Creates an Internet Key Exchange (IKE) policy with a unique priority number. You can configure multiple policies on each peer, but at least one of these policies must contain exactly the same encryption, authentication, and other parameters as one of the policies on the remote peer. Note This command enters the ISAKMP policy configuration mode.
Step 2	Router(config-isakmp)# authentication <i>rsa-sig/rsa-encr/pre-share</i>	Specifies the authentication method to be used in an IKE policy. Note The VPN encryption products described in this document do not currently support RSA authentication.
Step 3	Router(config-isakmp)# exit	Exits the ISAKMP policy configuration mode and returns to global configuration mode.
Step 4	Router(config)# crypto isakmp key <i>keystring address peer-address/peer-hostname</i>	Configures the authentication key that will be shared by each peer. Note This must be configured at both peers that will share a key.

Configuring IPsec Network Security

To configure IPsec network security, complete this procedure:

	Command	Purpose
Step 1	Router(config)# crypto ipsec security-association lifetime seconds <i>seconds/ kilobytes kilobytes</i>	Specifies the time a security association will live before expiring. The default lifetimes are 3600 seconds (one hour) and 4,608,000 kilobytes (10 megabytes per second for one hour).
Step 2	Router(config)# crypto ipsec transform-set <i>transform-set-name transform1 [transform2 [transform3]]</i>	Enters the transform-set configuration mode. A transform set represents a specific combination of security protocols and algorithms. During the IPsec security association negotiation, the peers search for a transform set that is the same at both peers. When such a transform set is found, it is selected and applied to the protected traffic as part of both peers' IPsec security associations.
Step 3	Router(cfg-crypto-trans)# exit	Exits the transform-set configuration mode and returns to global configuration mode.

	Command	Purpose
Step 4	Router(config)# crypto map <i>map-name seq-num ipsec-isakmp</i> [dynamic <i>dynamic-map-name</i>] [discover]	Creates a crypto map. Note This command enters the crypto map configuration mode, unless you enter the dynamic keyword.
Step 5	Router(config-crypto map)# set peer <i>hostname/ip-address</i>	Specifies a remote IPsec peer. Note This should be the same peer specified in Step 4 in the previous procedure.
Step 6	Router(config-crypto map)# set transform-set <i>transform-set-name</i>	Specifies the transform set allowed for this crypto map entry. Note This should be the same transform set specified in Step 2 of this procedure.
Step 7	Router(config-crypto map)# match address [<i>access-list-id</i> <i>name</i>]	Specifies an extended access list for a crypto map entry.
Step 8	Router(cfg-crypto-map)# exit	Exits the crypto map configuration mode and returns to global configuration mode.
Step 9	Router(config)# access-list <i>access-list-number</i> { permit deny } { <i>type-code wild-mask</i> <i>address mask</i> }	Creates an access list.

For complete information about global configuration commands, and about configuring LAN and WAN interfaces on your router, refer to the Cisco IOS configuration guides and command references.

Checking the Configuration

After configuring the new interface, you can use the following commands to verify that the new interface is operating correctly:

- Display the router hardware configuration with the **show version** command. Check that the list includes the new interface.
- Display all network modules and their interfaces with the **show controllers** command.
- Specify an interface with the **show interfaces** [*type slot/port*] command and verify that the first line of the display shows the interface with the correct slot and port number, and that the interface and line protocol are in the correct state, up or down.
- Display the protocols configured for the entire router and for individual interfaces with the **show protocols** command. If necessary, return to configuration mode to add or remove protocol routing on the router or its interfaces.
- Display the running configuration with the **show running-configuration** command, and the configuration stored in NVRAM using the **show startup-configuration** command.
- Use the **ping** command to send an echo request to a specified IP address.

Sample Encryption Configuration Files

This section contains sample configuration files for two peer routers set up to exchange encrypted data through a secure IPsec tunnel over a channelized T1 interface channel group, serial 1/0:0.

Configuration File for Peer 1

```

version 12.1
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname Rose
!
logging buffered 100000 debugging
enable password lab
!
ip subnet-zero
no ip domain-lookup
!
!
!
crypto isakmp policy 10
 authentication pre-share
crypto isakmp key pre-shared address 10.6.6.2
!
crypto ipsec security-association lifetime seconds 86400
!
crypto ipsec transform-set transform-1 esp-des
!
!
crypto map cmap 1 ipsec-isakmp
 set peer 10.6.6.2
 set transform-set transform-1
 match address 101
!
!
controller T1 1/0
 framing esf
 linecode b8zs
 channel-group 0 timeslots 1-23 speed 64
 channel-group 1 timeslots 24 speed 64
!
controller T1 1/1
 channel-group 0 timeslots 1-23 speed 64
 channel-group 1 timeslots 24 speed 64
!
!
process-max-time 200
!
interface FastEthernet0/0
 ip address 172.16.0.2 255.0.0.0
 no ip directed-broadcast
 no ip route-cache
 no ip mroute-cache
 speed 10
!
interface Serial0/0
 no ip address
 no ip directed-broadcast
 shutdown
!

```

```
interface FastEthernet0/1
 ip address 10.4.4.1 255.0.0.0
 no ip directed-broadcast
 no ip route-cache
 no ip mroute-cache
 load-interval 30
 speed 10
!
interface Serial1/0:0
 bandwidth 1472
 ip address 10.6.6.1 255.0.0.0
 no ip directed-broadcast
 encapsulation ppp
 no ip route-cache
 load-interval 30
 no fair-queue
 crypto map cmap
!
interface Serial1/0:1
 no ip address
 no ip directed-broadcast
 fair-queue 64 256 0
!
interface Serial1/1:0
 no ip address
 no ip directed-broadcast
!
interface Serial1/1:1
 no ip address
 no ip directed-broadcast
 fair-queue 64 256 0
!
router rip
 network 10.0.0.0
 network 10.0.0.0
!
ip classless
ip route 0.0.0.0 0.0.0.0 111.0.0.1
no ip http server
!
access-list 101 deny  udp any eq rip any
access-list 101 deny  udp any any eq rip
access-list 101 permit ip 10.6.6.0 0.0.0.255 10.6.6.0 0.0.0.255
!
line con 0
 exec-timeout 0 0
 transport input none
line aux 0
line vty 0 4
 password lab
 login
!
!
end
```

Configuration File for Peer 2

```
version 12.1
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname Peony
!
logging buffered 100000 debugging
enable password lab
!
!
!
!
ip subnet-zero
no ip domain-lookup
!
!
crypto isakmp policy 10
 authentication pre-share
crypto isakmp key pre-shared address 10.6.6.1
!
crypto ipsec security-association lifetime seconds 86400
!
crypto ipsec transform-set transform-1 esp-des
!
!
crypto map cmap 1 ipsec-isakmp
 set peer 10.6.6.1
 set transform-set transform-1
 match address 101
!
!
controller T1 1/0
 framing esf
 linecode b8zs
 channel-group 0 timeslots 1-23 speed 64
 channel-group 1 timeslots 24 speed 64
!
controller T1 1/1
 channel-group 0 timeslots 1-23 speed 64
 channel-group 1 timeslots 24 speed 64
!
!
process-max-time 200
!
interface FastEthernet0/0
 ip address 172.16.0.13 255.0.0.0
 no ip directed-broadcast
 no ip mroute-cache
 load-interval 30
 no keepalive
 speed 10
!
interface FastEthernet0/1
 ip address 3.3.3.2 255.0.0.0
 no ip directed-broadcast
 no ip route-cache
 no ip mroute-cache
 load-interval 30
 speed 10
!
```



```
interface Serial1/0:0
  bandwidth 1472
  ip address 10.6.6.2 255.0.0.0
  no ip directed-broadcast
  encapsulation ppp
  no ip route-cache
  load-interval 30
  no fair-queue
  crypto map cmap
!
interface Serial1/0:1
  no ip address
  no ip directed-broadcast
  fair-queue 64 256 0
!
interface Serial1/1:0
  no ip address
  no ip directed-broadcast
!
interface Serial1/1:1
  no ip address
  no ip directed-broadcast
  fair-queue 64 256 0
!
router rip
  network 3.0.0.0
  network 6.0.0.0
!
ip classless
ip route 0.0.0.0 0.0.0.0 172.16.0.1
no ip http server
!
access-list 101 deny    udp any eq rip any
access-list 101 deny    udp any any eq rip
access-list 101 permit ip 10.6.6.0 0.0.0.255 10.6.6.0 0.0.0.255
!
line con 0
  exec-timeout 0 0
  transport input none
line aux 0
line vty 0 4
  login
!
!
end
```

Installing Voice Cards

This section describes how to install the voice cards. See the [“IGX Configuration Summary” section on page 3-59](#) for a summary of the commands that apply to circuit lines and voice connections. The two voice card sets are the channelized voice module (CVM) and the universal voice module (UVM). These cards can also carry channelized data. The serial data card sets are the high-speed data module (HDM) and the low-speed data module (LDM). This section also describes the considerations for using the Time-Division Multiplexing (TDM) Transport feature on the CVM.

Connecting a CVM to a T1 or J1 Line

Voice or data connections on a T1 line use the CVM front card and the BC-T1 back card. Japanese J1 connections use the CVM front card and the BC-J1 back card. The procedure for making J1 connections is the same as for T1 connections. Make the T1 connections as follows:

-
- Step 1** Bring each cable through the opening at the bottom of the cabinet (if applicable) and up the back of the unit.
 - Step 2** Use the cable management feature to help route the cables.
 - Step 3** Connect the trunks to the connectors on the BC-T1s that mate with the CVM (not NTM). The T1 lines are attached to DB-15, subminiature, 15-pin connectors on the BC-T1 cards.

The back slot line numbers correspond to the back slot number in which the BC-T1 card resides. Record the back slot number of each line. These numbers are necessary for configuring the system after you complete hardware installation.



Note If the number of lines is odd, connect as many as possible in pairs, and connect the remaining lines in ascending order.

Connecting a CVM to an E1 Line or a Subrate Trunk

Channelized voice or data connections on an E1 line use the CVM front card and the BC-E1 back card. Subrate E1 connections use the CVM front card and the BC-SR back card. The E1 trunk interface card BC-E1 contains the E1 connector (G.703 Input/Output) that resides at the top of the back card. The BC-E1 faceplate has four, 75-ohm BNCs.



Note The BC-E1 faceplate provides two connector arrangements for attaching E1 lines. Use either the two BNC (RX and TX) connectors or the 15-pin DB connector.

Make the E1 connections as follows:

-
- Step 1** Bring each E1 BNC patch cable (or 15-pin cable) through the opening at the bottom of the cabinet (if applicable) and up the back of the unit.



Note Some versions of the BC-E1 use a metal BNC connector instead of a plastic BNC. For terminating 75- or 120-ohm balanced E1 lines to the metal BNC connectors on these back cards, remove and discard the BNC mounting nuts. With the mounting nuts removed, the ground that normally appears on one side of the connector shell is also removed. This step is not required for DB-15 connectors or for back cards that use the plastic BNC connectors.

- Step 2** Attach the cabling to connectors on the BC-E1s that mate with the CVM (not an NTM).
- Step 3** Use the cable management feature to help route the cables.

The back slot line numbers correspond to the back slot number in which the BC-E1 card resides. Record the back slot number of each line. These number are necessary for configuring the system after installation is complete.

The next section describes a specialized version of data transmission service called TDM Transport. It applies to older WANs not manufactured by Cisco.

TDM Transport on the CVM

This section describes how to plan for use of the Time-Division Multiplexing Transport (TDM Transport) feature. Note that TDM Transport requires Model C firmware on all connected CVMs or CDPs that use this feature. Refer to the *Cisco WAN Switching Command Reference* for a description of the command parameters in related commands.

Before adding a bundled connection under TDM Transport, consider the following:

- If a connection uses a T1 trunk, use the **cnftrk command** to configure the line coding for B8ZS instead of ZCS.
- Add the least number of bundled connections to create the data channels.
- The longest delay for a connection determines the end-to-end delay for the entire transparent circuit through the network.
- The maximum network delay is the sum of maximum queuing delays for the trunk cards over which an individual connection is routed. The maximum network delay for a high-speed data connection is 45 ms. Specify this limit using the **cnfsysparm** command.
- The total delay for a connection is defined as the sum of the propagation and trunk queuing delays. The total delay for a connection cannot be more than 25 ms different from the total delay for any other connection on the same card. The user is responsible for configuring the connections so that no difference between total delays exceeds 25 ms. If the 25 ms is exceeded, an error message is generated in the form *CC0700d6*, where *CC* is the slot number.
- In Switch Software Release 8.2, add the connection using the **addcon** command 7/8 coding, even though the system internally uses 8/8 coding. This causes the system to reserve the additional bandwidth required for the TDM Transport feature.

Connecting a UVM to T1 Lines

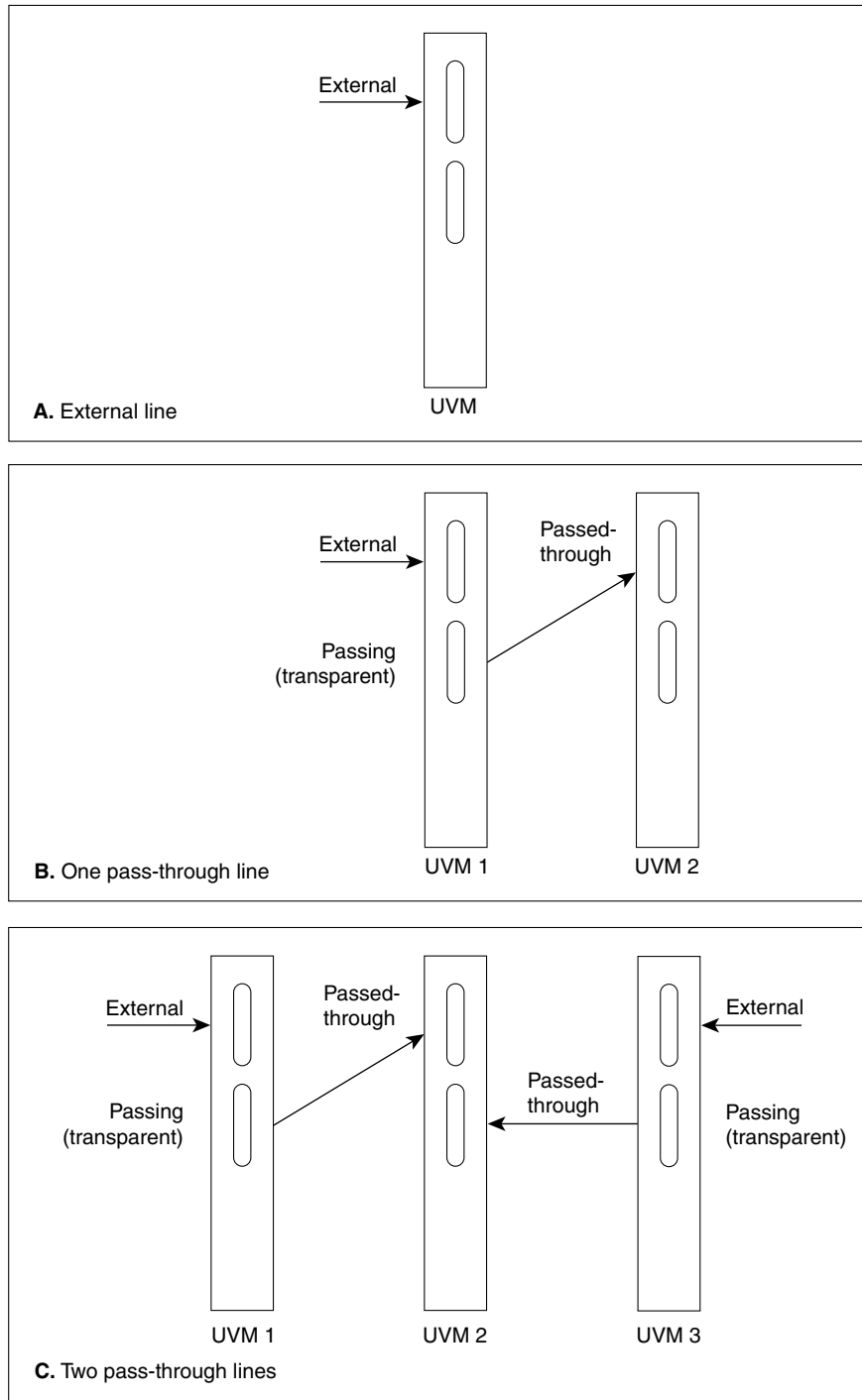
Voice or data connections on a T1 line use the UVM front card and the BC-UVI-2T1EC back card. The procedure for connecting the T1 lines is as follows:

-
- Step 1** Bring each cable through the opening at the bottom of the cabinet (if applicable) and up the back of the unit. Install optional Y-cables as needed. You can use the cable management feature to help route the cables.
- Step 2** If the intended compression for voice channels is LDCELP and the number of channels on a T1 line exceeds 16, install cabling for pass-through. Note that the UVM does not pass-through t-type or td-type connections. For the steps that follow, refer to [Figure 3-9](#) for an illustration of the possible UVM cabling arrangements. Note that, in Example B, the number of channels has not exceeded the UVM capacity, so pass-through is unnecessary.
- On port 1 of the primary UVM, connect the cable to the CPE.
 - On port 2 of the primary UVM, connect the cable to port 2.
 - Connect the cable from port 2 of the primary card to either port 1 or port 2 of the secondary UVM. Typically, if the secondary UVM is supporting the passed-through channels from only one primary UVM, you would connect the cable from port 2 of the primary card to port 1 of the secondary card. However, because the secondary UVM can receive 16 passed-through channels with LDCELP compression, you can pass 8 channels each from other UVMs.
 - If the secondary UVM is supporting an additional 8 channels with LDCELP, connect the cable between port 2 of the secondary UVM and the other primary UVM.

For a description of the pass-through feature, refer to the *Cisco IGX 8400 Series Provisioning Guide*.

Record the back slot number and port number of each line. These numbers are necessary for configuring the system after you complete hardware installation.

Figure 3-9 Pass-Through and Standard (External) UVM T1 Cabling



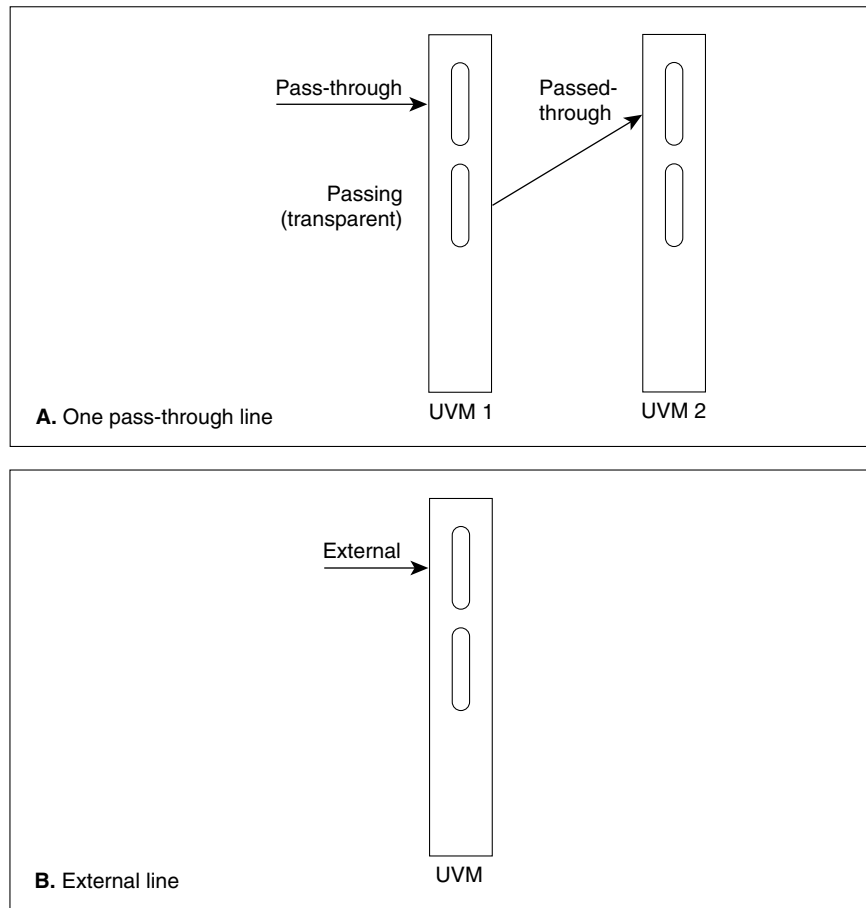
Connecting a UVM to E1 Lines

Voice or data connections on an E1 line use the UVM front card and the BC-UVI-2E1EC back card. The procedure for connecting the E1 lines is as follows:

-
- Step 1** Bring each cable through the opening at the bottom of the cabinet (if applicable) and up the back of the unit. You can use the cable management feature to help route the cables.
- Step 2** If you use the 120-ohm, DB-15 connectors, you must remove the nuts on the BNC connectors for the port, although the BNC has no attached cable.
- Step 3** If you use the 75-ohm BNC connectors in a balanced mode, you must remove the nuts from the BNC connector.
- Step 4** Install optional Y-cables as needed.
- Step 5** If the intended compression for voice channels is LDCELP and the number of channels on a E1 line exceeds 16, install cabling for pass-through. For the steps that follow, refer to [Figure 3-10](#) for an illustration of the possible UVM cabling arrangements. Note that, in Example B, the number of channels has not exceeded the UVM capacity, so pass-through is unnecessary.
- On port 1 of the primary UVM, connect the cable to the CPE.
 - On port 2 of the primary UVM, connect the cable to port 2.
 - Connect the cable from port 2 of the primary card to either port 1 or port 2 of the secondary UVM. Typically, if the secondary UVM is supporting the passed-through channels from only one primary UVM, you would connect the cable from port 2 of the primary card to port 1 of the secondary card. However, because the secondary UVM can receive 16 passed-through channels with LDCELP compression, you can pass 15 channels each from other UVMs.

For a description of the pass-through feature, refer to the *Cisco IGX 8400 Series Provisioning Guide*.

Figure 3-10 Pass-Through and Standard (External) UVM E1 Cabling



The back slot line numbers correspond to the slot number in which the BC-UVI-2E1EC card resides. Record the back slot number and port number of each line. These numbers are necessary for configuring the system after you complete hardware installation.

Connecting a UVM to J1 Lines

Voice or data connections on a J1 line use the UVM front card and the BC-UVI-2J1EC back card. The procedure for connecting the J1 lines is as follows:

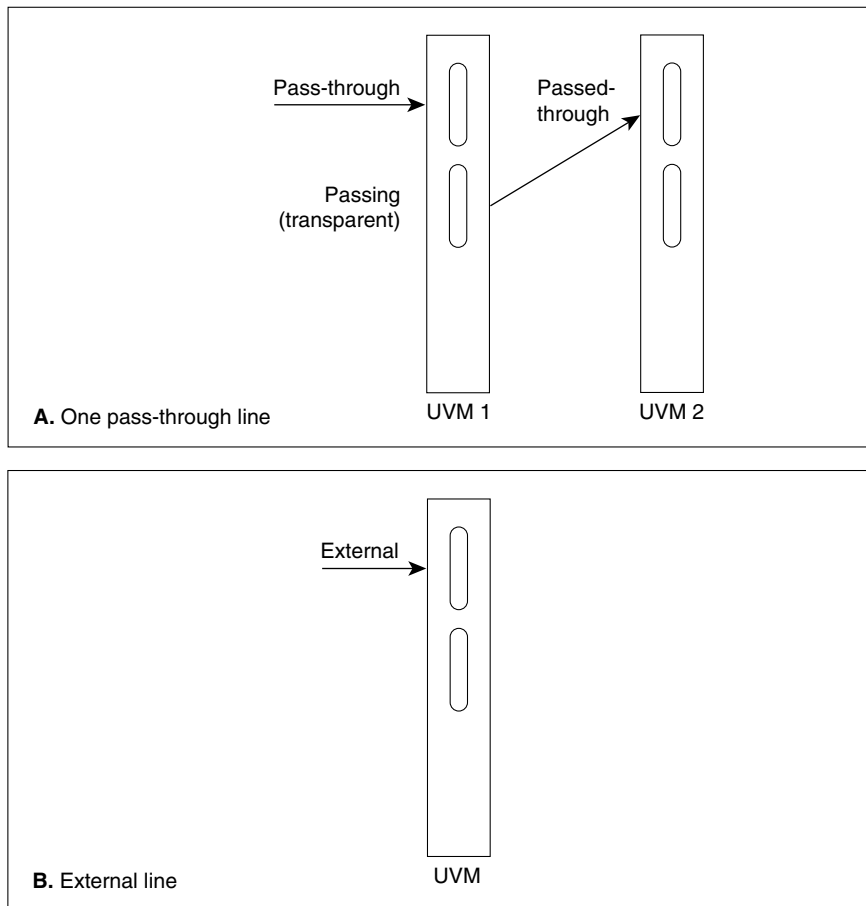
- Step 1** Bring each cable through the opening at the bottom or top of the cabinet (whichever is applicable) and along the back of the unit. You can use the cable management feature to help route the cables.
- Step 2** Attach each cable according to the cabling requirement (pass-through, external, and so on).

If the intended compression for voice channels is LDCELP and the number of channels on a J1 line exceeds 16, install cabling for pass-through. For the steps that follow, refer to [Figure 3-11](#) for an illustration of the possible UVM cabling arrangements. Note that, in Example B, the number of channels has not exceeded the UVM capacity, so pass-through is unnecessary.

- On port 1 of the primary UVM, connect the cable to the CPE.
- On port 2 of the primary UVM, connect the cable to port 2.
- Connect the cable from port 2 of the primary card to either port 1 or port 2 of the secondary UVM. Typically, if the secondary UVM is supporting the passed-through channels from only one primary UVM, you would connect the cable from port 2 of the primary card to port 1 of the secondary card. However, because the secondary UVM can receive 16 passed-through channels with LDCELP compression, you can pass 15 channels each from other UVMs.

For a description of the pass-through feature, refer to *the Cisco IGX 8400 Series Provisioning Guide*.

Figure 3-11 Pass-Through and Standard (External) UVM J1 Cabling



The back slot line numbers correspond to the slot number in which the BC-UVI-2J1EC card resides. Record the back slot number and port number of each line. These numbers are necessary for configuring the system after you complete hardware installation.

Making Serial Data Connections

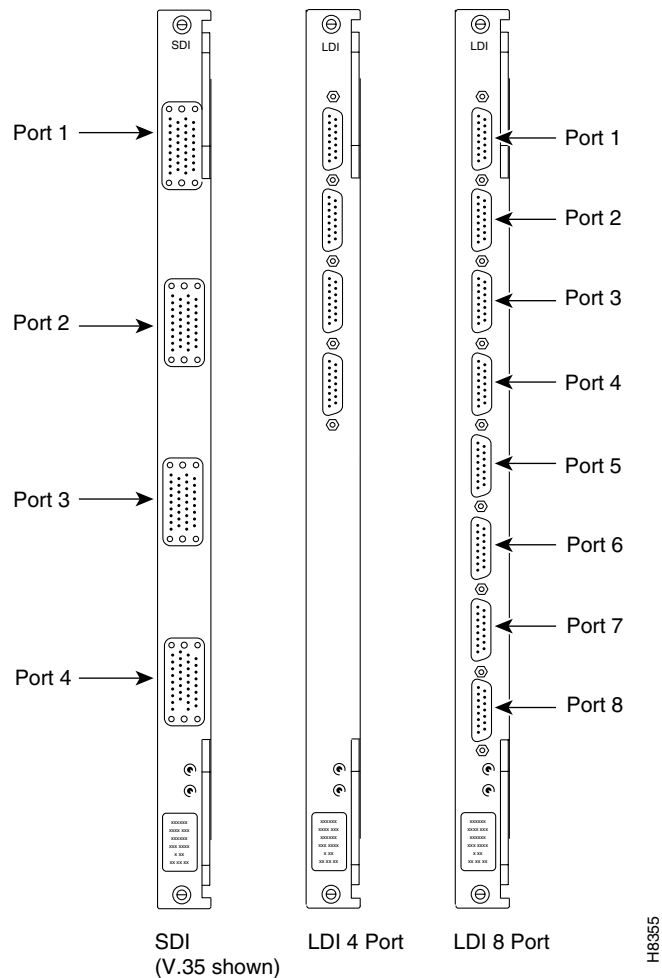
The low-speed data module (LDM) and high-speed data module (HDM) card sets provide serial data service. Each of these front cards uses a variety of back cards.

The LDM front card uses the 4- or 8-port version of the low-speed data interface (LDI) back card for EIA/TIA-232C/D (V.24) connections. The connection ports are labeled Port 1 through Port 4 or Port 1 through Port 8. See [Figure 3-12](#) for illustrations of these back cards. For instructions on configuring a port on the LDI back card for data terminal equipment (DTE) or data circuit-terminating equipment (DCE) mode, refer to the [“Configuring the Mode of an LDI Port”](#) section on page 3-35.

The HDM front card works with four types of serial data interface (SDI) back cards. Available SDIs are V.35, EIA/TIA-449/422, EIA/TIA-232D, and EIA/TIA-232C (V.24). (X.21 uses EIA/TIA-449 plus an adapter cable.) Each type of SDI has four connection ports, which are labeled Port 1 through Port 4. A sample SDI card appears in [Figure 3-12](#).

When you connect an HDM or LDM port, use the shortest reasonable cable length for each port.

Figure 3-12 SDI and LDI Faceplates



Configuring the Port Modes of the HDM Back Cards

Small jumper boards on the back card determine whether the mode of the port is DTE or DCE. The factory-set modes of the SDI ports alternate DCE with DTE. The steps that follow describe how to change the mode of the port. For the two modes, the rows on the back card jumper connector that are occupied by the jumper card are:

- DCE=1, 2, 4, and 5 (closest to the SDI faceplate)
- DTE=2, 3, 5, and 6 (1 row away from the SDI faceplate)

**Note**

A jumper board ships with an impedance of either 100 ohms or 200 ohms. For higher port speeds, the impedance is important if you have specified Y-cable redundancy. With Y-cable redundancy on a higher-speed connection, use the 200-ohm jumper board. With no Y-cable redundancy or when the port speed is relatively low, the 100-ohm jumper board is adequate.

To change the mode on a port to DTE, position the jumper board for that port as follows:

**Caution**

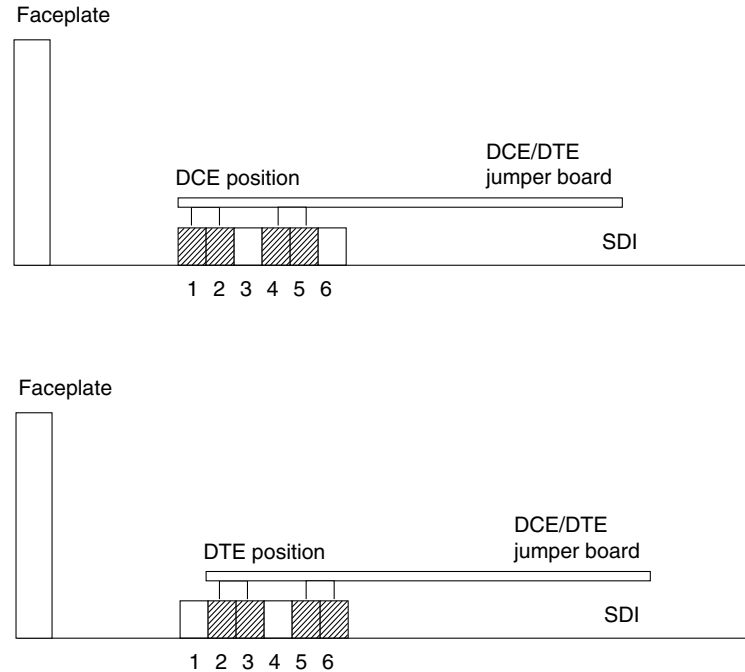
To prevent damage to the SDI cards, wear a wrist strap and clip the strap to the enclosure.

Step 1 At the back of the IGX node, remove the SDI card, as follows:

- Loosen the captive mounting screws on both ends of the faceplate.
- Operate the card extractors, then slide the card out.

Step 2 Move the jumper board one row of pins away from the SDI faceplate. (See [Figure 3-13](#).) For DTE mode, the jumper board should occupy rows 2, 3, 5, and 6.

If a port is in DTE mode and needs to be changed to DCE, plug the jumper board into the connector receptacle pin rows closest to the SDI faceplate. (See [Figure 3-13](#).) These rows are 1, 2, 4, and 5.

Figure 3-13 Changing the Mode on an SDI Card

H8370

HDM and LDM Redundancy

Optional redundancy for HDM and LDM cards can be provided with a second front and back card set and a Y-cable connection on each port to the customer data equipment.



Note

A jumper board ships with an impedance of either 100 ohms or 200 ohms. For higher port speeds, the impedance is important if you have specified Y-cable redundancy. With Y-cable redundancy on a higher-speed connection, use the 200-ohm jumper board. With no Y-cable redundancy or when the port speed is relatively low, the 100-ohm jumper board is adequate.

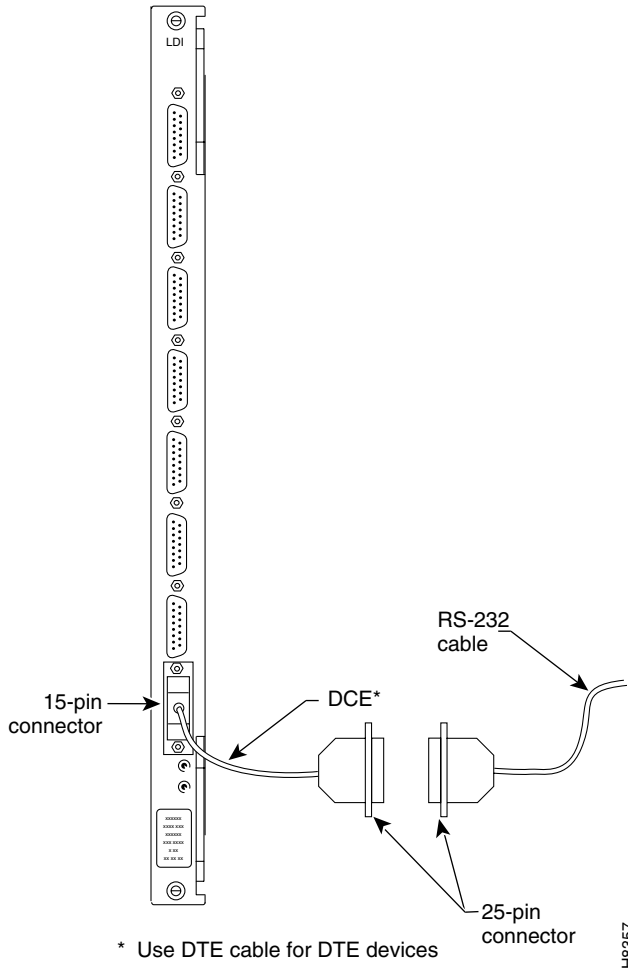
Configuring the Mode of an LDI Port

Each port on an LDI card uses an adapter cable. For a list of LDI adapter cables, refer to the [“Data Cabling”](#) section on page A-40. Each cable does the following:

- Determines whether the port operates in DCE mode or DTE mode
- Connects the port’s 15-pin connector to a 25-pin D connector
- Converts to either a male or female pinout

Figure 3-14 shows an example in which the adapter cable makes the port a DCE port. Circuits on the card test certain pins on the cable then configure the port as DTE or DCE.

Figure 3-14 Connecting a DTE or DCE Adapter Cable to an LDI



Making Frame Relay Connections

This section outlines how to establish Frame Relay service by setting up a universal frame module (UFM) or a Frame Relay module (FRM). The information includes details for T1, E1, HSSI, V.35, and X.25 interfaces. Detailed descriptions of the Frame Relay commands appear in the *Cisco WAN Switching Command Reference*. Specific cabling requirements for the UFI back cards on the UFM-U appear in the UFM-U description in the *Cisco IGX 8400 Series Provisioning Guide*.

Maximum Connections per Port with Signaling Protocols

For any Frame Relay card set that has a maximum frame length of 4510 bytes, the type of signaling protocol you can (optionally) specify with the **cnffrport** command results in a limit on the number of connections per physical or logical port. The maximum number of connections per port for each protocol is:

- For Annex A: 899
- For Annex D: 899
- For StrataLMI: 562

Neither the **addcon** nor the **cnffrport** command prevents you from adding more than the maximum number of connections on a port. (You might, for example, use the **cnffrport** command to specify an LMI when too many connections for that particular LMI already exist.) If the number of connections is exceeded for a particular LMI, the LMI does not work on the port, the full status messages that result are discarded, and LMI timeouts occur on the port. A port failure results and subsequently leads to a-bit failures in other segments of the connection path.

Setting Up Frame Relay on a UFM

Channelized and unchannelized versions of the UFM card sets exist. The channelized front cards, UFM-4C and UFM-8C, operate with T1 and E1 interfaces, and the unchannelized front card, UFM-U, operates with V.35, X.21, and HSSI interfaces.

The back cards have the following terminations:

- The UFI-8T1-DB-15 has 8, female, subminiature DB-15s.
- The UFI-8E1-DB-15 has 8, female, subminiature DB-15s.
- The UFI-8E1-BNC has 16 BNC connectors, 1 for each direction.
- The UFI-12V.35 has 6 low-force helix (LFH) connectors with 2 ports per connector.
- The UFI-12X.21 has 6 low-force helix (LFH) connectors with 2 ports per connector.
- The UFI-4HSSI has 4 connectors.

If the installation includes Y-cable redundancy, first read the [“Y-Cable Redundancy on the UFM’s” section on page 3-37](#).

Y-Cable Redundancy on the UFM’s

Redundancy for a Frame Relay port is possible with a second card set and the appropriate Y-cable. The card redundancy kit for UFM contains a second UFM/UFI card set and Y-cables to interconnect the ports on the two back cards. The [“Setting Up Frame Relay Ports and Connections \(UFM\)” section on page 3-39](#) includes the step for configuring Y-cable redundancy.

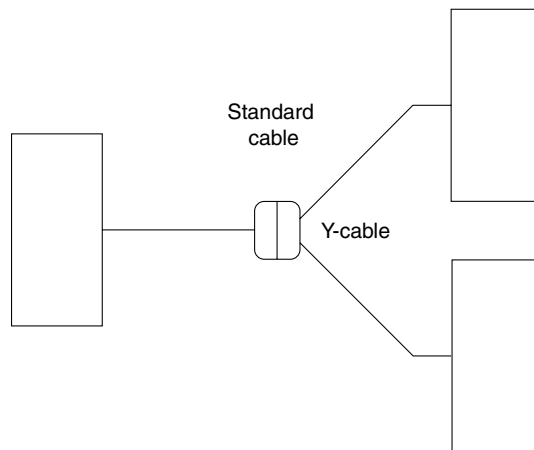
Refer to the cabling description in the UFM-U section of the *Cisco IGX 8400 Series Provisioning Guide* for descriptions and part numbers of all cables for unchannelized UFM’s.

[Figure 3-15](#) shows the Y-cable arrangement for standard cables that support one or two ports. The diagram for single-port cables applies to all back cards. The dual-port cables connect to only a V.35 or X.21 UFI. The Y-cable connects to the back card, and the standard cable runs between the access device or CPE and the base of the Y.

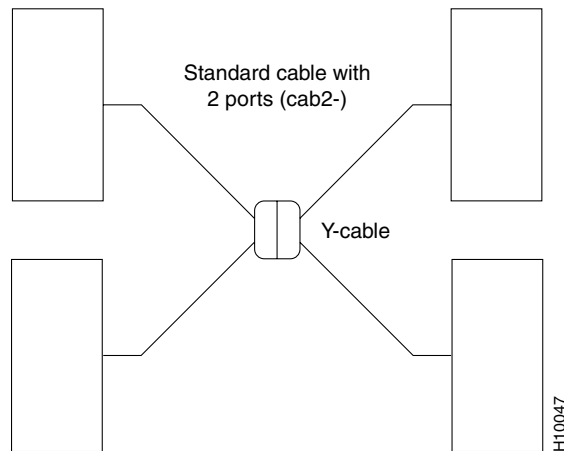
Y-cable redundancy is not allowed between different line types, such as a UFI-8T1-DB-15 and a UFI-8E1-DB-15. The **dspyred** command display shows any conflict in reverse video. (See the descriptions of the **upln** (or **upcln**) and **upfrport** commands in the *Cisco WAN Switching Command Reference*.)

The commands that relate to Y-cable redundancy are **addyred**, **delyred**, **dspyred**, and **ptyred**. After you have installed the cards in adjacent slots and connected the cables, use the **addyred** command to direct the node to recognize the card redundancy. See the *Cisco WAN Switching Command Reference* for descriptions of the commands.

Figure 3-15 Y-Cable Redundancy with Single- and Dual-Port Cabling



UFI-4HSSI, UFI-12V.35, or UFI-12X.21



UFI-12X.21 or UFI-12V.35

H10047

Connecting UFM Cabling

For important details on standard cables and Y-cables for the UFI back cards, refer to the cabling description in the UFM-U section of the *Cisco IGX 8400 Series Provisioning Guide*.

Take the following steps after you have inserted the cards according to the information on installing cards in the “[Preparing the Cards](#)” section on page 3-1. Connect the cables as follows:

-
- Step 1** For the UFM-U/UFI card sets, make sure that the cables are the correct DCE or DTE versions. For V.35 and X.21 connectors where both ports are to be used with two-port versions of the cable, the cable is either DCE or DTE. (You must specify both ports to be either DCE or DTE when you configure the port with the **cnffrport** command.)
 - Step 2** Bring each cable through the opening at the top or bottom of the cabinet (if applicable) and along the back of the unit. If necessary, use the cable manager to help route the cables.
 - Step 3** Add optional Y-cables as necessary.
 - Step 4** Secure the cables to the connectors on the back cards that mate with the correct front card. If the front card is a UFM-4C, use only the first four lines. If you install Y-cable redundancy on a UFI-4HSSI card, only Port 1 is configurable for redundancy.
 - Step 5** Record the slot number of each line for configuration purposes after you install the hardware.
-

Setting Up Frame Relay Ports and Connections (UFM)

This section outlines the steps for setting up and deleting Frame Relay ports, adding connections, and bundling connections. If a port has multiple permanent virtual circuits (PVCs), you can optionally bundle the connections. Bundling facilitates network meshing. You can specify connection bundling during parameter specification in the add connection (**addcon**) command: if you press **Return** without specifying a data-link connection identifier (DLCI) during port specification, the system prompts for bundling information. See the “Frame Relay Connections” chapter in the *Cisco WAN Switching Command Reference* for details.

Use either a Cisco WAN Manager workstation or an IGX control terminal to do the following tasks. For detailed command descriptions, see the *Cisco WAN Switching Command Reference*.

-
- Step 1** If necessary, use the **dspcds** command to verify the correct UFI back card and UFM front card. (Use the **vt** command to access other nodes.) The **dspcds** output shows any mismatch between firmware on the front card and firmware on the back card.
 - Step 2** If the card is a UFM-C, activate each line with the up line (**upln**) command. The range of lines for a UFM-4C is 1 to 4. The range of lines for a UFM-8C is 1 to 8.
A UFM-U does not require activation with the **upln** command.
 - Step 3** If the card is a UFM-C, assign logical Frame Relay ports to individual physical lines by using the **addrport** command. A UFM-U does not require the **addrport** command. Optionally, use the configure line command (**cnfln**) command for a UFM-C either before or after the **addrport** command. Note that if you use the **cnfln** command to assign a DS0 to carry signaling, you cannot subsequently assign that DS0 for user-data with the **addrport** command.
 - Step 4** If the card is a UFM-U, use the **cnfmode** command to configure the mode of the card if you do not use the default of mode 1. You must understand the ramifications of this step before you use **cnfmode**. If you do not understand the modes of the UFM-U, refer to the UFM-U description in the *Cisco IGX 8400 Series Provisioning Guide*.

- Step 5** For optional Y-cable redundancy, configure the two cards by using the **addyred** command. For Y-cable redundancy on a HSSI card, you must use port 1 of the cards for the primary and redundant ports. For important information about Y-cable redundancy on a UFM-U, see the description in the UFM-U portion of the *Cisco IGX 8400 Series Provisioning Guide*.
- Step 6** Activate the ports using the **upfrport** command.
- Step 7** Configure the port for DCE or DTE mode, speed, clocking, LMI type, and so on, by using the **cnffrport** command. Alternatively, you can keep the default parameters. If you plan to bundle connections, use the **cnffrport** command to set the Port ID to the DLCI planned for the near-end connections before you add the bundled connections. The PortID is optional for nonbundled connections. Note that the **cnfport** command functions the same for Frame Relay as the **cnffrport** command.
- Step 8** Add connections by using the **addcon** command. Adding connections requires the slot number, logical port number, and DLCI for each end of the connection. Frame Relay is a purchased option. If you attempt to add connections but the system display states that Frame Relay is not available, see the [“Obtaining Technical Assistance”](#) section on page xxiii.
- If you do not know the Frame Relay class intended for entry with the **addcon** command, determine which Frame Relay class number to use. Use the **dspfrccls** command to see the parameters that each class specifies. To modify parameters in a class, use the **cnffrccls** command.
- Step 9** Optionally—for an individual connection—you can configure bandwidth parameters or enable ForeSight (if purchased) by using the **cnffrcon** command.
- Optionally, you can set the channel priority by using the **cnfchpri** command. Normally, the system-default priority is adequate.
-

Commands for T1/E1 Frame Relay

To specify logical ports on a T1 or E1 interface, use the **addrport** command. The **addrport** command assigns a logical port number to a physical line and a range of 1 or more DS0s or time slots. Use the logical port number to activate a port (using the **upfrport** command), add connections (using the **addcon** command), or display statistics (using the **dspportstats** command). For example, after you add logical port 14.60 2.1-24 with the **addrport** command, you activate (up) this logical port by entering the **upfrport 14.60** command. The maximum number of logical port numbers on a UFM-C is 250. Use the **dspfrport** command to display logical ports.

Deleting a Frame Relay Port

Delete a logical port by executing the **delfrport** command. Executing the **delfrport** command dissolves any groups of DS0s or time slots and unassigns all DS0s or time slots on the logical port.



Note

Before you delete a Frame Relay port, you must delete any connections on the port using the **delcon** command.

After deleting a logical port with the **delfrport** command, you can deactivate the physical port with the **dnport** command.

Setting Up Frame Relay on an FRM

Four types of interfaces are available for the FRM. The back cards have the following terminations:

- The FRI-T1 has a female, subminiature DB-15.
- The FRI-E1 has a single 120-ohm, DB-15 connector for a balanced termination and two, 75-ohm BNC connectors for coaxial cables for an unbalanced termination. All connectors are female.
- FRI-V.35 has standard 34-pin female MRAC type connectors with a standard V.35 cable.
- FRI-X.21 has female DB-15 subminiature connectors.

Cabling requirements for the Frame Relay interfaces are in the [“FRI V.35 Port Pin Assignments” section on page A-39](#).

Take the following steps after you have inserted the cards according to the general information on installing cards in the [“Preparing the Cards” section on page 3-1](#). To connect a cable:

-
- Step 1** Bring each cable through the opening at the top or bottom of the cabinet (whichever applies) and along the back of the unit.
- Step 2** If needed, use the cable manager to help route the cables.
- Step 3** Secure the cables to the connectors on the cards that mate with the correct front card.
- Step 4** Record the slot number of each line. These numbers are necessary for configuring the system.
-

Port Mode Selection for V.35 and X.21

The position of a small jumper board at each port determines whether it is a DCE or a DTE.



Caution

To prevent damage to the FRI cards, ground yourself before handling IGX cards by clipping a grounding strap to your wrist, and clipping the wrist strap lead to the enclosure.

A small jumper card near each connector on the back card selects the port's mode. The factory-set modes alternate between DCE and DTE. The steps that follow describe how to change the mode of a port. The relation between back card row numbers and the port mode is as follows:

- DCE=1, 2, 4, and 5 (jumper card is closest to the FRI faceplate)
- DTE=2, 3, 5, and 6 (jumper card is one row away from the FRI faceplate)



Note

Jumper cards for selecting the mode of a V.35 or X.21 interface have an impedance of either 100 ohms or 200 ohms. At higher speeds on ports with Y-cable redundancy, the impedance is important. With Y-cable redundancy on a higher-speed connection, use the 200-ohm jumper card. Without Y-cable redundancy or when the port speed is low, the 100-ohm jumper card is adequate.



Note

Carefully choose the mode for each port. If you change a port mode after other ports on the card are carrying traffic, it disrupts service on the other ports.

To change the mode of an interface, reposition the jumper board for the port as follows:


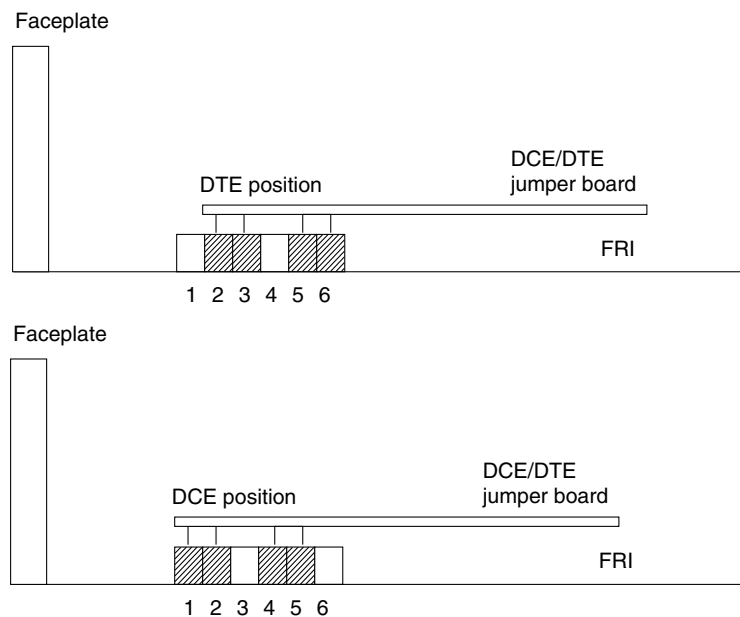
- Step 1** If the FRI is already in the node:
- Note its slot number.
 - Loosen the captive mounting screws on both ends of the faceplate.
 - Operate the card extractor levers and slide the card out.
- Step 2** To change to DTE, move the jumper board one row of pins away from the FRI faceplate. (See [Figure 3-16](#).) For DTE mode, the jumper board should occupy rows 2, 3, 5, and 6.
- To change to DCE, plug the jumper board into the connector receptacle pin rows closest to the FRI faceplate. (See [Figure 3-16](#).) The rows for DCE mode are 1, 2, 4, and 5.
- Step 3** Insert the FRI card and gently slide it in all the way to the rear of the slot.
-  **Note** The FRI card should slide in easily into the slot. Investigate any binding. Do not use force.
- Step 4** Insert and tighten the mounting screws.

Figure 3-16 Setting the Port Mode (DTE/DCE) on an FRI



H8372

Frame Relay Card Redundancy

Optional redundancy on a Frame Relay port is possible with a second FRM/FRI card set and a Y-cable connection on each applicable port. The [“Setting Up Frame Relay on an FRM”](#) section on page 3-41 includes the step for configuring Y-cable redundancy. The card redundancy kit contains a second FRM/FRI card set, Y-cables to interconnect the ports on the two back card, and four 200-ohm DCE or DTE jumper cards if the back cards are either FRI-V.35s or FRI-X.21s. (The DCE or DTE port applies

to only V.35 or X.21 interfaces.) Make sure that the firmware revision of the FRM in the kit matches the firmware in the installed FRM. Model D firmware supports V.35 and X.21 interfaces. Model E firmware supports T1 and E1 interfaces.

When you install a redundant card set with either a V.35 or X.21 interface, you must change the daughter cards on the existing FRI that specify DCE or DTE mode at each port. Install the higher impedance (200 ohms) version cards that are in the Y-cable kit.

Y-cable redundancy is not allowed between inconsistent back card types, such as an FRI T1 and an FRI V.35. The **dspyred** command display shows any conflict in reverse video. (Refer also to the descriptions of the **upcln** and **upfrport** commands in the *Cisco WAN Switching Command Reference*.)

After the hardware is installed, use the **addyred** command to reconfigure the node to recognize the card redundancy. Refer to the *Cisco WAN Switching Command Reference* for more information on the commands **addyred**, **delyred**, **dspyred**, and **ptyred**.

Setting Up Frame Relay Ports and Connections (FRM)

This section outlines the steps for setting up and deleting Frame Relay ports, adding and configuring connections, and bundling connections. As the steps show, some commands apply to channelized connections (T1, E1, or J1) but not to unchannelized connections (V.35 or X.21). Use either the IGX control terminal or a Cisco WAN Manager workstation to run the commands. For parameters and other details on the commands, refer to the *Cisco WAN Switching Command Reference*.

If a port has multiple PVCs, you can optionally *bundle* the connections. Bundling facilitates network meshing. You can specify connection bundling during parameter specification in the add connection (**addcon**) command: if you press **Return** without specifying a DLCI during port specification, the system prompts for bundling information.

-
- Step 1** If you have not already done so, activate the applicable lines with the **upln** command.
- Step 2** Use the **dspcds** command to verify that all nodes have the correct FRI back card and FRM front card. (Use the **vt** command to gain access to other nodes.) The **dspcds** output shows the slot number of each card and any mismatch between firmware on the front card and firmware on the back card. Note the slot number of each FRM or UFM for subsequent commands.
- Step 3** For V.35 and X.21 interfaces, check the mode (DCE or DTE) of each relevant port by using the **dspfrport** command. (For T1 and E1 lines, the mode is not applicable.) On an FRI-X.25 or FRI-V.35 back card, a jumper board near each connector determines the mode of the port. See the [“Port Mode Selection for V.35 and X.21”](#) section on page 3-41.



Note Jumper cards for selecting the mode of a V.35 or X.21 interface have an impedance of either 100 ohms or 200 ohms. At higher speeds on ports with Y-cable redundancy, the impedance is important. With Y-cable redundancy on a higher-speed connection, use the 200-ohm jumper card. Without Y-cable redundancy or when the port speed is low, the 100-ohm jumper card is adequate.

- Step 4** For optional Y-cable redundancy, configure the two slots for redundancy by using the **addyred** command.
- For V.35 and X.21 interfaces, skip the next three steps.
- Step 5** For T1, E1, and J1 interfaces, bring up the line using the **upln** command.
- Step 6** For T1, E1, and J1 interfaces, configure the line using the **cnfln** command.
- Step 7** For T1, E1, and J1 interfaces, add the *logical* Frame Relay port using the **addport** command.

- Step 8** For all interface types, activate the port using the **upport** command.
- Step 9** Configure the port for speed, clocking, LMI type, and so on, by using the **cnffrport** command. Alternatively, you can keep the default parameters.
- If you intend to bundle connections, use the **cnffrport** command to set the Port ID to the DLCI planned at the near-end connections. Setting the PortID is optional for nonbundled connections.
- Step 10** Determine which Frame Relay class number to use when you add connections to a port. To see the parameters that a class specifies, use the **dspfrccls** command. To modify parameters in a class, use the **cnffrccls** command.
- Step 11** Add connections to the port by using the **addcon** command. Enter the slot number and specify a DLCI for each end of the connection.
- Step 12** For an individual connection, you can configure bandwidth parameters or enable ForeSight (if purchased) by using the **cnffrcon** command.
- Step 13** Optionally, you can set the channel priority by using the configure channel priority **cnfchpri** command. Normally, the system-default priority is adequate.
-

Commands for T1/E1 Frame Relay

To specify logical ports on a T1 or E1 interface, use the **addfrport** command. The **addfrport** command assigns a logical port number to a group of one or more DS0s or time slots. The slot number and the lowest number in the user-specified DS0 or time slot group form the logical port number. Use the logical port number to activate a port (using the **upfrport** command), add connections (using the **addcon** command), or display statistics (using the **dspportstats** command). For example, after you add logical port 14.1-6 (6 DS0s or time slots) with the **addfrport** command, you activate (or up) this logical port by entering **upfrport 14.1**. Use the **dspfrport** command to display logical ports.

Deleting a Frame Relay Port

Running the **delfrport** command dissolves any groups of DS0s or time slots and unassigns all DS0s and time slots on the logical port. To delete a logical port:

-
- Step 1** Delete any connections on the port with the **delcon** command.
- Step 2** Delete the logical port with the **delfrport** command.
- Step 3** Deactivate the logical port with the **dnfrport** command.
- Step 4** Deactivate the physical line with the **dnln** command.
-

Making Alarm Relay Output Connections

To install an alarm relay module (ARM) card set:

-
- Step 1** At the back of the IGX node, identify the slot where the ARI card is to reside.
 - Step 2** Install the ARM in the front slot and use the card extractors to help secure card.
 - Step 3** Install the ARI in the corresponding back slot. Use the extractor handles to help secure the card, then tighten the captive screws by hand.
 - Step 4** Note that the FAIL LED on the ARM is not on. The ACTIVE LED also is not on.
 - Step 5** Attach a 22- or 24-gauge cable with the appropriate number of pairs to a male DB-37 connector at one end. Typically, a 12-pair cable is adequate. Connect this cable to the DB-37 connector on the ARI and tighten the captive screws.

See the [“Initial Startup of the IGX” section on page 3-56](#) when the system is ready for power.

Setting Up the ARM Card Set

The steps that follow show how to set up an ARM card set after the physical installation is complete. This is done from the IGX control terminal or the Cisco WAN Manager workstation. For details on each command used, refer to the *Cisco WAN Switching Command Reference*.

-
- Step 1** Verify that the node is equipped with the proper ARM front card and ARI back card by using the **dspecds** command. This shows in which slot the cards are located.
 - Step 2** From a control terminal or a Cisco WAN Manager NMS workstation, log in to the node and enter the **addalmslot** command followed by the slot number where the ARM is located. This activates the alarm reporting from the card.
 - Step 3** Observe that the ACTIVE LED on the ARM card is on.
 - Step 4** Testing the operation of the alarm outputs requires you to create an alarm and note the resulting alarm output. This test is easy on a node that is not connected to the network but is difficult on a node in a fully operational network. The best time to create a major alarm in an operational network is during a low traffic period. If you create an alarm, go to Step 5. Otherwise, end the procedure here.
 - Step 5** Create an alarm by disconnecting a trunk cable from the connector on a back card.
 - Step 6** Observe that a MAJOR LED comes on on the front of the ARM.
 - Step 7** Using a voltage/ohm meter (VOM), make sure continuity exists between pins 16 and 17 and between pins 35 and 36 at the DB-37 connector on the ARI card.
 - Step 8** Reconnect the cable that was disconnected in Step 5.
 - Step 9** With the VOM, check that the reading between pins 16 and 17 and pins 35 and 36 are open and the MAJOR LED is not on.

Alarm output connections are made at the DB37 connector on the ARI card. The connector pin assignments with the alarm signal names are listed in [Table 3-2](#). (See the [“External Alarm Cabling” section on page A-50](#).)

Table 3-2 ARM Card Connector Pin Assignments

Pin No.	Alarm Type	Alarm Name	Alarm Description
1	both	CHASSIS	Protective ground
3	Network	NWMAJA	Major—Normally open contact
22	Network		Major—Normally closed contact
4	Network	NWMAJC	Major—Common contact
10	Node	MNVISA	Minor Visual—Normally open contact
11	Node		Minor Visual—Normally closed contact
12	Node	MNVISC	Minor Visual—Common contact
16	Node	MJAUDC	Major Audible—Common contact
17	Node	MJAUDA	Major Audible—Normally open contact
23	Network	NWMINA	Minor—Normally open contact
24	Network		Minor—Normally closed contact
25	Network	NWMINC	Minor—Common contact
29	Node	NWAUDA	Minor Audible—Normally open contact
30	Node		Minor Audible—Normally closed contact
31	Node	NWAUDC	Minor Audible—Common contact
35	Node	MJVISC	Major Visual—Common contact
36	Node	MJVISA	Major Visual—Normally open contact

Table 3-3 shows the unassigned connector pins.

Table 3-3 Unassigned Connector Pins on the ARM Card

Pin No.	Alarm Type	Alarm Description
7	Relay 2	Common contact
8	Relay 2	Normally closed contact
9	Relay 2	Normally open contact
26	Relay 4	Common contact
27	Relay 4	Normally closed contact
28	Relay 4	Normally open contact

Making External Clock Connections

The DB-15 connector labeled Ext Clocks on the faceplate of the SCM connects two external sources for a high-stability clock (primary and redundant). One of the trunk or circuit line inputs can also serve as a source of timing for the node. If you do not select a clock source, the node uses the internal IGX clock as the clock source.

Two separate clock inputs exist, and can be used simultaneously on the IGX. They are labelled External-1 and External-2. Both clock inputs require an EIA/TIA 422 balanced square wave signal at either 1.544 or 2.048 MB per second.

**Note**

Standard DS1 or E1 BITS clock sources using AMI bipolar pulse stream signals are not compatible with IGX external clock inputs.

For a list of connector pin assignments, see the [“External Clock Input Cabling”](#) section on page A-49.

Attaching Peripherals

A network must have at least one control terminal (or a Cisco WAN Manager workstation if you want to collect statistics) attached, along with a network printer for printing out the status of the system. The SCM has three ports for attaching peripherals to an IGX node. These ports are Control Terminal, LAN AUI, and AUX port.

For the Cisco TAC to perform remote troubleshooting, a modem must connect to the network. This is a requirement for all Cisco service plans. The following sections provide procedures for attaching peripherals to the IGX node. Be sure to read the manufacturers' literature to ensure that the equipment is ready before attempting to connect it to the IGX node.

Connecting a Single Network Management Station

To use network management, at least one node in a Cisco WAN switching network running Release 7.2 or higher software must have a Cisco WAN Manager workstation connected. The workstation connects to the AUI Ethernet LAN port on the SCM.

The Cisco WAN Manager workstation can be used to configure and maintain all nodes in a network. For instructions on using the Cisco WAN Manager workstation, see the *Cisco StrataView Plus Operations Guide*.

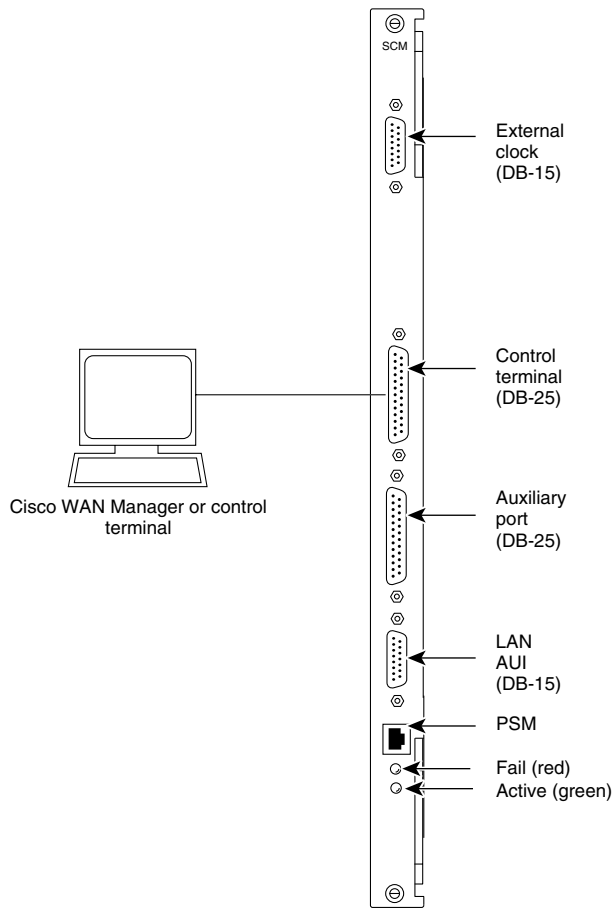
If only a single NMS station is connected and the network is relatively small, you can use a serial EIA/TIA232 port—the Control Terminal port.

The [“Network Management Terminal”](#) section on page A-21 lists the control terminals supported by the IGX 8410 node and the configuration settings. [Appendix A, “General IGX 8410 Switch Specifications,”](#) has the pin assignments for the IGX 8410 control terminal port.

Attach the control terminal to the SCM. (See [Figure 3-17](#).)

-
- Step 1** From the back of the cabinet, run the control terminal EIA/TIA-232/V.24 cable through the opening at the bottom and up to the SCM card in back slot 1.
- Step 2** Locate the control terminal connector on the SCM and attach the control terminal EIA/TIA-232/V.24 cable to it.

Figure 3-17 Connecting the Control Terminal



- Step 3** Tighten the EIA/TIA-232 connector screws to firmly attach the cable to the Control Terminal connector.
- Step 4** Plug the control terminal power cord into the appropriate wall receptacle.
- Step 5** Set the port function for VT100 (#5) using the **cnftermfunc** command.
- Step 6** Make sure that the Auxiliary port and the terminal are set to the same baud rate and check the other communication parameters using the **cnfterm** command.

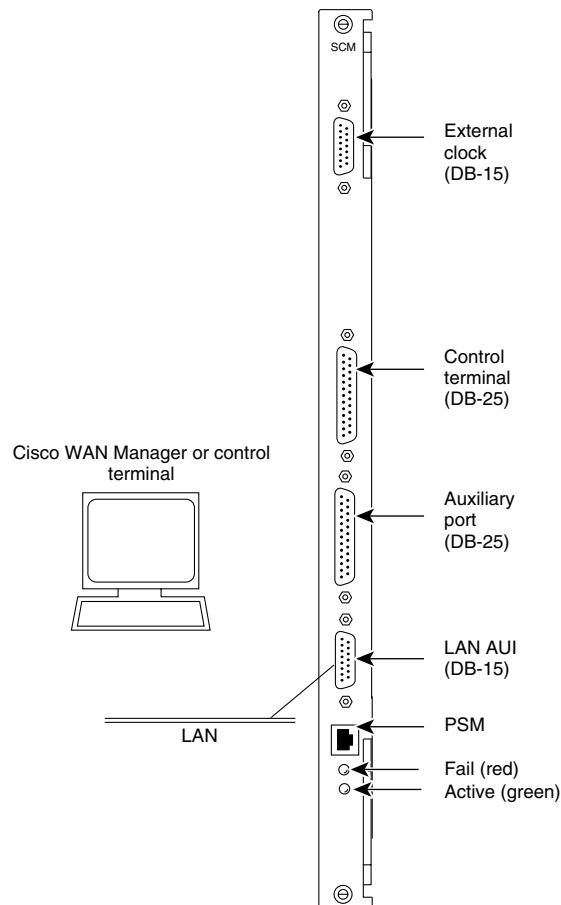


Note When you power up a node, it enters boot mode. Its control terminal communicates at a default rate of 9600 bps. If the rate for the node's control port previously was 19,200 bps, the first messages appears garbled because the control port (in boot mode) is temporarily running at 9,600 bps. When the transition to online occurs, the speeds match, so the display becomes readable.

LAN Connection for the Network Management Station

If the network is large or extensive network statistics are needed, an Ethernet port (LAN port) should be used. Larger networks produce a greater flow of statistics data between the node and the Cisco WAN Manager workstation, so a higher-speed Ethernet port is suitable. Figure 3-18 illustrates this connection. Accessing a node over an Internet connection requires the operator to use **the cnflan** command to enter the IP address, IP subnet mask, Transmission Control Protocol (TCP) service port, and gateway IP address.

Figure 3-18 LAN Connection to SCM



Configuring the LAN Port



Note Configure the LAN parameters before connecting the node to a LAN.



Note Refer to the *Cisco WAN Switching Command Reference* for additional information.

Step 1 Contact a system administrator to obtain IP addresses for the workstation and for the IGX node.

Step 2 Normally, the system administrator updates the network information server (NIS) database, as applicable (if a NIS is used), and adds the IP addresses for the workstation and node to the NIS database.

- The addresses shown are examples. Use the addresses obtained from the system administrator. (This example is for a workstation named “hedgehog” at address 192.187.207.200. It also assumes that the IGX node LAN port for node “sanfran” has been assigned an IP address of 192.187.210.30 and a hostname of “sanfran.”)

```
192.187.207.200 hedgehog
192.187.210.30 sanfran
```



Note If an NIS is in use (in a corporate network, for example), consult with the system administrator.



Note Enter 5120 for the LAN ports on all IGX ports.

Step 3 Configure the LAN port on the IGX node using a dumb terminal or an EIA/TIA-232 connection via the workstation (using the **vt** command, as applicable) to enter the appropriate **cnflan** parameters.

The **cnflan** command configures the node’s communication parameters so that the node can communicate with a Cisco WAN Manager terminal over an Ethernet LAN using the TCP/IP protocol. The parameters contain address information about the Ethernet TCP/IP network that is used to connect the Cisco WAN Manager workstation to an IGX node. The values used must conform to those of the network and should be supplied by the Ethernet network administrator.

The **cnflan** command has the following parameters:

- **IPAddr** is the Internet Protocol address of the node used in the TCP/IP protocol.
- **IPSubnetMask** is a 32-bit mask. The default for a Class C LAN network is 255.255.255.0.
- **TCPServicePort** is the IGX LAN port number entered in the **/etc/service** file on the workstation. It is 5120 for all IGX nodes.
- **GatewayIPAddr** is the Internet gateway address. This is the gateway that traffic is routed through if the IGX node and workstation are on different networks. If they are on the same network, the gateway is not used. The default “none” is displayed in this case. If a gateway IP is entered and later you want to remove it, enter **192.0.0.0** opposite the prompt and “none” will again be displayed.

A **cnflan** command screen looks like this:

```
D2.cb1          LAN    superuser IGX 8410    9.3 Feb. 27 2000 14:23 PST

Active IP Address:          192.187.207.21
IP Subnet Mask:            255.255.255.0
TCP Service Port:          5130
Default Gateway IP Address: 192.187.207.1

Maximum LAN Transmit Unit: 1500
Ethernet Address:          00.55.43.00.04.55

Control Socket - Ready
Base Socket Descriptor - 1

Socket Closed

Last Command: cnflan

Next Command:
```

The active IP address for the workstation has been entered as the IP address selected previously for the node, 192.187.207.21. The IP Subnet mask is entered as 255.255.255.0 for a Class C LAN network. The TCP service port is entered as 5120. Because the workstation and node are on different networks in this example, a gateway address of 192.187.207.1 has been entered. If the workstation and node are both on the same network, no gateway address is needed. The “Maximum LAN Transmit Unit” and “Ethernet Address” parameters are not configurable by the **cnflan** command. The Ethernet Address is a hardware address (burned into the NPM card) that is unique to each NPM card.

- Step 4** Connect the Cisco WAN Manager workstation and the IGX node to a LAN network. Examples are shown in [Figure 3-19](#) and [Figure 3-20](#). The LAN port on the IGX node provides a DB-15 connector that can be connected to a Y-cable, which in turn is connected to an AUI, as shown in [Figure 3-20](#).
- Step 5** To make sure that a LAN connection on the IGX LAN port is good, use a sample host name of “sanfran” entered in the config.sv file, and enter the following at the Cisco WAN Manager workstation:

```
ping sanfran
```

After the workstation and IGX node interface have been set up, Cisco WAN Manager can be started. After Cisco WAN Manager has started and the communication sockets are active, the **dsplan** command screen looks like this:

```
D2.cb1          LAN    cisco IGX 8410    9.3 Feb. 27 2000 14:27 PST

Active IP Address:          192.187.207.21
IP Subnet Mask:            255.255.255.0
TCP Service Port:          5130
Default Gateway IP Address: 192.187.207.1

Maximum LAN Transmit Unit: 1500
Ethernet Address:          00.55.43.00.04.55

Control Socket - Ready
Base Socket Descriptor - 1
```

Open Socket Descriptor - 2

Last Command: dsplan

Next Command:

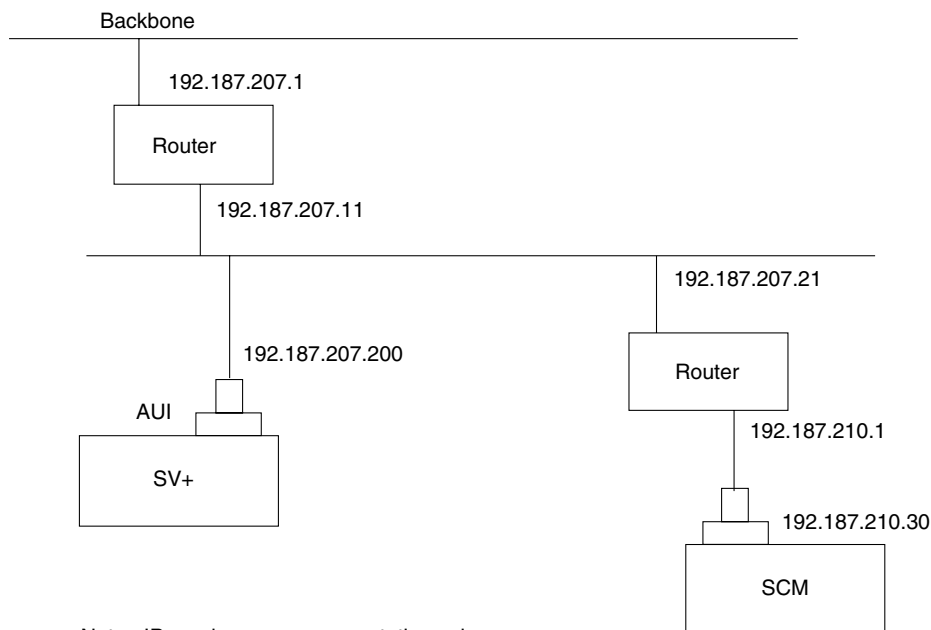


Note “Sockets” is the BSD UNIX name for connections between processes and typically applies to network communication.



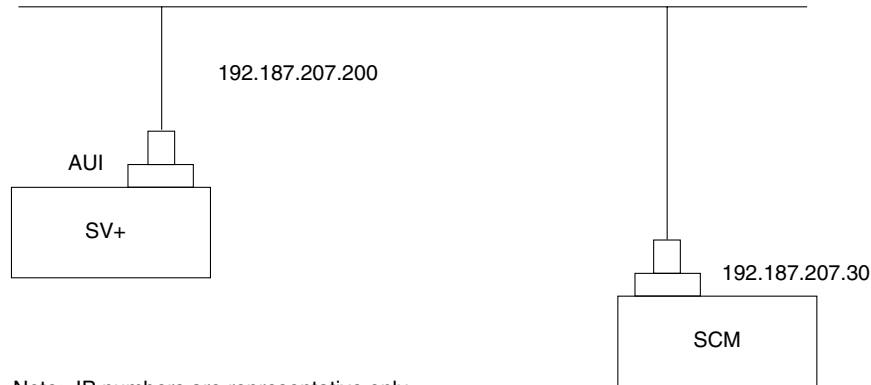
Note Before switching on the Cisco WAN Manager workstation, refer to *Cisco WAN Manager Operations*.

Figure 3-19 SV+ LAN Connection through Router to an IGX Node



Note: IP numbers are representative only.

H8374

Figure 3-20 SV+ LAN Connection to an IGX Node (No Gateway)

Note: IP numbers are representative only.

H6375

- Step 6** Switch on the control terminal (or Cisco WAN Manager workstation). Adjust the terminal's configuration, if necessary, to match the default settings of the control terminal port in the IGX node. See *Cisco WAN Manager Operations* for settings and operating instructions for the workstations.

Connecting a Network Management Station to Multiple Networks

When a network management station has more than one serial port, ports can connect to different networks. When the number of workstation serial ports is less than the number of networks to be managed, a terminal server is necessary to obtain a communications link to the separate networks. This subject is covered in the *Cisco WAN Manager Installation* publication.

Connecting the Printer

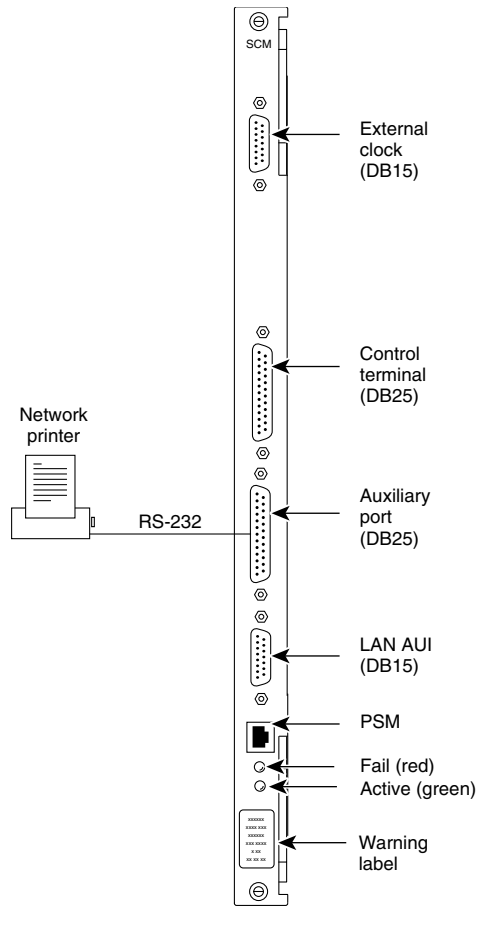
At least one node in the network should have a printer connected. The printer connects to the AUX port on the SCM.

The printer is used to print information about network operation. It can be configured to print maintenance information on a regular basis, and it can print specific diagnostic information when necessary. Instructions on using the printer for this purpose are in the *Cisco WAN Switching Command Reference*.

Attach the printer to the IGX node as follows:

- Step 1** Check the printer EIA/TIA-232/V.24 cabling pinout and, if required, adjust the DIP switches to the settings indicated for the type of printer to be connected to the IGX node. See Appendix A, “[System Specifications](#)” for EIA/TIA-232/V.24 cable pinout and DIP switch settings.
- Step 2** At the back of the cabinet, run the printer EIA/TIA-232/V.24 cable through the opening at the bottom and up to the SCM card in back slot 1.
- Step 3** Locate the AUX port connector on the SCM and attach the printer EIA/TIA-232/V.24 cable to it. See [Figure 3-21](#).

Figure 3-21 Connecting a Network Printer



- Step 4** Tighten the EIA/TIA-232/V.24 connector screws to firmly attach the cable connector to the AUX port connector.
- Step 5** Plug the printer power cord into the appropriate wall receptacle.

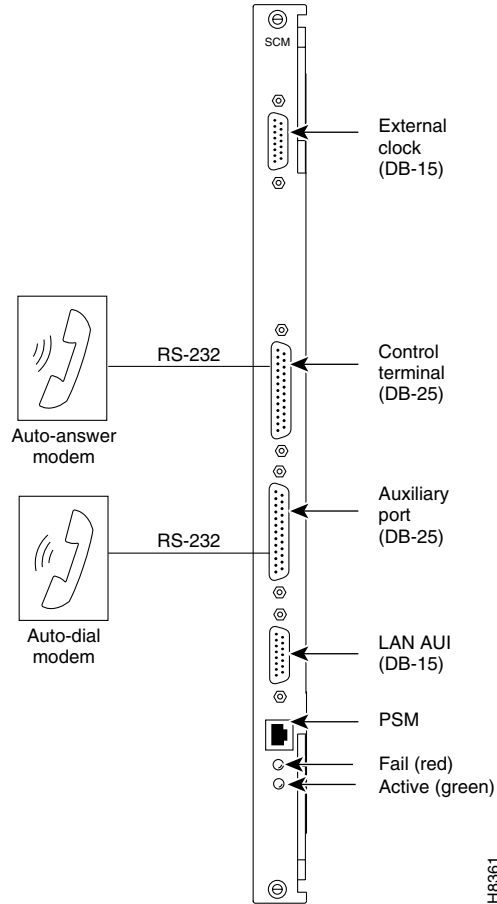
Connecting a Modem

Two modems can be connected to the IGX node to provide access for remote troubleshooting and for remote alarm logging. (See [Figure 3-22](#).) Each connection between the SCM and a modem requires a special cable and setup procedure.

The modem that provides access for remote troubleshooting from the Cisco TAC office (TAC-to-IGX modem) connects to the Control Terminal port on the SCM. Typically, the modem connects to the telephone wall jack with a direct-dial line. For information on contacting TAC, see the [“Obtaining Technical Assistance”](#) section on page xxiii.

The modem that is used to provide remote alarm logging (IGX-to-TAC modem) is connected to the AUX port on the SCM. This modem connects to a wall jack using a standard telephone line.

Figure 3-22 Connecting Modems to an IGX Node



Connecting the Power Supply Monitor

The power supply monitor (PSM) is a connector with outputs that signal an AC power supply alarm. Cisco provides no equipment that connects to the PSM connector, so user-supplied equipment is necessary. Refer to the *Cisco IGX 8400 Series Provisioning Guide* for a description of the PSM outputs.

Using the Power Supply Monitor Connector

The Power Supply Monitor (PSM) is an RJ-45 connector with the following pinout:

- Pin 1 = Digital Ground
- Pin 2 = AACFAIL*_OUT
- Pin 3 = BACFAIL*_OUT

Each AC power supply provides an open collector output that goes low if an AC power failure occurs. The inactive state of the status signals is high on the SCM. The signals go into an ALS244 driver, the outputs of which are connected directly to the RJ-45 connector as well as circuitry that communicates the status to the control card. To use the PSM connector, you need a device that responds with a fail condition when a “0” TTL logic level is present on pin 2 or pin 3.

Initial Startup of the IGX

This section describes checkout procedures to follow after the hardware is in place and ready to receive power. The [“IGX Configuration Summary” section on page 3-59](#) summarizes the steps and lists the commands for bringing up the system.

Before using the IGX node, be sure that the following procedures are complete:

-
- Step 1** If the IGX node uses AC, make sure that the node is connected to the correct AC receptacle. For a DC-powered unit, make sure that it connects to the correct, dedicated DC source.
 - Step 2** Check the record for the correct switch status for switch W6 on the SCM. See the recommendation in the [“Preparing the Cards” section on page 3-1](#). If the switch position was not previously verified, check it now. W6 sits above component U7P on the SCM. To indicate to the controller card that the system is an IGX 8430 node, remove the jumper. To indicate that the system is an IGX 8420 node, leave the jumper on the card. For an IGX 8410, Cisco personnel set the switch positions to indicate the node type.
 - Step 3** The full complement of cards for the node are mounted in the correct slots, correctly seated, and secured with screws.
 - Step 4** The T1 cables are attached to the correct BC-T1, BC-UVI-2T1EC, or UFI-8T1 card.
 - Step 5** The E1 cables are attached to the correct BC-E1, BC-UVI-2E1EC, or UFI-8E1 card.
 - Step 6** The Fractional E1 or T1 connections are attached to the BC-E1 or BC-T1 card connector if the IGX node is providing Fractional E1 or T1 service.
 - Step 7** The Subrate connections connect to the BC-SR card if the IGX node is providing Subrate E1 or T1 service.
 - Step 8** E3 cables connect to the correct BC-UAI-1E3 card.
 - Step 9** T3 cables connect to the correct BC-UAI-1T3 card.
 - Step 10** The data connections are attached to the appropriate SDI/LDI cards.
 - Step 11** A control terminal connects to the Control Terminal port on the SCM in back slot 1, or a Cisco WAN Manager workstation connects to the AUI port, and the power cord is plugged into the appropriate AC receptacle.



Caution

If the FAN 2 connector on the PE-BC is unused, be sure not to plug the control terminal cable into FAN2.

-
- Step 12** If specified, a printer connects to the AUX port on the SCM in back slot 1, and the power cord is plugged into the appropriate AC receptacle.
 - Step 13** If specified, one or more modems connect to the Control Terminal port or AUX port, as applicable, on the SCM in back slot 1, and any modem power cords plug into the appropriate AC receptacle.
 - Step 14** At the back of the unit, turn the circuit breakers to the ON position. In a system using a DC source, attach the cable guard (AC should already have the cable guard in place). After initial power up, DC systems can be switched off and on either at the PEM or at the building site’s resident circuit breaker. Use the building’s DC circuit breaker only if all cables are clearly marked, if the building’s dedicated circuit breaker has an actual switch and not just a fuse, and if controlling power at the building’s circuit breaker actually provides an advantage over removing the cable guard.

- Step 15** Observe that, after you turn on the IGX node, the cards run diagnostic self-test:
- The standby NPM red FAIL light flashes until self-testing and configuration updates are completed. The other NPM immediately becomes active but also performs self-testing and configuration updating. The process can take several minutes.
 - The remaining cards show “FAIL” for a few seconds then become active or standby.
 - The AC and DC Okay LEDs immediately come on.
 - Alarms might be indicated. Alarms might be present on trunks that have not been physically connected. The alarms disappears when those trunks are downed.
- Step 16** If an alarm exists for a T1 or an E1 line that is physically connected to the IGX node, try reconnecting the line to make sure that there is a good physical connection. If the alarm condition continues, a valid T1 or E1 problem might exist.
-

NPM Startup Diagnostic Test

The IGX software contains a group of diagnostic tests that run on the system’s hardware at powerup. The startup diagnostic either passes or fails the NPMs. The test result is displayed on the control terminal screen as pass or fail. The pass screen looks like this:

```
*****
Release 7 Boot power up diagnostics starting.

68000 Internal Registers test passed.
68000 clock test passed.
Static RAM test passed.
TDM memory test passed.
Fast RAM test passed.
BRAM test passed.
Dynamic RAM test from Hex Address 400000 to Hex Address 9FFFFFF

Release 7 Power up diagnostics complete.
*****
```

The fail screen looks like this:

```
*****
Release 7 Boot power up diagnostics starting.

68000 Internal Registers test passed.
68000 clock test passed.
Static RAM test passed.
TDM memory test passed.
Fast RAM test passed.
BRAM test failed.
Remove and reinsert this NPM to see if it fails again.
*****
```

If an NPM fails the power-up diagnostic, the boot process does not finish. If this failure occurs:

- Step 1** Remove the failed NPM from its slot.
- Step 2** Install the NPM in the same slot again.

- Step 3** Wait for the power-up diagnostic to run.
- Step 4** If the NPM fails the power-up diagnostics again, replace it with a known-good NPM. For card replacement procedures, refer to [Chapter 4, “Troubleshooting the IGX.”](#)

Card Self-Test

IGX software includes internal diagnostic routines that periodically test a card’s performance. The diagnostics automatically run in background and do not disrupt normal traffic. If a failure occurs during the test, the red FAIL LED comes on. You can also view status on a terminal with the **dspecd** command.

The report of a card failure remains until cleared. On the CLI, clear a card failure by using the **resetcd** command. Two types of resets exist. The reset-failure clears the event log of failures detected by the test. It does not disrupt operation. A reset-hardware resets the card’s firmware: it reboots the firmware (momentarily disabling the card) and, if a redundant card exists, switches over to the standby card.

Inspecting Status Lights

Check the status lights on the system unit cards. [Table 3-4](#) shows the lights for normal status where $n+1$ redundancy exists for NTM and CVM cards.

Table 3-4 System Unit Card Status Lights

Card	Active Status	Standby Status ¹	Alarms
NPM	1	1	–
CVM	–	–	–
UVM	-	-	-
NTM	–	all	–
BC-T1/E1	–	all	–
BC-SR (Subrate)	–	all	–
HDM/LDM	–	all	–
SDI/LDI	–	all	–
FRM	–	all	–
UFM	-	all	-
SCM	1	0	–
ARM	1	–	–
Power Supplies	All	–	–

1. Standby status is indicated by no lights on.

- If any card’s **FAIL** light is on steady, or if there is no **ACTIVE** card when there should be for that type, try removing and inserting the same card. Also, check the EEPROMs on the card to make sure that they are all seated properly (press down on the ICs to ensure proper seating).
- If a power supply AC okay LED or DC okay LED is off, try removing and inserting the power supply. If any LED remains off, see [Chapter 4, “Troubleshooting the IGX.”](#)

Checking the Power Supplies (AC Systems)

The means for verifying the correct power supply voltages are the DC Okay and AC Okay LEDs on each power supply. If either of these LEDs is off, a problem exists in relation to that supply. Power supplies are not field-adjustable. If a power supply voltage is out of tolerance, replace the supply with one known to be within tolerance.

**Note**

In an IGX node, no test points are available in either the AC power supplies or any circuit board for checking voltages.

IGX Configuration Summary

This section outlines the steps and names the commands for configuring a network. This section is not an exhaustive presentation. For detailed descriptions of the commands, refer to *Cisco WAN Switching Command Reference* or *Cisco WAN Switching SuperUser Command Reference*.

You can configure the IGX node through commands you enter at the control terminal or, if you have access, at a Cisco WAN Manager network management system (NMS). Note that certain features are paid options, which TAC personnel must enable before you add the corresponding connections. Examples of paid options are Frame Relay and ABR with ForeSight.

For IGX configuration, the control terminal has system access either through a local control port (over an EIA/TIA-232 or Ethernet TCP/IP link) or from a control terminal screen on a Cisco WAN Manager NMS. Remote control terminal access is possible using a virtual terminal (**vt**) command if the node has been configured with a name (**using the cnfname** command) and at least one trunk has been established to the network.

The basic tasks to configure an IGX node are as follows:

- For setting up the node:
 - Configure the node name (**using the cnfname** command).
 - Configure the time zone (**using the cnftmzn** command).
 - Configure the LAN interface (**using the cnflan** command).
 - Configure the auxiliary or terminal ports to support any necessary external devices such as a local printer, an autodial modem, or an external multiplexer attached to the unit (**using the cnfprf, cnfterm, and cnftermfunc** commands).
- For setting up the trunks:
 - Verify that the correct cards are in both the local and remote node (**using the dspcds** command).
 - Activate the trunk at each node (**using the uptrk** command).
 - Configure any parameters required for the trunk at each node (**using the cnftrk** command).
 - For a UXM-E, specify cellbus bandwidth as needed (using the **cnfbusbw** command).
 - Set up optional Y-cable redundancy if you require it (using the **addyred** command).
 - Set up optional trunk redundancy if you require it (using the **addtrkred** command).
 - Set up any substrate trunk interface control templates if desired (using the **cnftrkict** command).

- For setting up voice lines:
 - Activate the line (using the **upcln** or **upln** commands).
 - Configure the line (using the **cnfln** command).
 - Configure redundancy (using the **addyred** command).
- For setting up data lines and ports:
 - Activate the line (using the **upcln** command).
 - Configure the line (using the **cnfcln** command).
 - Configure redundancy (using the **addyred** command).
- For setting up Frame Relay lines and ports. (See the [“Setting Up Frame Relay Ports and Connections \(UFM\)” section on page 3-39](#) for a description.)
 - Activate each port (using the **upfrport** command).
 - Specify a mode for the card as needed if the card is a UFM-U (using the **cnfmode** command). To determine the current mode of a particular UFM-U, use the **dsptime** command.
- For setting up ATM lines and ports:
 - Activate the line (using the **upln** command).
 - Configure the line (using the **cnfln** command).
 - Activate the ports (using the **upport** command).
 - Configure the ports (using the **cnfport** command).
 - For a UXM-E, specify cellbus bandwidth as needed (using the **cnfbusbw** command).
- For setting up voice connections:
 - Add the connections (using the **addcon** command).
 - Configure connection parameters (using the **cnfvchadv**, **cnfchdl**, **cnfchec**, **cnfchgn**, **cnfcond**, **cnfcondsc**, **cnfrevsig**, **cnfsmtsig**, **cnfvchtp**, and **cnfchutl** commands).
 - For only the UVM, additional configuration commands include **cnfvumchparm**, **cnfchfax**, and **cnflnpass**. (Use the **dsplncnf** command to check whether the port is configured for External, Pass-through, Blocking, or Inserting.)
- For setting up data connections:
 - Add the connections (using the **addcon** command).
 - Configure connection parameters (using the **cnfdclk**, **cnfkdir**, and **cnfict** commands).
- For setting up Frame Relay connections:
 - Add the connections (using the **addcon** command).
 - Configure connection classes (using the **cnfcls** command).
 - Configure control templates, channel utilization, and channel priorities (using the **cnfict**, **cnfchutl**, and **cnfchpri** commands).
- For setting up ATM connections (see also the paragraph that follows this list for information on connections using ATM-to-Frame Relay interworking):
 - Add connections (using the **addcon** command).
 - Configure a connection type (using the **cnfcontyp** command).
- Optimize network routing and bandwidth (using the **cnfchutl**, **cnfpref**, **cnfcos** commands).

Interworking Connections in a Tiered Network

Two approaches are available for establishing a Frame Relay-to-ATM interworking connection in a tiered network. The simplest approach is to use the Connection Manager in Cisco WAN Manager. When you specify a connection to a Frame Relay service module (FRSM) on a Cisco MGX 8220 edge concentrator, Cisco WAN Manager directs the node to establish the correct end-to-end connection type. This connection type is either `atfr` (ATM-to-Frame Relay interworking) or `atfst` (ATM-to-Frame Relay interworking with ForeSight). The other approach is to use the command line interface on the IGX node or other routing node to run `addcon` and related commands (such as `cnfcon`) to establish the connection between routing nodes. A network interworking connection requires that you specify each individual segment of the connection. (Establishing the connection between the FRSM on the Cisco MGX 8220 and the BPX node requires you to run the `addchan` command on the Cisco MGX 8220.)

Configuring an IGX Switch to Be an Interface Shelf

An *interface shelf* is a nonrouting, concentrator shelf that communicates ATM cells to and from a BPX or IGX routing hub in a tiered network. (An interface shelf is also known as a *feeder shelf*.) An interface shelf is an IGX node configured to be an interface shelf. The MGX 8220 edge concentrator is also an interface shelf. IGX/AF is the designation of an IGX interface shelf.

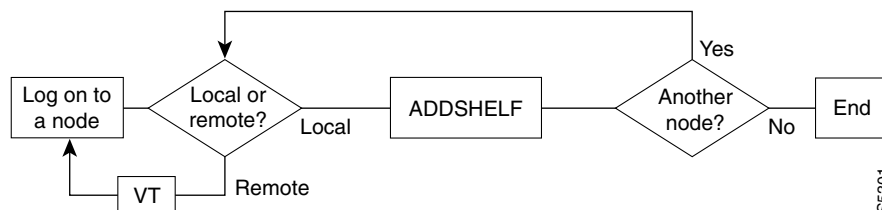
For an IGX node to serve as an interface shelf, personnel in the TAC must first configure the node for that purpose because tiered network capability is a purchased option.

You can add an interface shelf from Cisco WAN Manager or the command line interface (CLI). The steps for adding a new interface shelf to a network are:

-
- Step 1** Activate the trunk between the interface shelf and routing hub. On the CLI, use the `uptrk` command. (Note that you do not subsequently use the `addtrk` command for the interface shelf.)
 - Step 2** Configure the trunk for STI cell headers and BPX Addressing Mode (BAM).
 - Step 3** Add the IGX/AF to the hub (after the TAC has enabled this feature) by using the `addshelf` command. You add the shelf from the routing hub.

Figure 3-23 illustrates the sequence of using the `addshelf` command either locally or remotely to add one or more interface shelves. To delete an interface shelf, use the `delsshelf` command after you delete connections and the active interfaces. To view status of an interface shelf, run the `dspnode` command at the routing hub. (The `dspnw` command shows an alarm on a node but does not specify an interface shelf.)

Figure 3-23 Add an Interface Shelf from the Hub



Adding Connections in a Tiered Network Through the CLI

Adding a connection in a tiered network requires that you add local segments and a network segment. The following steps illustrate the setup for each segment for an interworking connection:

Step 1 For segment 1:

```
addcon slot.port.DLCI local_nodename slot.vpi1.vci1
```

where the first slot has a Frame Relay card, and the second slot has a BTM. (In an IGX interface shelf, the only card that supports the trunk to the hub is the BTM.)

Step 2 The network segment:

```
addcon slot.port.vpi1.vci1 remote_nodename slot.port.vpi2.vci2
```

where the card in *slot* is a BNI

Step 3 For segment 2:

```
addcon slot.vpi2.vci2 local_nodename slot.port.DLCI
```

where the second slot is a Frame Relay card.



Note The *vpi* and *vci* must match only at the segment on the local interface shelf. Apart from this requirement, the *vpi.vci* on segment 1 can also be the *same* as the *vci.vpi* on segment 2.

Converting a Routing Node to an Interface Shelf

To convert a routing node to an interface shelf, first remove the routing node from the network by deleting all connections then deleting and downing all lines and trunks. See information in the *WAN Switching System Overview*, or in the interface shelf section in the *Understanding and Enabling Software Functions on IGX 8400 Switches* tech note.

Where to Go Next

For information on troubleshooting the Cisco IGX 8400 series, see [Chapter 4, “Checking AC Power Supplies.”](#)

For software configuration and service provisioning information, see the *Cisco IGX 8400 Series Provisioning Guide*, Chapter 1, [“Introduction to the Cisco IGX 8400 Series.”](#)

For more information on switch software commands, refer to the *Cisco WAN Switching Command Reference*, Chapter 1, [“Command Line Fundamentals.”](#)



Troubleshooting the IGX

This chapter describes how to diagnose problems. When a troubleshooting table in this chapter recommends replacement, refer to the procedures in Chapter 5, “[Replacing Parts on the IGX.](#)”

The IGX operating system software does most of the IGX monitoring and maintenance. The only action that qualifies as preventive maintenance is checking the power supplies.

Checking AC Power Supplies

You cannot directly measure voltages on the AC power supplies in an IGX node. If a problem exists with one of the supplies, one or both the DC and AC LEDs goes off. Refer to [Chapter 5, “Replacing Parts on the IGX,”](#) for instructions on reseating or replacing an AC power supply.

After you install new or additional cards in the node, check the LEDs on the power supplies to make sure that the cards have not put an excessive load on the power supplies.

Troubleshooting an IGX Node

This section describes elementary troubleshooting procedures and briefly describes the commands used when troubleshooting an IGX node. (These commands are described in detail in the *Cisco WAN Switching Command Reference*.) This set of procedures is not exhaustive and does not take into account any of the diagnostic or network tools available to troubleshoot the IGX node.



Caution

Do not perform any disruptive tests or repairs to the IGX node without first calling the Technical Assistance Center (TAC). For further information, refer to the “[Obtaining Technical Assistance](#)” section on page xxiii.

This section contains the following topics:

- Troubleshooting tables for the IGX node
- System hardware status (configuring and displaying), including circuit cards, system buses, and power supplies.
- CGA relay and forced yellow signal group channel additions.

- Channel loopback and connection tests.
- Alarm thresholds for statistical line errors, and line error display reporting.
- External test equipment, such as a bit error rate tester (BERT).

General Troubleshooting Procedures

The IGX node regularly runs self-tests to ensure proper function. When the node finds an error condition that affects operation, it deactivates the affected card or line then selects a standby card or redundant line if one is available.



Caution

A FAIL LED that comes on on a card indicates that an error occurred. Try resetting the light with the **resetd f** command. If the FAIL LED comes on again, use the table below to find the cause or call the Cisco TAC to obtain information on isolating the problem and possibly replacing a component. For information on contacting the Cisco TAC, see the [“Obtaining Technical Assistance”](#) section on page xxiii.

Symptom	Probable Cause	Solution
No indicators on IGX boards on—console screen blank. LEDs on power supplies not on.	IGX circuit breakers off.	<ol style="list-style-type: none"> 1. Switch on power switch. 2. Switch off, then switch on the power switch to reset the breaker. Check to see if any overload condition exists (shorted connections, crow-barred power supplies).
	IGX power cord dislodged from plug.	Reconnect power cord to AC receptacle.
	Power supplies not functioning.	Replace power supplies.
Front card FAIL LED on.	Front card experienced an error: <ul style="list-style-type: none"> • NPM card • UXM-E card • NTM card • UFM card • FRM card • UVM card • CVM card • HDM card • LDM card • ARM card 	Indicates that an error occurred. First, reset the card with the resetd f command. If the LED comes on again, call the Cisco TAC. For more information, refer to the “Obtaining Technical Assistance” section on page xxiii. Note If an NPM fails in a nonredundant IGX system, reboot the system.
Front card indicator on—replacement card does not fix problem.	Defective backplane is possible.	If a new card does not fix the problem, the backplane might be suspect (very uncommon failure). Contact the Cisco TAC. For more information, refer to the “Obtaining Technical Assistance” section on page xxiii.

Symptom	Probable Cause	Solution
SDI card FAIL indicator on.	SDI card failed: <ul style="list-style-type: none"> SDI (EIA/TIA232) card SDI (EIA/TIA449) card SDI (V.35) card 	Indicates an error occurred. Check alarm status of card. First, reset the card with the resetcd f command. If the LED comes on again, reseal card. If the LED comes on again, call the Cisco TAC. For more information, refer to the “Obtaining Technical Assistance” section on page xxiii.
The FAIL indicator on any of the following card sets came on, but the replacement card does not fix the problem: UXM-E, UFM, ARM, CVM, LDM.	Defective backplane is possible (very uncommon). Note All cards connect to the backplane, and if the backplane is defective, it can cause a fault on any card.	If new card does not fix the problem, contact the Cisco TAC. For more information, refer to the “Obtaining Technical Assistance” section on page xxiii.
	Blown backplane fuse (very uncommon).	
Power Supply AC or DC Okay LED off.	Possible power supply defect.	Re-seat supply per instructions in Chapter 5, “Replacing Parts on the IGX.” Remove and replace power supply if defective.
	PE-BC wiring or card defective.	<ol style="list-style-type: none"> If power supplies output checks out, then PE-BC wiring connections or card is suspect. Make sure that the plug connection to the PE-BC card is secure; tighten if it is not. If the plug connection is secure and the Power Supply Monitor FAIL indicator is still on, then remove and replace the SCM card.
Command-line display incorrectly shows wrong IGX system type.	Jumper switch W6 in wrong position (see the “Making Frame Relay Connections” section on page 3-36).	To indicate an IGX 8420 node, the jumper must be in place. To indicate an IGX 8430 node, the jumper must be absent.
	SCM circuitry that reads W6 setting might be defective.	Verify SCM circuitry with a known good SCM.

Symptom	Probable Cause	Solution
Neither Okay LED on a power supply is on.	Defective fan or fans in cooling assembly is allowing the temperature in the enclosure to rise above 40° C.	Verify that fan tray fans are working. If not, replace tray according to instructions in Chapter 5, “ Replacing Parts on the IGX. ”
	Defective power supply fan in power supply allowing the power supply temperatures to rise above 40° C.	<ol style="list-style-type: none"> 1. If the system cooling fan assembly is functioning correctly, then a power supply fan is suspect. Remove cover over power supplies to determine if fan is rotating. Replacing a power supply fan is not a field repair. Replace the supply. 2. Issue a <code>dsppwr</code> command at the control terminal to check to see if the power supply fans are rotating, if not, remove and replace the power supply with the defective fan. 3. If power supply fans are functioning, then the power supply temperature sensor is defective. Remove and replace the temperature sensor
	Defective SCM card.	<ol style="list-style-type: none"> 1. If both the enclosure fan assembly and the power supply fans are working correctly, then the SCM card is suspect. 2. Remove and replace the SCM card.
Console screen blank, IGX indicator lights on.	Control terminal switched off.	Switch on the control terminal.
	Control terminal power cord disconnected.	Reconnect the control terminal power cord to 208/240 VAC power outlet.
	EIA/TIA-232 cable loose or disconnected from the control terminal port on the SCM, or from the control terminal.	Reconnect the EIA/TIA-232 cable to Control Terminal port on the SCM back card or to the control terminal itself.
	Control terminal malfunctioning.	Refer to the control terminal manufacturer's manual.
Printer not functioning.	Printer switched off.	Switch on the printer.
	Printer out of paper.	Renew the paper supply.
	Printer power cord disconnected.	Reconnect the printer cord to 208/240 VAC power outlet.
	EIA/TIA-232 cable loose or disconnected from the control terminal port on the SCM, or from the printer.	Reconnect EIA/TIA-232 cable to the Control Terminal port on the SCM back card or to the printer itself.
	Printer malfunctioning.	Refer to the printer manufacturer's manual.

Symptom	Probable Cause	Solution
Modem not functioning.	Modem switched off.	Switch on the modem.
	Modem power cord disconnected.	Reconnect modem power cord.
	EIA/TIA-232 cable loose or disconnected from the Control Terminal port on the SCM, or from the modem.	Reconnect the EIA/TIA-232 cable to the Control Terminal port on the SCM back card or the modem itself.
	Telephone hookup cable disconnected.	Reconnect the telephone hookup cable.
	Modem malfunctioning.	Refer to the modem manufacturer's manual.
	DIP switches not set correctly.	Refer to the modem manufacturer's manual.
Data Frame Multiplexing (DFM) is not functional.	DFM has been not been enabled by the Cisco TAC.	Contact the Cisco TAC. For more information, refer to the “Obtaining Technical Assistance” section on page xxiii .
DFM has been enabled but does not function.	DFM only runs on speeds up to 64 kbps.	Readjust the speed.
Background noise or music sounds choppy.	VAD problem—VDP needs sensitivity adjustment.	Contact the Cisco TAC. For more information, refer to the “Obtaining Technical Assistance” section on page xxiii .
High-speed modem drops to low speed.	ADPCM is taking over.	Contact the Cisco TAC. For more information, refer to the “Obtaining Technical Assistance” section on page xxiii .
Bundled (Frame Relay) connections have failed.	One or more bundled connections have failed.	Contact the Cisco TAC. For more information, refer to the “Obtaining Technical Assistance” section on page xxiii .

Troubleshooting the IGX Console Alarms

The initial mode of troubleshooting the IGX node uses the console alarms displayed on the console screen. This section provides you with a procedure for isolating the alarms and thereby isolating the fault. Any repair to the IGX node must be performed by personnel qualified by Cisco.

Isolating Alarm Faults



Caution

Contact the Cisco TAC before performing any disruptive testing or attempting to repair the IGX node, to ensure that you have isolated the correct problem area and to enable Cisco personnel to provide you with assistance in performing the necessary procedures. For more information, refer to the [“Obtaining Technical Assistance” section on page xxiii](#).

When a MAJOR/MINOR alarm flashes on the console screen, complete the following steps to determine the probable cause of the alarm:

-
- Step 1** Use **dspnw** command to identify the nodes.
- Step 2** Use **vt** command to place yourself at the affected node, and use the **dspalms** command to identify the alarm type.
- If the alarm display indicates a failed connection, go to the [“Troubleshooting Failed Connections” section on page 4-6](#).
 - If the alarm display indicates a failed circuit line, go to the [“Troubleshooting Failed Circuit Lines” section on page 4-6](#).
 - If the alarm display indicates a failed trunk, go to the [“Troubleshooting Failed Trunks” section on page 4-8](#).
 - If the alarm display indicates a failed card, go to the [“Troubleshooting Failed Cards” section on page 4-10](#).
 - If the alarm display indicates an unreachable node, go to the [“Troubleshooting Unreachable Nodes” section on page 4-10](#).
-

Troubleshooting Failed Connections

-
- Step 1** Use the **dspcons** command to identify which connections have failed and to determine the remote-end connection assignments.
- Step 2** Use the **dsplog** command to determine the cause of failure of the connections. These failures could consist of failed circuit lines, trunks cards, or clock overspeeds.
- If the connections have failed due to a circuit line failure, go to the [“Troubleshooting Failed Circuit Lines” section on page 4-6](#).
 - If the connections have failed due to a packet line failure, go to the [“Troubleshooting Failed Trunks” section on page 4-8](#).
 - If the connections have failed due to a card failure, go to the [“Troubleshooting Failed Cards” section on page 4-10](#).
 - If connections have failed due to a clock over speed condition, go to the [“Troubleshooting Clock Over Speed” section on page 4-10](#).
-

Troubleshooting Failed Circuit Lines

-
- Step 1** Use the **dspclns** command to identify the circuit line number and failure type.
- If the failure is a circuit line local CGA (no pulses received at the local end of circuit line) go to the [“Troubleshooting Circuit Line Local or Remote CGAs” section on page 4-7](#).
 - If the failure is a circuit line remote CGA (no pulses received at the remote end of circuit line), go to the [“Troubleshooting Circuit Line Local or Remote CGAs” section on page 4-7](#).

- c. If the failure is circuit line frame slips (indicating excessive frame slips on the T1 between the IGX node and the PBX), go to the [“Troubleshooting Circuit Line Frame Slips”](#) section on this page.
 - d. If the failure is circuit line bipolar errors (indicating excessive bipolar errors on this circuit line), go to the [“Troubleshooting Circuit Bipolar Errors”](#) section on this page.
-

Troubleshooting Circuit Line Local or Remote CGAs

- Step 1** Use the **dsplog** command to determine date, time of day, and the duration of the CGA alarm.
 - Step 2** Determine if the PBX T1 subrate or the PBX E1 interface went down at the time the CGA alarm was logged by the IGX node.
 - Step 3** Check cabling between IGX node and the PBX and make necessary repairs, if defective.
 - Step 4** Make a note of the steps taken and call the Cisco TAC (see the [“Obtaining Technical Assistance”](#) section on page xxiii).
-

Troubleshooting Circuit Line Frame Slips

- Step 1** Use the **dsplog** command to determine date, time of day, and duration of the frame slip alarm. Also determine if the clock source for this line has changed due to line failure in the network.
 - Step 2** Use the **dspcnerrs** command to quantify frame slips and rate information.
 - Step 3** Use the **dspcnhist** command to obtain historical information on frame slips.
 - Step 4** Use the **dspcurclk** command to identify the current clock source and path to the current clock source.
 - Step 5** Use the **clrclnalm** command to clear the circuit line alarms
 - Step 6** Make a note of the steps taken, and call the Cisco TAC (see the [“Obtaining Technical Assistance”](#) section on page xxiii).
-

Troubleshooting Circuit Bipolar Errors

- Step 1** Use the **dsplog** command to determine when the bipolar error threshold was exceeded, and the duration of the alarm.
 - Step 2** Use the **dspcnerrs** command to quantify the bipolar errors.
 - Step 3** Use the **dspcnhist** command to obtain historical information on bipolar errors.
 - Step 4** Check cabling between IGX node and the PBX for loose connections, and tighten it if it is loose.
 - Step 5** Use the **clrclnalm** command to clear line alarms.
 - Step 6** Make a note of the steps taken, and contact the Cisco TAC. For more information, refer to the [“Obtaining Technical Assistance”](#) section on page xxiii.
-

Troubleshooting Failed Trunks

-
- Step 1** Use the **dsptrks** command to identify the remote end node name, trunk numbers at each end, and the type of failure.
- If the display shows a communication failure, go to the [“Troubleshooting Communication Failure and CGAs”](#) section on page 4-8.
 - If the display shows a local CGA, go to the [“Troubleshooting Communication Failure and CGAs”](#) section on page 4-8.
 - If the display shows a remote CGA, go to the [“Troubleshooting Communication Failure and CGAs”](#) section on page 4-8.
 - If the display shows a bipolar error, go to the [“Troubleshooting Bipolar Errors, Frame Slip Errors, and Out-of-Frame Errors”](#) section on page 4-9.
 - If the display shows a frame slip error, go to the [“Troubleshooting Bipolar Errors, Frame Slip Errors, and Out-of-Frame Errors”](#) section on page 4-9.
 - If the display shows an out-of-frame error, go to the [“Troubleshooting Bipolar Errors, Frame Slip Errors, and Out-of-Frame Errors”](#) section on page 4-9.
 - If the display shows a time-stamped packet drop error, go to the [“Troubleshooting Packet Drops”](#) section on page 4-9.
 - If the display shows a non-time-stamped packet drop error, go to the [“Troubleshooting Packet Drops”](#) section on page 4-9.
 - If the display shows a loopback, go to the [“Troubleshooting a Loopback”](#) section on page 4-9.
-

Troubleshooting Communication Failure and CGAs

A Local CGA indicates no pulses at the local end of the trunk; a remote CGA indicates no pulses at the remote end of the trunk.

-
- Step 1** Use the **dsplug** command to determine when the communication failure or CGA occurred, and identify connections that might have failed because of lack of bandwidth on an alternate route.
- Step 2** Use the **dsprkerrs** command at each end of the packet line to quantify errors, and determine if they are unidirectional or bidirectional.
- Step 3** Call telephone carrier and request span testing. Ask the carrier to perform BER tests using multiple test patterns, including standard quasi, all 1, and 3 and 24 patterns.
- Step 4** Make a note of the steps taken, and contact the Cisco TAC. For more information, refer to the [“Obtaining Technical Assistance”](#) section on page xxiii.
-

Troubleshooting Bipolar Errors, Frame Slip Errors, and Out-of-Frame Errors

A bipolar error indicates excessive bipolar errors on the trunk. A frame slip error indicates excessive frame slips on the trunk. An out-of-frame error indicates excessive out-of-frame errors on the trunk.

-
- Step 1** Use the **dsplog** command to determine the date, time of day, and duration of the alarm.
 - Step 2** Use the **dsprkerrs** command at each end of the trunk to quantify errors, and determine whether they are unidirectional or bidirectional.
 - Step 3** Use the **dsprkhist** command at each end of the trunk to collect historical information on line errors.
 - Step 4** Use the **clrtrkalm** command to clear trunk alarms.
 - Step 5** Contact the Cisco TAC for assistance. Cisco personnel can monitor line errors and might advise disruptive testing to be scheduled with the telephone carrier. For more information, refer to the [“Obtaining Technical Assistance” section on page xxiii](#).
 - Step 6** Call the telephone carrier and request span testing. Ask the carrier to perform bit error rate (BER) tests using multiple test patterns, including standard quasi, all 1, and 3 and 24 patterns.
 - Step 7** If the telephone carrier is unable to isolate the problem on the span, contact Cisco TAC for assistance. For more information, refer to the [“Obtaining Technical Assistance” section on page xxiii](#).
-

Troubleshooting Packet Drops

Time-stamped and non-time-stamped packet drop errors indicate that packet drops have exceeded the threshold for generating an alarm.

-
- Step 1** Use the **dsplog** command to determine when the dropped packet alarm threshold was exceeded, and to determine the duration of the alarm.
 - Step 2** Use the **dspload** command alarm to determine the current loading of this trunk.
 - Step 3** Make a note of steps taken and call Cisco TAC. For more information, refer to the [“Obtaining Technical Assistance” section on page xxiii](#).
-

Troubleshooting a Loopback

-
- Step 1** Determine if company personnel are performing span tests with CSU loopbacks, demarcation, or DSX panel.
 - Step 2** If company personnel are performing loopback tests, ask them to indicate when they have completed testing, and monitor the system to ensure that the loopback indication disappears when testing is complete.
 - Step 3** If company personnel are not performing loopback tests, the telephone carrier most likely has the E1 span in loopback mode.

- Step 4** Call the telephone carrier to verify that they are testing the E1 span, and ask them to indicate when they have completed their tests. Monitor the system to ensure that the loopback indication disappears when testing is completed.
 - Step 5** Make a note of the alarm steps taken, and call Cisco TAC. For more information, refer to the [“Obtaining Technical Assistance”](#) section on page xxiii.
-

Troubleshooting Failed Cards

- Step 1** Use the **dspecds** command to determine which card has failed, along with its status (active or standby).
 - Step 2** Use the **dspllog** command to determine the time of day the card failed and whether or not any connections using this card are also in a failed condition.
 - Step 3** If the failed card is an HDM or LDM card, use the **dspbob** command at each end of the connection, using this card to verify that data is passing. For a CDP, CVM, or UVM, use the **dspchstats** command.
 - Step 4** If a card has failed, make a note of the steps taken, and call Cisco TAC (see the [“Obtaining Technical Assistance”](#) section on page xxiii).
-

Troubleshooting Unreachable Nodes

- Step 1** At any node, use the **dspllog** command to determine the date and time of day that the node became unreachable. A node is usually unreachable because of a trunk failure or a power outage.
 - Step 2** Contact personnel at that node to determine if there was a power failure at the time logged by the IGX node.
 - Step 3** If there was a power failure, check that NPM comes up, and run diagnostics.
 - Step 4** If there was not a power failure, call Cisco TAC. For more information, refer to the [“Obtaining Technical Assistance”](#) section on page xxiii.
-

Troubleshooting Clock Over Speed

- Step 1** Use the **dspbob** command to determine the incoming baud rate for this connection.
 - Step 2** Use the **dspcon** command to verify that the console incoming baud rate is the same as the configured baud rate.
 - Step 3** Reconfigure the incoming baud rate to match the configured baud rate.
 - Step 4** Make a note of the steps taken, and call Cisco TAC. For more information, refer to the [“Obtaining Technical Assistance”](#) section on page xxiii.
-

Displaying a Summary of Alarms

The first step in troubleshooting an IGX node is to check the condition of the system by displaying alarm conditions throughout the system. To see a summary of all the alarms on an IGX node, use the **dspalms** (display current node alarms) command. The alarms summary includes the following:

- Number of failed connections
- Number of major and minor alarms
- Number of failed cards
- Power monitor failures
- Bus failures (either failed or needing diagnostics)
- Number of alarms on other nodes in the network
- Number of unreachable nodes in the network



Note

You cannot include the **dspalms** command in a job.

To display alarms, enter the **dspalms** command.

If the screen indicates a failure, refer to the commands in [Table 4-1](#) to further isolate the fault.

Table 4-1 *Fault Isolation and Diagnostic Commands*

Failure	Diagnostic Commands
Connection	dspcons (display connections)
Line alarm	dspclns (display circuit lines)
Trunk	dsptrks (display trunks)
Cards	dspcds (display cards)
Power monitor and fans	dspppwr (display power supply status)
Remote node	dspnw (display network)
Unreachable nodes	dspnw (display network)
Remote node alarms	dspnw (display network)

Displaying the Status of Cards

When a card indicates a failed condition on the alarm summary screen, use the **dspcds** command to display the status of the cards on a node. The information displayed for each card type includes the slot number, software revision level, and card status. (Note that you cannot use **dspcds** in a job.)



Note

If the **dspcds** command or any other command incorrectly states the IGX model (for example, stating that an IGX 8420 node is an IGX 8430 node), check the jumper switch W6 on the SCM. A jumpered W6 indicates an IGX 8420 node. An open W6 indicates an IGX 8430 node. Chapter 4, “[Installing the IGX](#),” documents this aspect of the SCM.

[Table 4-2](#) lists all possible **dspcds** command status descriptions for all card types, including CVM.

Table 4-2 dspcds Command Status Descriptions

dspcds Command Status	Description
Active	Active card.
Active—F	Active card with nonterminal failure.
Standby	Standby card.
Standby—F	Standby card with nonterminal failure.
Standby—T	Standby card performing diagnostics.
Standby—F—T	Standby card with nonterminal failure performing diagnostics.
Failed	Card with terminal failure.
Unavailable	Card is present but can be in any of the following states: <ul style="list-style-type: none"> • The node does not recognize the card (might need to be reseated). • The card is running diagnostics.
Down	Downed card.
Empty	No card in that slot.
Active—T	Active card performing diagnostics.
Updating (NPM only)	Standby NPM downloading the network configuration from an active NPM. Note Red fail LED flashes during updating.
Cleared (NPM only)	NPM is preparing to become active.
Loading software (NPM only)	There are downloader commands that appear when the system is downloading software to the NPM.



Note

Cards with an “F” status (nonterminal failure) are activated only when necessary (for example, when there is no card of that type available). Cards with a failed status are never activated.

To display cards, issue the **dspcds** command. The **dspcds** command cannot be included in a job. Refer to the *Cisco WAN Switching Command Reference* for more information.

User-Initiated Tests

Several user commands help you test the node status. The CLI commands are:

- **tstcon**—For voice connections
- **tstcon**—For data connections
- **tstport**—For data and Frame Relay ports

For details on these commands, see the *Cisco WAN Switching Command Reference*.

Loopback Tests

Loopback tests are available to help diagnose the state of the IGX system. The CLI commands for activating these tests are:

- CVM/NTM for implicit internal loopback.
- Voice: **addloclp**, **addrmtlp**
- Data: **addloclp**, **addrmtlp**
- Frame relay: **addloclp**

For detailed information on these commands, see the *Cisco WAN Switching Command Reference*.

Card Testing with External Test Equipment

The HDM/SDI or LDM/LDI card set can be tested as a pair at the local node using external test equipment such as a bit error rate tester (BERT). This can be useful in isolating “dribbling” error rates to the cards, the Frame Relay data input, or the transmission facility. This test checks the data path from the electrical interface at the port through the card set to the cellbus in both directions of transmission.

**Note**

This is a disruptive test. Notify your network administrator before performing this test.

To perform this test, proceed as follows:

-
- Step 1** Disconnect the cable connection to the SDI or LDI, and connect the BERT in its place.
 - Step 2** Set up an internal loopback on the Frame Relay port to be tested, using the **addloclp** command.
 - Step 3** Turn on the BERT, make sure that it indicates circuit continuity, and observe the indicated error rate.
 - Step 4** If there are any errors indicated, first replace the back card and retest. If the errors remain, then replace the front card and retest.
 - Step 5** When the test is complete, disconnect the BERT and reconnect the data cable. Release the local loopback by using the **dellp** command.
 - Step 6** Repeat at the node at the other end of the connection, if necessary.
-

Where to Go Next

For information on part replacement in the Cisco IGX 8400 series, see [Chapter 5, “Moving a Node.”](#)

For software configuration and service provisioning information, see the *Cisco IGX 8400 Series Provisioning Guide*, [Chapter 1, “Introduction to the Cisco IGX 8400 Series.”](#)

For more information on switch software commands, refer to the *Cisco WAN Switching Command Reference*, Chapter 1, [“Command Line Fundamentals.”](#)



Replacing Parts on the IGX

This chapter covers replacing a single card, a power supply, or a complete node.



Warning

Ultimate disposal of this product should be handled according to all national laws and regulations. To see translations of this warning, refer to the Regulatory Compliance and Safety Information document that accompanied this product.



Warning

When installing or replacing the unit, the ground connection must always be made first and disconnected last. To see translations of this warning, refer to the Regulatory Compliance and Safety Information document that accompanied this product.

Moving a Node

The requirements for moving a node depend on the distance involved. In all cases however, the node must be disconnected from the network by:

- Removing connections (**delcon**).
- Downing trunk lines (**deltrk, dntrk**)
- Downing circuit lines (**delcln, dncln**).
- Removing all data cables.
- Turning off power. For DC-powered systems, do this at the building site's dedicated branch circuit breakers rather than at the PEM circuit breaker.
- Removing any bolts holding the cabinet to the floor or any other structure.

The remainder of the task is the physical move of the unit. Use the pallet and box that shipped with the original packing to move the node a long distance. For shorter moves of a standalone unit, screw the feet up into the unit to expose the wheels then roll the unit.



Caution

When moving a Cisco cabinet, do not push the cabinet at its sides. Instead, grip the cabinet at the front or back edges to maneuver it to the new location.

Replacing Front Cards

This section describes how to perform a hot replacement of a front card. Read the following list before proceeding with front card replacement:

- The FRM and NTM front cards come in either a one- or two-piece version. The versions are interchangeable; nevertheless, make sure that sufficient parts are available.
- Before you replace an NPM with an NPM B version, make sure that the system software supports the B version. Check the Release Note that comes with this manual to see the required version, or call the Cisco TAC through Customer Engineering. For more information, refer to the [“Obtaining Technical Assistance”](#) section on page xxiii.
- When a system has only one NPM and you need to remove it, you should first insert the new NPM and place it in standby so that, when you remove the old NPM, the standby NPM becomes active. In this way, connections remain intact.
- With one exception, any front card can be replaced without the requirement of first deleting logical connections. The exception is when the card type is changed (for example, when an HDM replaces an FRM). In this case, applicable ports are brought down and then deleted before connections are deleted with the **delcon** command).
- Use a 5/32-in. Allen wrench to open the front door. Also, front card faceplate screws require a No. 1 Phillips screwdriver or the Cisco combination tool (PN 218705).



Caution

Before you handle a card, attach an ESD-preventive wrist strap. The IGX 8410 node has an attached ESD-preventive wrist strap at both the front and back of the cabinet. For an IGX 8420 or IGX 8430 node, you must attach a wrist strap to the cabinet. Handling a card without an electrostatic preventive wrist strap might result in electrostatic damage to the card.

To replace a card with the power on:

- Step 1** If necessary, delete relevant connections with the **delcon** command.
- Step 2** Loosen the two Phillips captive screws in the faceplate.
- Step 3** Operate the extractor handles to disconnect the card from the backplane.
- Step 4** Pull the card out of the card cage.



Caution

Correct alignment between connector pins and receptacles is critical. Before inserting a card, make sure that all backplane pins are straight. Make sure that the connectors on the card and backplane are aligned. Insert the card gently.

- Step 5** Installing a front card requires that the card be inserted into the card track and pushed firmly, but gently, into the connector on the back card (or the backplane connector if the card is an NPM).
- Step 6** Hold the extractor handles in the open position until they contact the shelf supports, and then rotate them into the closed position.
- Step 7** Tighten the captive screws on the card's faceplate just enough to secure the card.



Note For an illustrated view of removing and inserting cards, see the [“Inserting the Cards” section on page 3-8](#).

Replacing Back Cards

This section describes how to remove and replace a back card such as the SCM.



Note Note that no connections are to be deleted prior to replacing an SCM.

Step 1 Visually inspect the replacement SCM to verify that it is in good working order.



Note If the replacement IGX SCM has any defects, contact the Cisco TAC and do not proceed with replacement. For more information, refer to the [“Obtaining Technical Assistance” section on page xxiii](#).

Step 2 Verify that the SCM jumpers W5 and W6 are configured correctly for your IGX node. Remove or add jumpers if necessary.



Note SCM jumpers W5 and W6 determine the total number of cards the switch software will sense (W5 in and W6 out = IGX-8; W5 out and W6 in = IGX-16; W5 and W6 out = IGX-32). For an illustrated view of SCM jumpers W5 and W6, see the [“Preparing the Cards” section on page 3-1](#).

Step 3 Verify that there are no alarms on the IGX LEDs by using the **dspalms** command. Clear all alarms on target node, if possible.

Step 4 Reset the standby NPM if the target IGX has CC redundancy. Allow the module to come back to standby mode.



Note Resetting the Standby NPM can take 30 minutes or longer depending on the size and complexity of the network. This activity can be completed during a maintenance window 12 hours in advance of the SCM replacement, as long as there are no provisioning or changes to the target IGX during those 12 hours.

Step 5 Use the **switchcc** command to verify that both NPMs can control IGX functionality.

Step 6 Wait for the standby NPM to come back into standby mode.

Step 7 Power the IGX node down.

Step 8 Disconnect all cables to the SCM. Identify and mark any cable locations before removing them.

Step 9 Loosen the captive mounting screws on the top and bottom of the IGX SCM faceplate.

Step 10 Operate the extractor levers and slide the SCM out of the cabinet.

Step 11 Inspect the backplane (upper portion of the IGX chassis) and the utility bus (lower portion of the IGX chassis) to verify that there are no bent pins or other defects.



Note If there are any bent pins or defects, contact the Cisco TAC before proceeding. For more information, refer to the [“Obtaining Technical Assistance” section on page xxiii](#).

- Step 12** Insert the replacement IGX SCM into the empty slot.
- Step 13** Tighten captive mounting screws on the top and bottom of the IGX SCM faceplate.
- Step 14** Operate the extractor levers and slide the SCM into the cabinet. Verify that extractor levers do not get wedged behind the SCM faceplate on insertion.
- Step 15** Reattach all cables to the IGX SCM.
- Step 16** Power on the IGX.



Note Verify that the IGX displays no new alarms after startup. It can take 10 to 15 minutes for all the cards in the IGX to clear alarm status. Do not power the node off and on to clear alarms. If alarms do not clear, contact the Cisco TAC (see the [“Obtaining Technical Assistance” section on page xxiii](#)). If the IGX clears alarm state, but does not recognize the correct number of cards in the chassis, a jumper might need to be changed on the SCM. If this happens, contact the Cisco TAC to obtain the correct jumper position.



Note For an illustrated view of removing and inserting cards, see the [“Inserting the Cards” section on page 3-8](#).

Board-Level Revision Number

The manufacturing board-level revision number, also known as the manufacturing 800 number, provides the maximum information possible about a given card. The ability to remotely identify the manufacturing board-level revision number assists in troubleshooting, maintenance, and sparing. Prior to Switch Software Release 9.3.0, there was no mechanism to remotely identify the board-level revision number without physically removing the card from the slot. Now, the board-level revision number is stored in each card's NVRAM, and the Cisco WAN switch software is able to read the board-level revision number and store it in the SNMP MIB. This project provides the capability to identify the board-level revision number through CLI, Cisco WAN Manager, or CiscoView for IGX front cards.

You can view the board revision number, also called the top assembly number, using the **dspscd** command. Use the **dspnovram** command to view NVRAM information for the interface cards. To configure NVRAM use the **setnovram** command. Use the **cnfnpparm** command to view and configure the NVRAM information for the NPM cards. For a description of how to use these commands, refer to the *Cisco WAN Switching Command Reference* and the *Cisco WAN Switching SuperUser Command Reference*.



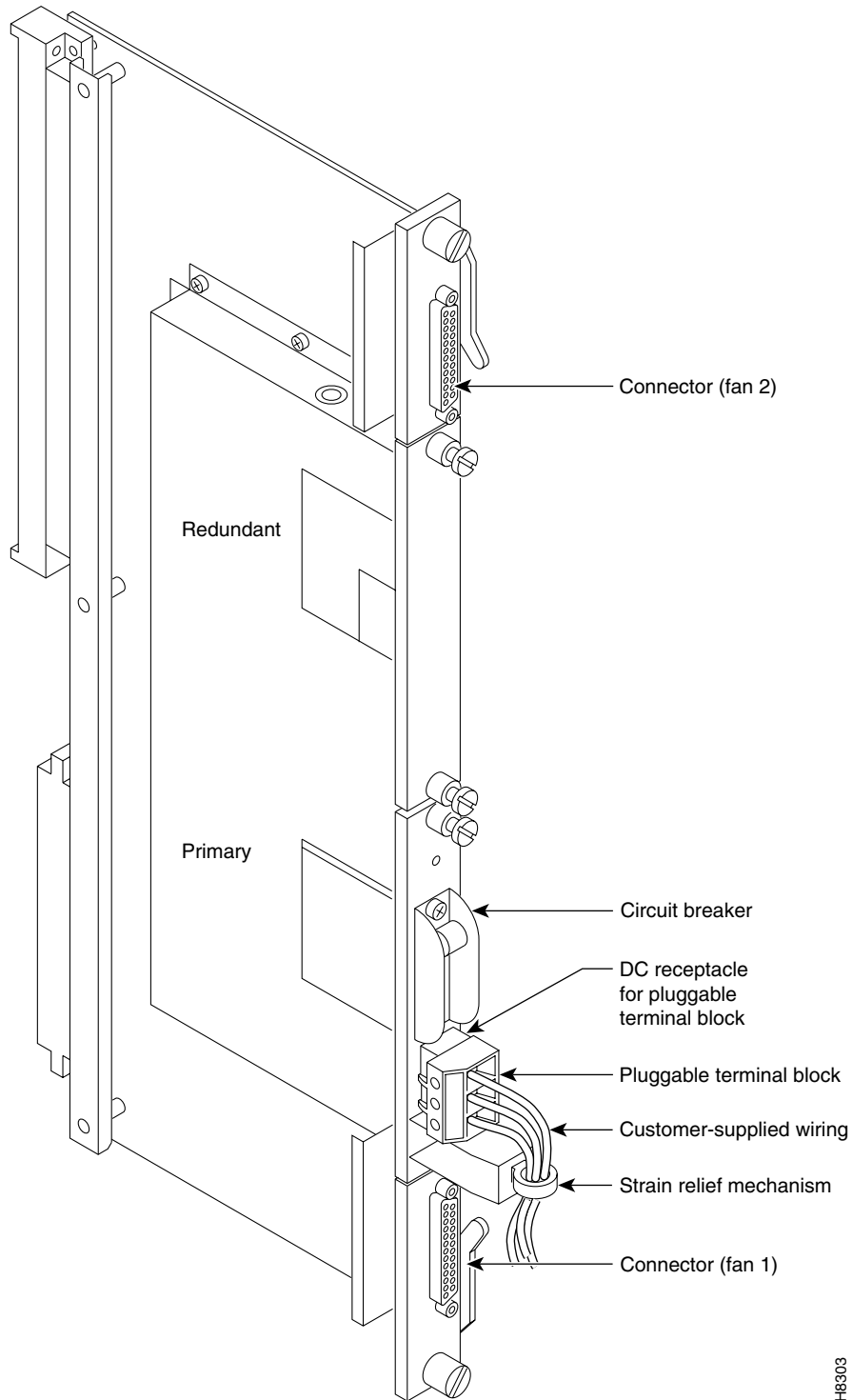
Note Switch software releases prior to 9.3.0 do not display the board revision number. With Switch Software Release 9.3.0 or later software, the switch software displays the number stored in NVRAM as the top assembly number. If the number displayed doesn't start with 800, the number displayed is actually the fab number rather than the top assembly number.

Replacing a DC Power Entry Module

A DC power entry module (PEM) contains few active components, so it rarely needs replacement. To replace a PEM, refer to [Figure 5-1](#) and proceed as follows:

-
- Step 1** Remove the cable guard: Loosen the captive screw at its base and, holding the cable guard at its top and bottom, swing the guard away from the system at the base.
 - Step 2** Switch the circuit breaker on the PEM to the OFF position.
 - Step 3** Grasp the pluggable terminal block and disconnect it from the module.
 - Step 4** Remove the wiring from the strain relief mechanism.
 - Step 5** Loosen the captive screws that secure the PEM in the PE-BC.
 - Step 6** Pull the power entry module out of the power entry back card (PE-BC).
 - Step 7** Slide in the replacement module until it seats in the D-connector on the PE-BC.
 - Step 8** Tighten the screws to secure the PEM in the PE-BC.
 - Step 9** Place the wiring within the strain relief mechanism.
 - Step 10** Plug in the terminal wiring block into the DC receptacle.
 - Step 11** Switch the circuit breaker on the PEM to the ON position.
 - Step 12** Re-attach the cable guard after confirming correct system operation.
-

Figure 5-1 PEM Faceplate Features and Surrounding Area



Replacing an AC Power Supply

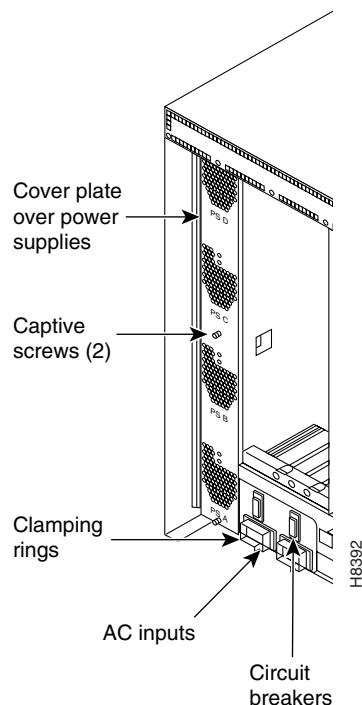
This section contains separate descriptions for replacing an AC power supply in IGX 8410, IGX 8420, and IGX 8430 nodes.

Replacing an AC Power Supply in an IGX 8410 Node

When a power supply has failed, a red FAIL light on the SCM comes on and one or more “okay” LEDs on the power supply go off. Before replacing a power supply, check if it needs only to be reseated. The following describes first how to reseal, then how to replace, a supply.

- Step 1** Loosen the captive screws and remove the AC power cover plate. See [Figure 5-2](#).

Figure 5-2 Replacing an AC Power Supply



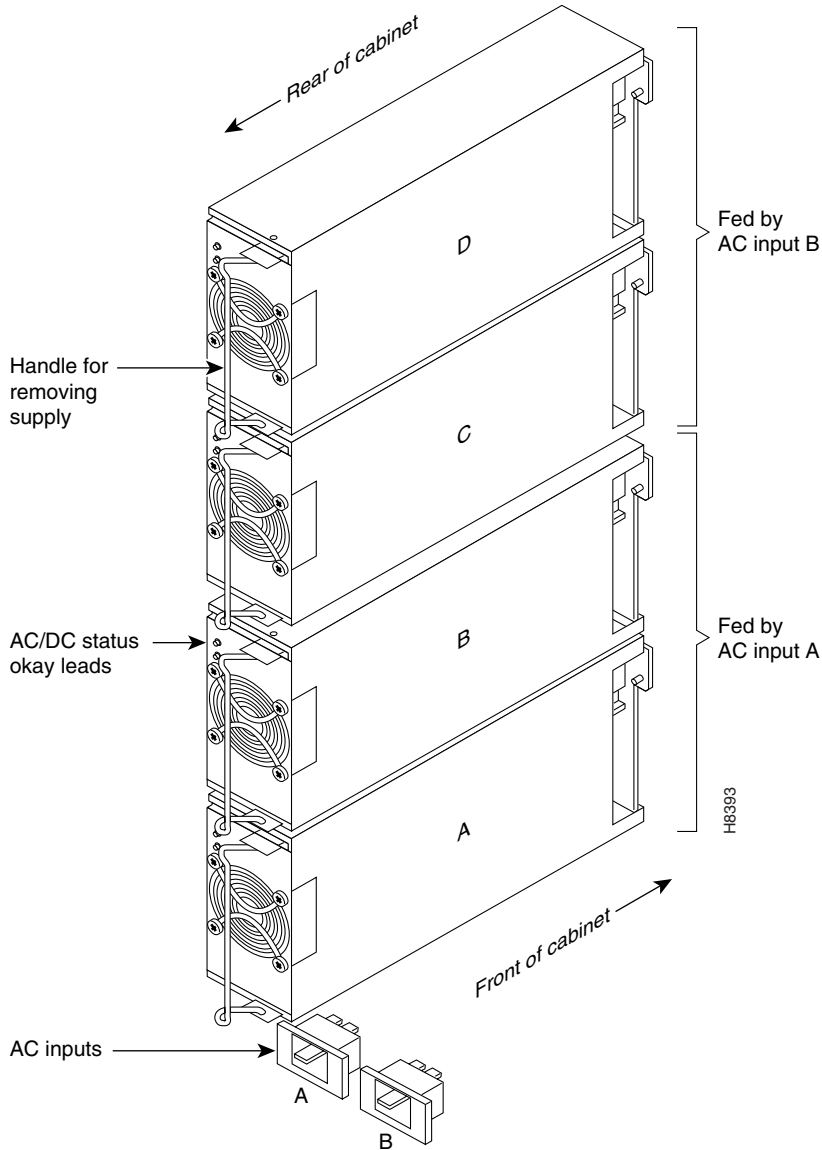
- Step 2** Identify the power supply that needs replacement.
- Step 3** Grip the hinged handle on the supply, slightly pull out the supply, then reseal it. This resets the supply’s internal power-monitoring circuit. See [Figure 5-3](#).
- Step 4** Check the supply-monitoring circuit on the SCM. First, enter the command `resetcd 0` at the control terminal (this resets the power supply monitor on the SCM). After waiting about 10 seconds or more, enter the `dsppwr` command and see if the FAIL indicator for the supply comes on. Note which power supply has failed.



Note If the DC and AC okay LEDs do not come on or the **dsppwr** command still indicates a failure, proceed with the replacement.

Step 5 Pull out the power supply with one hand under the supply.

Figure 5-3 Power Supplies



Installing an AC Power Supply in an IGX 8410 Node

To install a power supply, perform the following steps:

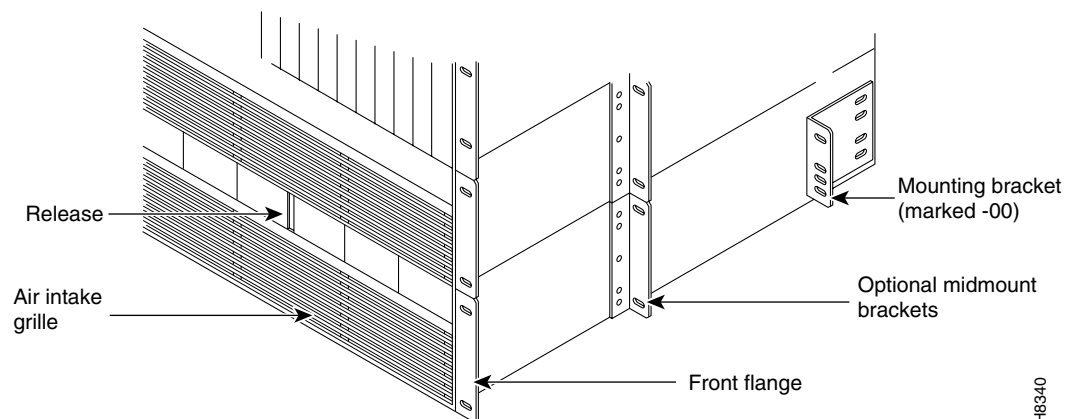
-
- Step 1** Slide a replacement power supply into the power supply tray and push it to the back. When a supply reaches the end of the slot in the tray, a slight resistance is encountered. Push the power supply slightly farther in to seat the supply correctly.
 - Step 2** Install the power supply cover plate.
 - Step 3** Tighten the captive screws on the cover plate until finger-tight.
 - Step 4** Use the `dsppwr` command to check the status and output voltage of the replacement power supply. Make sure that the status is OK and the output voltage is 50 V \pm 2 V.
-

Replacing an AC Power Supply in an IGX 8420 or IGX 8430 Node

When a power supply has failed, a red FAIL light on the SCM comes on. Before replacing a power supply, check to see if it needs only to be reseated. The following steps describe how to reseal a supply then how to replace it.

-
- Step 1** To remove the air inlet grille, locate the small access hole at the top and center.
 - Step 2** Insert a flat-blade screwdriver in the access hole.
 - Step 3** Rotate the screwdriver to release the spring latch holding the air intake grille (see “Release” in [Figure 5-4](#)).

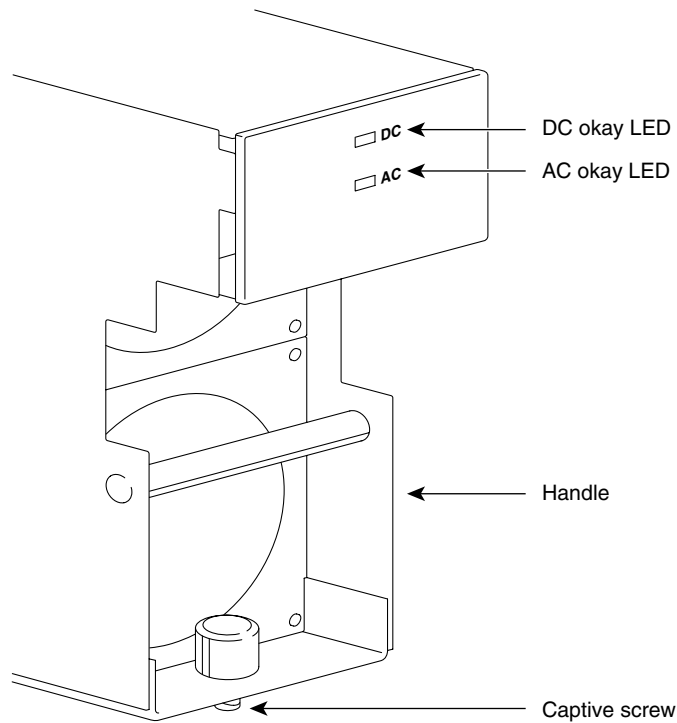
Figure 5-4 Replacing an AC Power Supply



- Step 4** Tilt the air inlet grille down to approximately a 45° angle, then lift it out and set it aside. This exposes the power supply retainer bracket (a hinged door).
- Step 5** With a flat-bladed screwdriver, unscrew the retainer screw in the center of the hinged door and tilt the door down.
- Step 6** Identify which power supply needs replacement. The power supply lettering begins with A on the far left and continues through F on the far right.

- Step 7** Loosen the captive screw at the front bottom of the power supply. See [Figure 5-5](#).
- Step 8** Move the supply slightly out, then reseal it and tighten the captive screw. This resets the supply's internal power-monitoring circuit.
- Step 9** Check the supply-monitoring circuit on the SCM. First, enter the **resetcd 0** command at the control terminal (this resets the power supply monitor on the SCM). After waiting about 10 seconds or more, enter the **dsppwr** command and see if the FAIL indicator for the supply comes on again. Note which power supply has failed.

Figure 5-5 875-Watt Power Supply



H8341



Note If the DC and AC okay LEDs do not come on or the **dsppwr** command still indicates a failure, proceed with the replacement.

- Step 10** Loosen the captive screw that secures a supply to the power supply tray.
- Step 11** Pull out the power supply with one hand on the handle and one hand under the supply.

Installing an AC Power Supply in an IGX 8420 or IGX 8430 Node

To install a power supply, do the following:

-
- Step 1** Slide a replacement power supply into the power supply tray and push it to the back. When a supply reaches the end of the slot in the tray, a slight resistance is encountered. Push the power supply slightly farther in to seat the supply correctly.
 - Step 2** Tighten the captive screw until it is finger-tight.
 - Step 3** Close the hinged door and tighten its retaining screw.
 - Step 4** Install the air intake grille and press firmly on the top, then center, of the air intake grille until the latch snaps into place.
 - Step 5** Use the `dsppwr` command to check the status and output voltage of the power supply. Make sure that the status is OK and that the output voltage is 50 V \pm 2 V.
-

Replacing a Fan Assembly

This section contains separate descriptions for replacing the cooling units in IGX 8410 and IGX 8420 or IGX 8430 nodes.

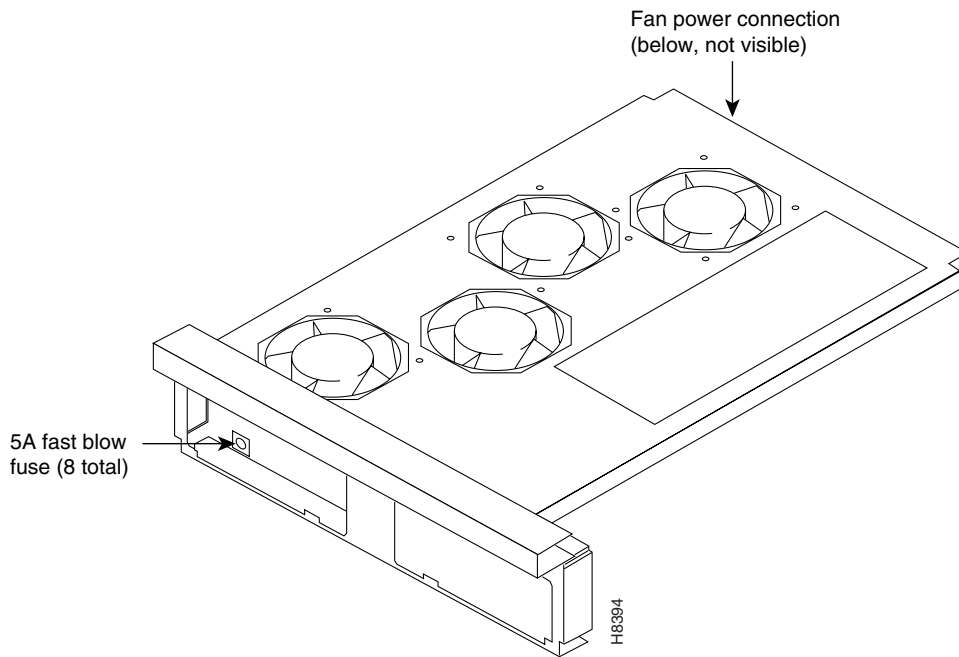
Replacing a Fan Assembly in an IGX 8410 Node

The fan assembly resides below the card cage and has four fans. Individual fans cannot be replaced, so the whole assembly must be replaced when a failure occurs. See [Figure 5-6](#).

Cooling fan trays are hot-swappable. However, the operation must proceed swiftly to keep the system cool enough. Otherwise, the system power must be off. Having the replacement fan tray and tools in the immediate vicinity of the system helps ensure that the procedure goes quickly. The required tools are a flat-blade screwdriver and a Phillips screwdriver.

To replace the cooling unit assembly:

-
- Step 1** Have the replacement fan tray and tools ready.
 - Step 2** Remove the air intake grille at the front of the system by operating the toggle latch at the top-center of the grille with a screwdriver, tilting the grille forward, and lifting it out.
 - Step 3** Examine the front and back of the fan tray to be familiar with the setup. Note the power connectors attached to the fan tray: the connectors at the fan tray itself are to be disconnected rather than the D-connector at the PE-BC. Also note that the captive screws that hold the fan tray in place are at the front of the fan tray.
 - Step 4** Loosen the captive screws.
 - Step 5** At the back of the IGX 8410 node, remove the clamp that secures the power cable for the fans to the chassis.
 - Step 6** Use a small screw driver or fingertip in this step. For each of the fan power connectors, press in the small plastic latch that locks the connector halves together. With the other hand, grip the part of the connector that is attached to the fan tray and separate the cord from the fan tray. The fan tray now has no power.

Figure 5-6 Fan Tray Assembly

- Step 7** Push a finger or thumb through the square holes in the chassis to start the fan tray toward the front of the system. Go to the front of the system.
- Step 8** Remove the cooling unit and slide in the replacement unit.
- Step 9** Plug the power connectors into the fan tray.
- Step 10** Make sure that all fans are operating.
- Step 11** Secure the fan tray assembly by tightening the captive screws.
- Step 12** Attach the clamp for the fan power cord to the chassis.
- Step 13** After fan tray replacement, install the air intake grille.

Replacing a Fan Assembly in IGX 8420 or IGX 8430 Nodes

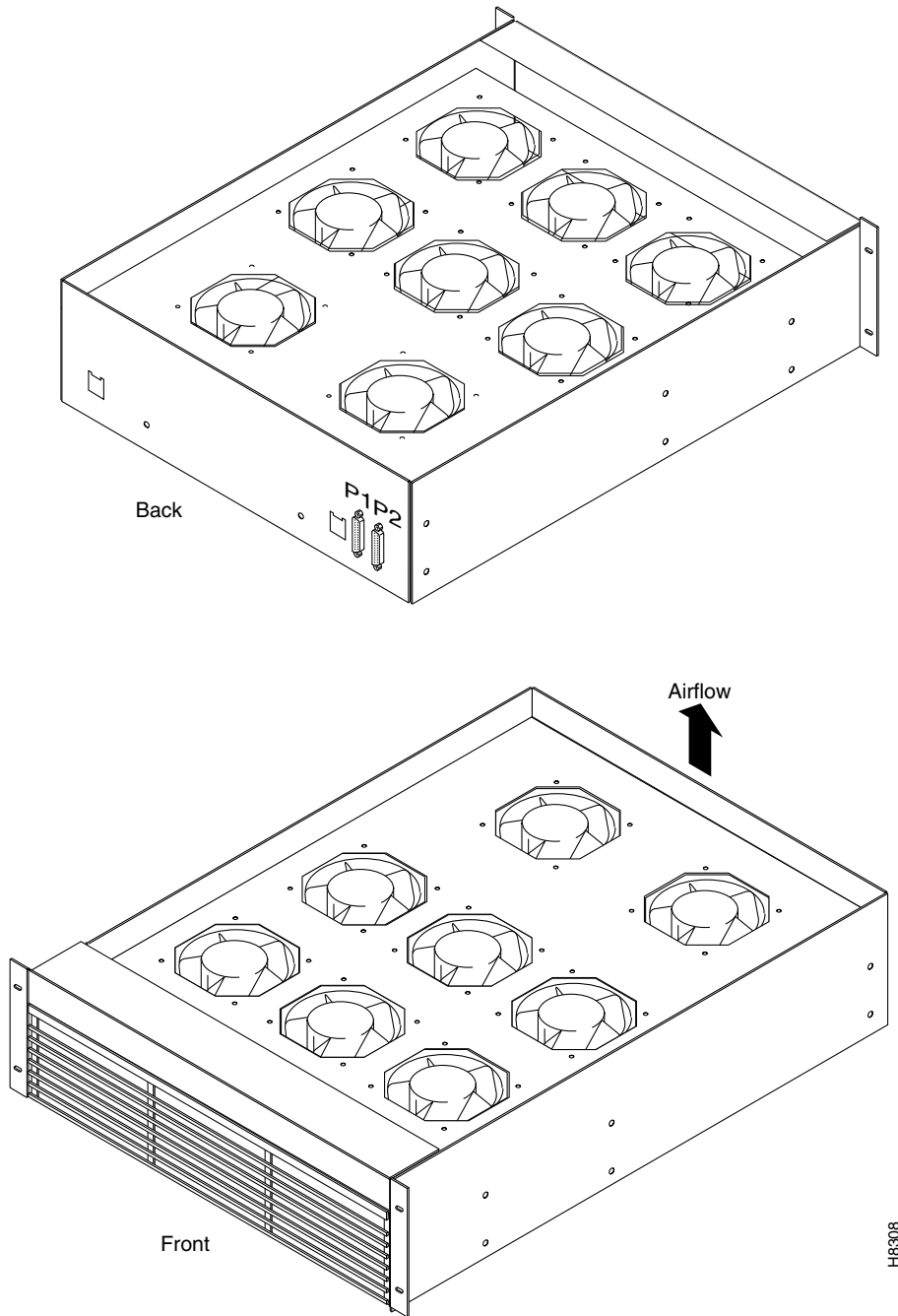
An IGX node contains either one or two cooling units. In an IGX 8420 node, the single cooling unit resides immediately below the card cage. In an IGX 8430 node, one unit resides below the lower card cage (Fan Tray 1). The booster unit (Fan Tray 2) resides above the upper card cage. If a fan failure occurs, the whole assembly must be replaced.

Fan trays are hot-swappable. However, the swap must go swiftly to keep the system cool. Replacement must take less than two minutes, and this is relatively easy. Otherwise, system power must be off. In an IGX 8430 node, the fan tray that remains while the other tray is out helps keep the system cool. Have the replacement fan tray and tools nearby to help the swap go quickly. The required tools are a flat-blade screwdriver and Phillips screwdriver.

To replace the cooling unit assembly:

-
- Step 1** Have the replacement fan tray and tools ready and located near the front of the node.
 - Step 2** For the bottom fan tray, remove the air intake grille at the front of the system by turning the internal screw at the top center of the grille a quarter turn, tilting the grille forward, and lifting it out. (Fan tray 2 at the upper end of an IGX 8430 node does not have an air intake grille.)
 - Step 3** Examine the front and back of the fan tray to be familiar with the setup. Note the power connectors attached to the fan tray. The connectors at the fan tray itself are to be disconnected rather than the D connector at the PE-BC. Also note that the captive screws that hold the fan tray in place are at the front of the bottom fan tray (fan tray 1) and at the back of the booster fan tray (fan tray 2) in an IGX 8430 node.
 - Step 4** Loosen the captive screws.
 - Step 5** At the back of the IGX node, remove the clamp that secures the power cable for the fans to the chassis.
 - Step 6** Use a small screwdriver or fingertip in this step. For each of the fan power connectors, press in the small plastic latch that locks the connector halves together. With the other hand, grip the part of the connector that is attached to the fan tray and separate the cord from the fan tray. The fan tray now has no power.
 - Step 7** Push a finger or thumb through the square holes in the chassis to ease the fan tray towards the front of the system. Go to the front of the system.
 - Step 8** Remove the cooling unit and slide in the replacement unit.
 - Step 9** Plug the power connectors into the fan tray. Make sure that plug P1 connects to connector P1, and plug P2 connects to connector P2.
 - Step 10** Do a visual check to make sure that all fans are operating.
 - Step 11** Use the **dsppwr** command to see if system software recognizes correct operation.
 - Step 12** Secure the fan tray assembly by tightening the captive screws.
 - Step 13** Attach the clamp for the fan power cord to the chassis.
 - Step 14** After lower fan tray replacement, return the air intake grille.
-

Figure 5-7 Fan Tray Assembly



Backplane Fuses

Backplane fuses rarely, if ever, need replacement. Backplane fuses are intended to prevent catastrophic damage to the backplane in the event of accidental shorting of –48 VDC on the backplane to chassis ground. This type of event could be caused by bent backplane pins, contact of conductive elements (EMI cans, EMI gaskets, and so on) to power pins. These events would most likely happen during a factory build or initial system installation.

Because of design constraints, these fuses need to be in sockets on the backplane and are, therefore, not readily accessible. A special tool (Cisco P/N 218090-00) and set of instructions are required for fuse replacement. Cisco recommends that only factory-trained personnel do the procedure.

If a bad card slot is verified, call Cisco TAC (see the “[Obtaining Technical Assistance](#)” section on page xxiii). If a card with an open fuse is verified, return it to Cisco.

In the IGX 8410 node, backplane fuses exist only on the back of the backplane. In an IGX 8420 or IGX 8430 node, the location of the fuse depends on the version of the backplane. In older IGX 8420 or IGX 8430 backplanes, the fuses reside on the front. [Figure 5-8](#) shows the location of each fuse in an IGX 8410 backplane. The fuse numbers are F1–F8. Two spare fuses are also present. [Figure 5-9](#) and [Figure 5-10](#) show current and early backplane fuse locations in the IGX 8420 backplane.

Figure 5-8 Fuse Locations, IGX 8410 Backplane

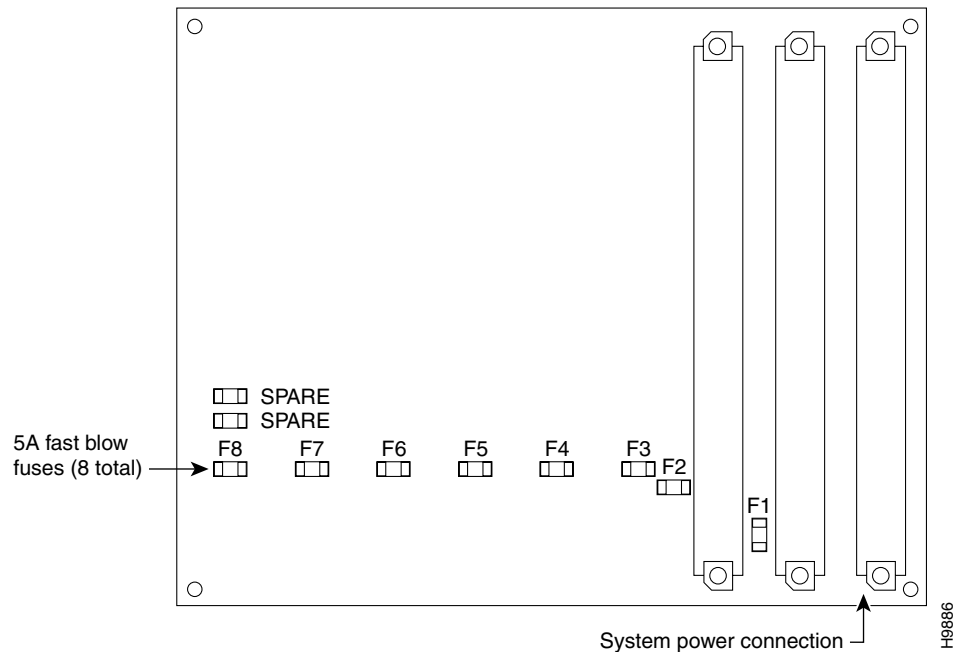


Figure 5-9 IGX 8420/8430 Fuse Locations, Back of Current Backplane

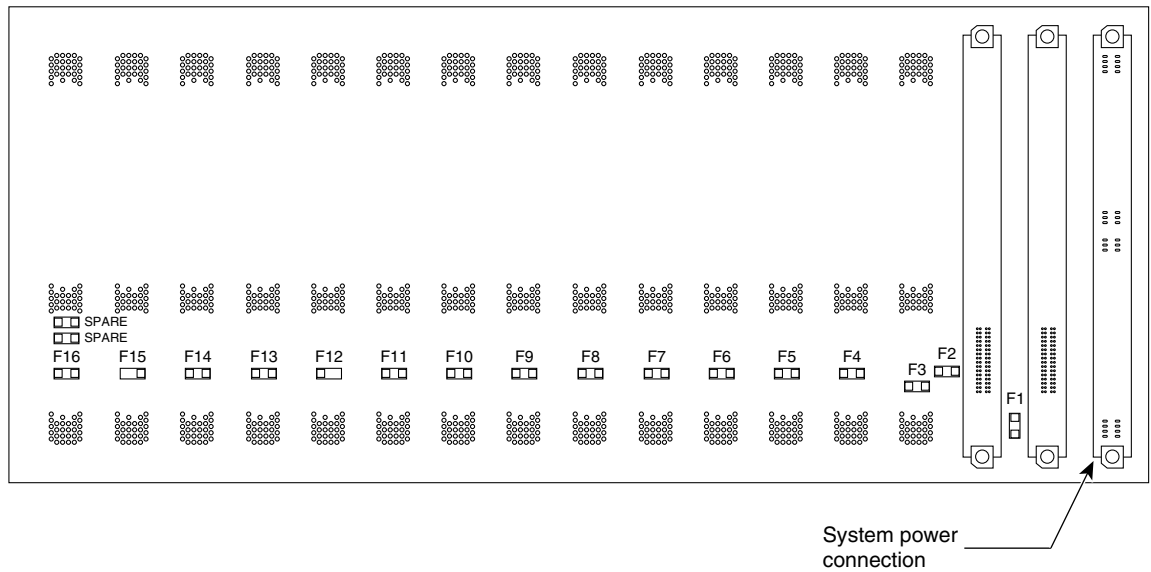
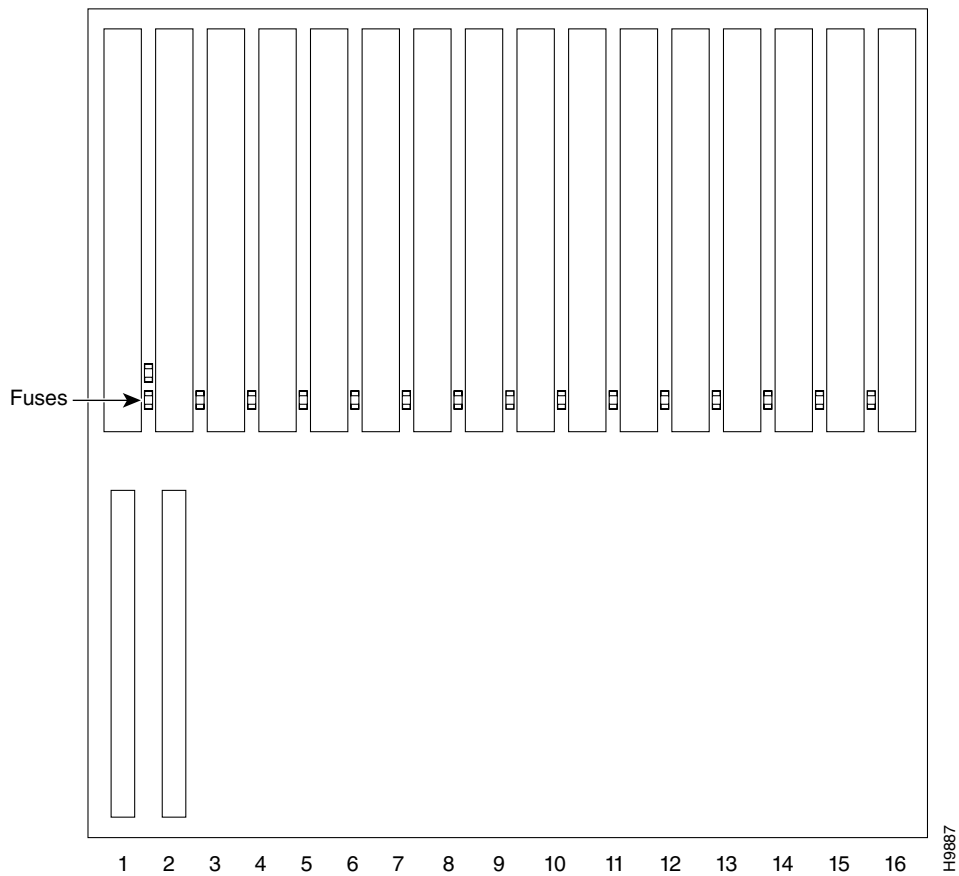


Figure 5-10 IGX 8420/8430 Fuse Locations, Front of Early Backplane



Where to Go Next

For an introduction to the Cisco IGX 8400 series, see Chapter 1, “[Cisco IGX 8400 Series Product Overview](#).”

For installation and basic configuration information, see the *Cisco IGX 8400 Series Provisioning Guide*, Chapter 1, “[Introduction to the Cisco IGX 8400 Series](#).”

For more information on switch software commands, refer to the *Cisco WAN Switching Command Reference*, Chapter 1, “[Command Line Fundamentals](#).”



System Specifications

This appendix contains system specifications for all models and communications types for the node.

General IGX 8410 Switch Specifications

This section provides general system information on the IGX 8410 node.

System capacity:	1 shelf with 8 card slots. Slots 1 and 2 are dedicated to NPM front cards and the SCM back card. Up to 32 trunks (physical or virtual). Up to 48 lines (any T1, IMA NxT1, E1, IMA NxE1, T3, E3, or OC3/STM1 interfaces that are not trunks).
Enclosure size:	IGX 8410 Standalone/Rack-mount: Height: 25 in. (63.5 cm) standalone; 24.5 in. (62.3 cm), rack Width: 19.9 in. (50.5 cm), standalone; 19 in. (48.3 cm), rack Depth: 26.5 in. (67.3 cm), standalone and rack-mount
Shipping weight:	270 lb (122.7 kg)
Clearance requirement:	Min. clearance: 30 in. front; nominal 30 in. rear; 12 in. side
Power input voltage:	AC system: Normal operating range is 100–240 VAC, 47 to 63 Hz. The (under- and over-voltage limits are 90–254 VAC). DC system: –42 to –56 VDC. Each AC supply can provide up to 400W to the card shelves. Space is available for four power supplies.
Input AC power connector:	IEC 16 A input connector: Six different power cords are available to comply with the standards of individual countries. Power cords are 6 ft (about 2 meters) long. See the “Cabling Summary” section on page A-26 for details.

Current requirements:	Configuration-dependent: use Network Design Tool for exact requirements. For planning purposes, use the following:
• AC system	10A maximum for 110 VAC, 5A for 220 VAC
• DC system	20A maximum at –48 VDC; 25A at –42 VDC (worst case)
DC input connections:	3-wire pluggable terminal block with screw terminal connectors
Operating environment:	0 to 40° C (32 to 104° F) normal operation (50° C or 122° F up to 72 hours). 10 to 85 percent relative humidity, non-condensing.
Shock:	Withstands 10 G, 10 ms. at 1/2 sine wave
Vibration:	Withstands 1/4 G, 20–500 Hz
Heat transfer to room:	IGX 8410: 2720 Btus max.

General IGX 8420/8430 Switch Specifications

This section provides general system information on the IGX 8420 and IGX 8430 nodes.

System capacity:	1 or 2 shelves, each with 16 card slots. Slots 1 and 2 are dedicated to NPM front cards and the SCM back card. Up to 32 trunks (physical or virtual). Up to 64 lines (any T1, IMA NxT1, E1, IMA Nx E1, T3, E3, or OC3/STM1 interfaces that are not trunks).
Enclosure size:	IGX 8420 Standalone/Rack mount: HT: 32.25 in. (82 cm), standalone; 31.75 ins. (80.7 cm), rack WD: 19.9 in. (50.5 cm), standalone; 19 in. (48.3 cm), rack DP: 26.75 in. (68 cm), standalone; 26 in. (66 cm), rack IGX 8430 Standalone/Rack mount: HT: 55.5 in. (141 cm), standalone; 55 in. (139.7 cm) rack WD: 19.9 in. (50.5 cm), standalone; 19 in. (48.3 cm), rack DP: 26.75 in. (68 cm), standalone; 26 in. (66 cm), rack
Shipping weight:	600 lb (270 kg) for a fully loaded IGX 8430 enclosure. 400 lb (180 kg) for a fully loaded IGX 8420 enclosure.
Clearance requirement:	Minimum 30 in. front and rear; nominal 12-in. side clearance.

Power input voltage:	AC system: Normal operating range is 200–240 VAC, 47 to 63 Hz. The under and over-voltage range is 180–254 VAC. DC system: –42 to –56 VDC. Each AC supply can provide up to 875W to a card shelf. Cabinet has space for six AC power supplies. Note Three of the six available AC power supply slots should be used for power redundancy.
Current requirements:	Configuration-dependent: Use Network Design Tool for exact requirements. For planning purposes, use the following: <ul style="list-style-type: none"> AC system IGX 8420/8430 node: 12A at a nominal voltage of 200 VAC. At the under-voltage limit of 180 VAC, the current draw is a maximum of 16A. DC system IGX 8420 node: 24A max. per circuit at –42 VDC (worst case) IGX 8430 node: 44A at nominal –48 VDC; 50A maximum per circuit at –42 VDC.
Input AC power connector:	AC power distribution unit is the same for all cabinets: IEC 16A input connector. Six different power cords available, depending on country of destination. See the “Power Cabling” section on page A-47 .
DC input connections:	DC power is the same for all IGX 8420 and IGX 8430 cabinets shipped. DC: 3-screw pluggable terminal connectors.
Operating environment:	0 to 40°C (32 to 104°F) normal operation (50°C or 122°F up to 72 hours). 10 to 85 percent relative humidity, non-condensing.
Shock:	Withstands 10 G, 10 ms. at 1/2 sine wave.
Vibration:	Withstands 1/4 G, 20 to 500 Hz.
Heat transfer to room:	IGX 8420 node: 4300 Btus max, AC-powered system; 3600 Btus in a DC-powered unit. IGX 8430 node: 8600 Btus max, AC-powered system; 6800 Btus in a DC-powered unit.

IGX Power Consumption by Card Type

This section contains information on power consumption by individual IGX front card type.

Card Type	Power Consumption
ALM	51W
ARM	9W

BTM	56W
CVM	44W
FRM-B	50W
FRM	55W
FTM	43W
HDM	51W
LDM	34W
NPM	43W
NTM	37W
UFM-C	66W
UFM-U (HSSI)	93W
UFM-U (V.32, X.21)	72W
URM	73W
UVM	55W
UXM	73W
UXM-E	65W
FAN TRAY	160W

UXM-E Physical and Electrical Specifications

This section provides physical and electrical specifications for the UXM-E card set.

Dimensions	Front card: 15.25 by 16.25 in. Back card: 6.5 by 16.25 in.
Weight:	Front card: 8 lb (3.6 kg). Back card: 4 lb (1.8 kg)
Input voltage:	-48 VDC
Power consumption:	65W

ATM Layer Specification for the UXM-E

This section lists items that apply to the UXM-E's implementation of the ATM layer.

ATM layer management protocol:	Interim Local Management Interface (ILMI) or none	
Standards:	ATM Forum UNI 3.1, TM 4.0	
Virtual path identifier (VPI) range:	1–255	
Virtual circuit identifier (VCI) range for user traffic:	VCC: 0–65535	VPC: 32–65535
Frame-to-ATM interworking:	Network interworking (FRF.5) Service interworking (FRF.8)	

OC-3 (STM-1) Interface on UXM-E Back Cards

These specifications apply to the UXM-E back cards BC-UAI-*xxx-xx*. The specifications are the same for single-mode fiber (SMF) and multimode fiber (MMF), except where the text makes a distinction.

Line rate:	155.52 Mbps	
Line code:	NRZ, CMI for STM-1 electrical	
Idle code:	Configurable	
ATM mapping:	physical layer convergence procedure/header error control (PLCP/HEC) HEC for STM-1 electrical	
Signal levels for:	Maximum:	Minimum:
MMF transmit (TX)	–15 dBm	–22 dBm
MMF receive (RX)	–10 dBm	–31 dBm
SMF TX	–8 dBm	–15 dBm
SMF RX	–8 dBm	–28 dBm
SMFXLR TX	0 dBm	–3 dBm
SMFXLR RX	–3 dBm	–34 dBm

Wavelength:	1310 nm for SMF, MMF; 1550 nm for XLR
Cable length:	15 km for IR SMF 100 km for XLR 2 km for MMF
Physical framing:	STS-3c, STM-1
Port interface:	Local Management Interface (LMI), ILMI
Maximum ATM cell rate per port:	353208 cps per port
Impedance:	STM-1: 75 ohms
ATM layer protocol:	LMI, ILMI
Port alarm processing:	LOS, LOF, LOP, path AIS, path yellow
Line errors counted:	Section BIP8, line BIP24, line FEBE, path BIP8, path FEBE
Connector:	SMF: SC MMF: SC STM-1: BNC
Maximum cable lengths:	MMF ~ 2 Km SMF IR ~ 15 Km
Indicators:	Card status and port status
Payload scramble:	On/Off
HCS masking:	Yes/No
Standards (applicable to both SMF and MMF):	Telcordia Technologies: GR-253-CORE. ANSI: T1.102, T1.105. ITU-T: G.703, G.707, G.783, G.813, G.957, G.958.

T3 Interface on BC-UAI-6T3 or BC-UAI-3T3

These specifications apply to the UXM-E's six and three-port T3 back cards.

Line rate:	44.736 Mbps \pm 20 ppm, asynchronous
Line code:	B3ZS
Clock source mode:	Internal (asynchronous)
Signal level:	DSX-3
Framing formats:	ANSI T1.107 C-bit parity
Alarms processed:	AIS LOS Remote alarm indication Loss of framing
Line errors counted:	BPV Parity bit errors
Receiver input impedance:	Terminated=75 ohms
Transmission modes:	Point-to-point
Connector:	SMB (adapter available for BNC)
Max. line lengths:	450 ft (137 m) to DSX-3 using 75-ohm coaxial cable
Indicators:	Red alarm Yellow alarm LOS AIS
Idle code:	Configurable
ATM mapping:	PLCP/HEC
Standards:	ANSI T1.102, ANSI T1.404, ITU-T G.824, T1.107
Payload scramble:	On/Off
HCS masking:	Yes/No
ATM cell rate per port:	96000 cps in PLCP mode, 104268 cps in HEC mode

E3 Interface on BC-UAI-6E3 or BC-UAI-3E3

These specifications apply to the UXM-E's six and three-port E3 back cards.

Line rate: 34.468 Mbps \pm 20 ppm, asynchronous

Line code: HDB3

Clock source mode: Internal (asynchronous)

Signal level: ITU-T G.703

Framing formats: ITU-T G.804, G.832

Alarms processed: AIS
LOS
Remote alarm indication
Loss of framing

Line errors counted: BPV
Parity bit errors

Receiver input impedance: Terminated=75 ohms

Transmission modes: Point-to-point

Connector: SMB (adapter available for BNC)

Indicators: Red alarm
Yellow alarm
LOS
AIS

Idle code: Configurable

ATM mapping: HEC (G.804)

Standards: ITU-T G.804, G.823, G.832, ITU-T G.703

Payload scramble: On/Off

HCS masking: Yes/No

ATM cell rate per port: 80000 cps

T1 Interface on BC-UAI-8T1 or BC-UAI-4T1

These specifications apply to each port of the UXM-E's eight and four-port T1 back cards.

Line rate:	1.544 Mbps \pm 32 ppm, asynchronous
Line code:	B8ZS
Clock source mode:	Internal (asynchronous)
Framing formats:	Extended superframe (ESF)
Alarms processed:	AIS LOS Remote alarm indication Loss of framing
Line errors counted:	BPV Parity bit errors
Receiver input impedance:	Terminated=100 ohms
Transmission modes:	Point-to-point
Connector:	DB-15
Line lengths:	0–655 ft
Indicators:	Red alarm Yellow alarm LOS AIS
Idle code:	Hex 6A
ATM mapping:	HEC
Standards:	ANSI T1.102, ANSI T1.404, T1.231, T403 ITU-T G.824
Payload scramble:	On/Off
HCS masking:	Yes/No
ATM cell rate per port:	3622 cps

E1 Interface on BC-UAI-8E1 or BC-UAI-4E1

These specifications apply to the UXM-E's eight and four-port E1 back cards.

Line rate:	2.054 Mbps \pm 50 ppm, asynchronous
Line code:	HDB3
Clock source mode:	Internal (Asynchronous)
Framing formats:	Multiframe, clear channel
Alarms processed:	AIS LOS Remote alarm indication Loss of framing
Line errors counted:	BPV Parity bit errors
Receiver input impedance:	Terminated=75 ohms for BNC or 120 ohms for DB-15
Transmission modes:	Point-to-point
Jitter:	\pm 50 ppm
Connector:	BNC or DB-15
Indicators:	Red alarm Yellow alarm LOS AIS
Idle code:	Hex 6A
ATM mapping:	HEC
Standards:	ITU-T G.703, G.704, G.706, G.732, G.735-9, G.775, G.823, G.832, I.431
Payload scramble:	On/Off
HCS masking:	Yes/No
ATM cell rate per port:	4830 cps

UFM Physical and Electrical Specifications

This section contains physical and electrical specifications for the UFM cards.

Dimensions:	Front card: 15.25 by 16.25 in. Back card: 6.5 by 16.25 in.
Weight:	Front card: 8 lb (3.6 kg). Back card: 4 lb (1.8 kg).
Input voltage:	-48 VDC
Power consumption:	UFM-C: 66 W. UFM-U: 72 W (V.35/X.21) or 93 W (HSSI).
Interface mode:	DTE or DCE

T1 Interface on UFI-8T1 Back Card

This section applies to each T1 line on the UFI-8T1. The UFI-8T1 is the eight-port T1 back card for the UFM. The information applies whether the front card supports four or eight ports.

Line rate:	1.544 Mbps, ± 50 bps (± 200 bps VCO lock range)
Line framing:	ESF per AT&T TR 54016
Frame Relay interface:	Meets ANSI T1.618, two-octet header
Frame Relay rates:	Either 56 kbps or $n \times 64$ kbps, where $1 \leq n \leq 24$. Sum of all $n \leq 24$.
Number of interfaces:	1–24 occupied channels where $1 \leq n \leq 24$, and the sum of $n \leq 24$.
Synchronization:	Transmitter can be either loop-timed to line or synchronized to node.
Line coding:	B8ZS
Framing formats:	Fractional T1, contiguous DS0s. Minimum of four DS0s required
Signal level:	DSX-1 compatible
Line impedance:	Terminated=100 ohms nominal. Bridged=1 Kohm
Pulse amplitude:	Individual pulse amplitude 2.4–3.6V (making a total base-to-peak amplitude of $6V \pm 0.6V$)
Minimum pulse density:	Zero-code suppression, either LSB, MSB or B8ZS
VF signaling:	Robbed bit D4 with A and B bits
Max. line lengths:	Up to 533 ft with equalizers using ABAM cable

Input jitter tolerance:	Meets AT&T PUB 62411 specifications
Output jitter generation:	Meets AT&T PUB 62411 using normal mode synchronization
Connector:	DB-15 female

E1 Interface for UFI-8E1 Back Card

This section applies to each E1 line on the UFI-8E1. The UFI-8E1 is the eight-port E1 interface card for the UFM. The information applies whether the UFM front card supports four or eight ports.

Line interface connector:	DB-15 (120 ohms), BNC (75 ohms)
Line rate:	2.048 Mbps, ± 50 bps (± 200 bps VCO lock range)
Frame Relay interface:	Meets ANSI T1.618, two-octet header
Number of Frame Relay interfaces:	1–31 occupied channels where $1 \leq N \leq 31$, and the sum of all $N \leq 31$.
Frame Relay interface rate:	Either 56 kbps or $N \times 64$ kbps, where $1 \leq N \leq 31$. Sum of all $N \leq 31$.
Line code:	Bipolar HDB3
Line impedance:	120 ohms (balanced) or 75 ohms (balanced or unbalanced)
Minimum pulse density:	Zero-code suppression using HDB3 coding
Frame format:	Unframed: 32-channel (G.703). Framed: 30 or 31-channel multiframe per ITU-T G.704.
VF Signaling:	CAS or CCS
Maximum line length:	E1 output complies with G.703, so cabling must not exceed -6 dB/1000 ft at 1024 KHz (whether cable is coaxial or twisted pair)
Input jitter tolerance:	Meets G.823
Output jitter generation:	Meets G.823
Electrical interface:	Complies with G.703 specification
Connector:	Back card has either all DB-15 female or all BNC connectors

UFM Unchannelized Interface

This section contains specifications for the V.35/X.21 and HSSI interface cards for the UFM-U.

	V.35 or X.21	HSSI
Line rate:	56 kbps–10.24 Mbps	1.-24–16.384 Mbps
Clock rate:	$N \times 64$ KHz, where $1 \leq N \leq 32$ $N \times 1.024$ MHz, where $2 \leq N \leq 10$	$1.024 + N \times 0.512$ MHz
Connector type:	DB-60	50-pin SCSI
Interface mode:	DTE or DCE	DTE or DCE

Frame Relay Interface for the FRM Front Card

This section contains technical specifications for Frame Relay service on the FRM.

Type of service:	Permanent virtual circuit (PVC)
Data interface:	Per ITU-T I.122 and ANSI T1/S1 standards
Data transfer protocol:	LAP-D frame level core functions
Input data format:	High-Level Data Link Control (HDLC) protocol
Input data frame length:	Up to 4096 bytes
Frame integrity check:	Frame Check Sequence and CRC check of data frame. If CRC fails, data frame is discarded at receiving node.
Input data rate:	56 kbps–2.048 Mbps. The maximum rate is available with only one of four ports on the back card active.
Ports per card:	4 model D 31 model E
PVCs per port:	252 per FRM card, distributed in any combination
Port electrical interface:	ITU-T V.35. IGX node and X.21 can be DCE or DTE for direction of control leads and timing on Model D and E using E1 or T1.
Data clocking:	Normal or looped
Virtual circuit identifier:	Data Link Connection Identifier (DLCI)
Control protocol:	Local management interface with XON/XOFF type flow control. The IGX node sets FECN and BECN bits in Frame Relay frame.

Bundled connections:	252 virtual circuits per card 1024 virtual circuits per node
Billing time accuracy:	Upon request from a user-device, an IGX node provides GMT from any node accurate to within one second.

T1 Interface on FRI Back Card

The BC-FRI-T1 is the T1 interface for the FRM Frame Relay card.

Line Rate:	1.544 Mbps, ± 50 bps (± 200 bps VCO lock range).
Line Code:	Bipolar AMI or B8ZS.
Framing Formats:	Fractional T1, adjacent or alternating channels. Minimum of four DS0 channels required.
Signal Level:	DSX-1 compatible
Line Impedance:	Terminated=100 ohms nominal. bridged=1 Kohm
Pulse Amplitude	Individual pulse amplitude 2.4–3.6V (making a total base-to-peak amplitude of $6V \pm 0.6V$)
Minimum Pulse Density:	Zero code suppression, either LSB, MSB or B8ZS
Frame Format:	D4 and Extended SuperFrame (ESF)
VF Signaling:	Robbed bit D4 with A and B bits
Max. Line Lengths:	Up to 533 ft with equalizers using ABAM cable
Jitter Transfer:	Meets AT&T PUB 62411 specifications.
Jitter Tolerance:	Meets ANSI standards and AT&T PUB 62411 specifications.
Connector:	DB-15 female

E1 Interface on BC-E1 Back Card

The BC-E1 is the E1 interface card for both the NTM trunk and the CVM voice card.

Line rate:	2.048 Mbps, ± 50 ppm (± 200 bps VCO lock range)
Line code:	Bipolar AMI or HDB3
Line impedance:	120 ohms (balanced) or 75 ohms (balanced or unbalanced)

Minimum pulse density:	Zero-code suppression via HDB3 coding
Frame format:	Unframed: 32-channel (G.703). Framed: 30 or 31-channel multiframe per ITU-T G.704.
VF signaling:	Channel-associated signaling (CAS) or common channel signaling (CCS)
Maximum line lengths:	100 meters. The E1 output complies with G.703, so cabling must not exceed -6dB/1000 ft at 1024 KHz (applies to 75 ohm coaxial or 120 ohm twisted pair up to 350 meters or 1000 ft). Cisco supplies cable with a maximum attenuation of 7 dB /1000 ft, but the maximum cable length for this E1 interface is 100 meters.
Jitter:	Transmit output jitter, receive jitter tolerance, and jitter gain meet G.823.
Electrical interface:	Complies with G.703 specification.
Connector:	DB-15 female or BNC

Voice Circuit Support

This section lists voice circuit specifications. Where appropriate, the text names the card to which the specification applies.

Voice channel interface:	24-channel T1 (D4 format) 24-channel T1-ESF 30-channel framed E1
Voice compression:	32/24/16 kbps ADPCM on the CVM 32/24/16 kbps ADPCM 16 kbps or 8 kbps LDCELP (UVM only) Voice Activity Detection (VAD) compression
Compression algorithm:	ITU-T G.721, G.723, G.726 Cisco 32 kbps ADPCM Cisco LDCELP Cisco CSACELP
PCM encoding types:	Accommodates mu-Law or a-Law encoding. End-to-end conversion available.
Channel gain control:	-8 dB to +6 dB.
Signaling modes:	T1: Robbed bit or CCS (ISDN). E1 and J1: CAS or CCS
Signaling conditioning:	Various make-busy and forced-idle routines during circuit alarm, configurable on a per-channel basis.

Quantizing distortion added:	2.5 quantizing distortion units (QDUs) with 32 kbps ADPCM over 1 hop plus 0.7 QDUs with digital loss PAD (mu-law or a-Law).
Nominal transmission loss:	0 dB at 1 KHz.

UVM Physical and Electrical Standards

This section lists physical and electrical characteristics for the UVM card sets.

Dimensions:	Front card: 15.25 by 16.25 in. Back card: 6.5 by 16.25 in.
Weight:	Front card: 8 lb (3.6 kg). Back card: 4 lb (1.8 kg)
Input voltage:	-48 VDC
Power consumption:	55W

T1 Interface on the BC-UVI-2T1EC

The BC-UVI-2T1EC is the two-port T1 interface for the UVM voice card.

Line rate:	1.544 Mbps, ± 32 ppm
Line code:	B8ZS, AMI
Line impedance:	100 ohms
Frame format:	D4, ESF
VF signaling:	CAS (robbed bit), CCS (ISDN)
Signaling conditioning:	Configurable
Idle code:	Hex 7F
Cable lengths:	0-655 ft
Jitter:	± 32 ppm
Standards:	ANSI T1.102, T1.231, T1403 ITU-T G.824
Connector:	Two DB-15, female

E1 Interface on the BC-UVI-2E1EC

The BC-UVI-2E1EC is the two-port E1 interface for the UVM voice card.

Line Rate:	2.048 Mbps, ± 50 ppm
Line Code:	HDB3, AMI
Line Impedance:	120 ohms on BNC (balanced), 75 ohms on DB-15
Frame Format:	CEPT
VF Signaling:	CAS or CCS
Signaling conditioning:	Configurable
Idle code:	Hex 54
Max. Line Lengths:	100 meters
Jitter:	± 50 ppm
Standards:	ITU-T G.703, G.704, G.706, G.732, G.735-9, G.775, G.823, G.826, I.431
Connector:	Two DB-15, female, and two pairs of BNCs

J1 Interface on the BC-UVI-2J1EC

The BC-UVI-2J1EC is the two-port J1 interface for the UVM voice card.

Line Rate:	2.048 Mbps, ± 50 ppm (± 200 bps VCO lock range)
Line Code:	Bipolar CMI
Line Impedance:	110 ohms
Frame Format:	TTC-2M / JJ-20.11
VF Signaling:	CAS or CCS
Signaling conditioning:	Configurable
Idle code:	Hex 7F
Max. Line Lengths:	100 meters. Cisco supplies cable with a maximum attenuation of 7 dB per 1000 ft, but the maximum cable length recommended for this J1 interface is 100 m.

Jitter:	± 50 ppm: transmit output jitter, receive jitter tolerance, and jitter gain meet G.823.
Standards:	Applicable JATE standards
Connector:	Two DB-15, female

J1 Interface on the BC-J1

The BC-J1 is a J1 interface card for both the NTM trunk card and the CVM voice card.

Line Rate:	2.048 Mbps, ± 50 ppm (± 200 bps VCO lock range)
Line Code:	Bipolar CMI
Line Impedance:	120 ohms (balanced) or 75 ohms (balanced or unbalanced)
Frame Format:	Per JJ-20.11
VF Signaling:	CAS or CCS
Maximum line lengths:	100 m. Cisco supplies cable with a maximum attenuation of 7 dB /1000 ft, but the maximum cable length recommended for this J1 interface is 100 m.
Jitter:	Transmit output jitter, receive jitter tolerance, and jitter gain meet G.823.
Electrical interface:	Complies with G.703.
Connector:	DB-15 female or BNC

Data Channel Support for HDM and LDM

This section contains interface card specifications for the HDM and LDM data cards.

Synchronous data interfaces:	EIA/TIA-232C/D, EIA/TIA-449/422, V.24, X.21, and V.35 with IGX switch as DCE or DTE
High-speed rates (HDM):	2.4 kbps–1.344 Mbps
Low-speed data rates:	2.4 to 19.2 kbps per LDM port
Ports per card:	LDI back card: 4 or 8 SDI back card: 4

Control leads supported:	SDI back card: Per interface standards SDI back card: Up to 7 in each direction for fast EIA LDI back card: 3 in each direction for DCE and DTE for each port
Control lead sync w/data:	Control leads are sampled every 50 ms. A change normally follows data within 100 to 1000 msec. Fast EIA lead is within 1 byte.
Data clocking:	Synchronous and isochronous clocking Normal, looped, and split clock configurations
Pleisochronous clock range:	±2 percent of nominal data rate

ATM Interface

This section contains general ATM interface specifications. For specifications that apply to the UXM-E only, see the [“ATM Layer Specification for the UXM-E”](#) section on page A-5.

Type of Service:	Permanent virtual circuit (PVC)
Interface Types:	UNI and NNI per ITU-T I.361 and I.363
Data Rates:	T1, E1, T3, E3, OC3 (STM-1)
ATM Layer:	Physical Layer Convergence Protocol (PLCP) per AT&T publication TA-TSY-00772 and 000773 for T3; ITU I-361 with HEC for E3
Cell Rate:	T1: 3622 E1: 4830 T3: 96,000 cps in PLCP mode, 104268 cps in HEC mode. E3: 80,000 cps OC-3: 353,207
Adaptation Layer:	AAL5
Number of PVCs per card:	255
VPI Addressing Range:	0 to 255
VCI Addressing Range:	0 to 65535
Traffic Queues:	CBR, VBR, and ABR (except ALM/A)
Management Protocol:	LMI and ILMI

Network Synchronization

External Clock Sources:	The IGX switch synchronizes to the nearest, highest-stratum clock available. Any T1, E1, T3, E3, OC3 (STM-1) line, trunk, or optional external clock inputs can serve a clock source.
Internal to Node Source:	T1: 1.544 MHz, ± 10 ppm (stratum 4) E1: 2.048 MHz, ± 10 ppm (stratum 4)
Clocking Hierarchy:	Dynamic primary, secondary, and tertiary clocking
Note	Without a defined external clock reference, the IGX defaults to its internal clock source.

Network Management Control

Network Control Terminal:	Cisco WAN Manager workstation and Cisco software required for graphical display of network status, statistics gathering and display, and automatic downloading of software.
Control Terminal:	DEC VT100, WYSE 85, Televideo 970, or equivalent terminal for basic system configuring and alarm monitoring.
Remote Alarm Reporting:	Auto-dial modem connects to one of two control ports on each IGX node for automatic reporting of network alarms.
Remote Diagnostics:	Auto-answer modem connects to one of two control ports on each IGX node for remote diagnostic access by Cisco TAC or other authorized personnel.
Network Control Ports:	Two ports per node—one EIA/TIA 232C interface and one Ethernet LAN port.
Alarm Notification:	Status of all trunks and nodes in network distributed to and stored by each individual node. Reported to Cisco WAN Manager workstation at connecting node.
External Alarms:	Meets Telecordia Technologies (formerly Bellcore) Compatibility Bulletin #143 and AT&T Technical Reference PUB 43801 DS1 (T1) facility alarm requirements when equipped with DTI group.
Indicators and Controls:	Active and Fail lights on all cards and power supplies.

Peripheral Specifications


Note

EIA/TIA-232 and EIA/TIA-449 existed as recommended standards RS-232 and RS-449 before the Electronics Industries Association (EIA) and Telecommunications Industry Association (TIA) accepted them as standards.

Network Management Terminal

StrataView Terminal

A Cisco WAN Manager workstation is required for managing an IGX network. Refer to the *Cisco WAN Manager Installation* publication for setup instructions and specifications for the Cisco Network Management Terminal. The *Cisco WAN Manager Installation* publication has all the necessary information for obtaining network alarm, control, and statistics from IGX switch software for Cisco WAN Manager.

Control Terminal

[Table A-1](#) lists the control terminals requirements.

Table A-1 Control Terminal Requirements

Parameter	Requirement
IGX Port Used	Control terminal port on the SCM card is used to interface with a local control terminal
Code	Standard 7- or 8-bit ASCII; 1 or 2 stop-bits; even, odd, or no parity
Interface	EIA/TIA-232 DCE
Data Rate	All standard asynchronous data rates from 300 to 19200 bps, independently software-selectable
Supported Terminals	VT-100, or equivalent, recommended
Cable Required	Straight-through EIA/TIA-232 cable

Printer

The maintenance printer that is currently being shipped with the IGX node is the Okidata Model 184. Refer to [Table A-2](#) for interface requirements.

Table A-2 Printer Interface Requirements

Parameter	Requirements
IGX port used	The AUX port on the SCM is the interface with the maintenance printer.
Code	Standard 8-bit ASCII; 8 data bits, 1 stop-bit, odd parity
Interface	EIA/TIA-232 DCE
Data Rate	9600 baud
Supported Printers	Okidata 184
Cable Required	Straight-through EIA/TIA-232 cable

DIP Switch Settings for Okidata 184

DIP Switch A is an eight-section DIP switch located on the main circuit board of the printer. For access to the configuration switches, slide back the switch cover at the top-rear of the printer case. Set Switch A according to the information in [Table A-3](#).

Table A-3 DIP Switch A Settings

Switch A	Setting	Description
1	Off	ASCII with non-slashed zero
2	Off	
3	Off	
4	Off	11-inch
5	On	paper
6	Off	No auto line feed
7	On	8-bit data
8	Off	Enables front panel

The high-speed serial interface DIP switch consists of two DIP switches, SW1 and SW2, located on a serial board that is attached to the printer's main board. Set switches 1 and 2 as indicated in [Table A-4](#) and [Table A-5](#).

Table A-4 Settings for DIP Switch 1 (SW1)

Switch 1	Setting	Description
1	On	Odd parity
2	On	No parity
3	On	8 data bits

Table A-4 Settings for DIP Switch 1 (SW1) (continued)

Switch 1	Setting	Description
4	On	Ready/busy protocol
5	On	Test select circuit
6	On	Print mode
7	On	Busy line selection
8	On	DTR pin 2 enabled

Table A-5 Settings for DIP Switch 2 (SW2)

Switch 2	Setting	Description
1	Off	Transmission
2	On	speed =
3	On	9600 baud
4	On	DSR active
5	On	Buffer = 32 bytes
6	On	Timing = 200 ms
7	On	Space after power on
8	Don't care	Not used

Modems

In general, a dial-out connection to a modem uses the AUX port on the SCM. A dial-in connection from a modem uses the Control port on the SCM. Refer to [Table A-6](#) for interface requirements.

Table A-6 Modem Interface Requirements

Parameter	Requirement
IGX port used	Control port on SCM is used for auto-answer modem; AUX port on SCM is used for auto-dial modem.
Code	Standard 8-bit ASCII, 1 stop-bit, no parity
Interface	EIA/TIA-232 DCE
Cable	Null modem cable
Phone lines	Dedicated, dial-up business telephone line for TAC-to-IGX modem and auto-dial-to-TAC modem
Data rate	Standard, asynchronous rates 3.0–19.2 kbps, independently software-selectable
Supported modems	Motorola Model V.34R 9600 baud modem

Motorola V.34R IGX Dial-In/Out Configuration

IGX Auto-Answer

Auto-answer is a setup in which the Cisco TAC can dial into the switch. Using the **cnfterm** command, set the IGX Control port speed to 9600 bps. Using the **cnftermfunc** command, set the terminal type to VT100/StrataView. To program the modem, temporarily attach a terminal to the modem using a null modem cable. The modem EIA port automatically matches the 9600 bps setting of the terminal. Enter the commands listed in [Table A-7](#) to set up the modem for proper operation.

Table A-7 *Setting Up the Motorola v.34R for Auto-Answer Mode*

Step	Command	Function
1	AT&F&W	Reset to factory default and save.
2	ATS0=1	Enables auto-answer mode (answer on first ring).
3	ATL1	Modem speaker at low volume.
4	AT*SM3	Enables automatic MNP error correction.
5	AT*DC0	Disables data compression.
6	AT*FL0	Disables XON/XOFF flow control.
7	AT&S1	Sets DSR to “normal.”
8	ATE0	Disables local character echo.
9	ATQ1	Disables result codes. (Modem will appear “dead.”)
10	AT&W	Saves current configuration settings in nonvolatile memory.

IGX Auto-Dial

Using the **cnfterm** command, set the IGX Auxiliary port (AUX port) speed to 9600 bps and enable XON/XOFF flow control. Using the **cnftermfunc** command, select option 7, Autodial Modem, then enter the Network ID designated by Cisco and the Cisco modem phone number. Attach a 9600 bps terminal to the modem using a cross-over cable and enter the following commands ([Table A-8](#)).

Table A-8 *Steps for Attaching a Terminal to the Autodial Modem*

Step	Command	Function
1	AT&F	Initializes factory defaults.
2	ATL1	Modem speaker at minimum volume.
3	AT*SM3	Enables automatic MNP error correction.
4	AT*DC0	Disables data compression.
5	AT*SC1	Enables DTE speed conversion.
6	AT*FL1	Enables XON/XOFF flow control.
7	AT*SI1	Enables 5-minute inactivity disconnect.
8	AT&C1	DCD controlled by modem.
9	AT&D2	Modem disconnects when node toggles DTR.

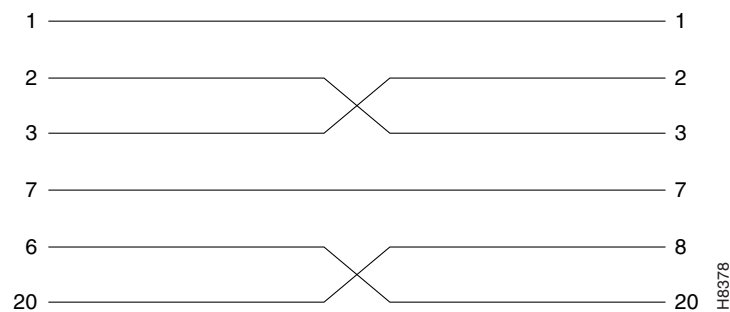
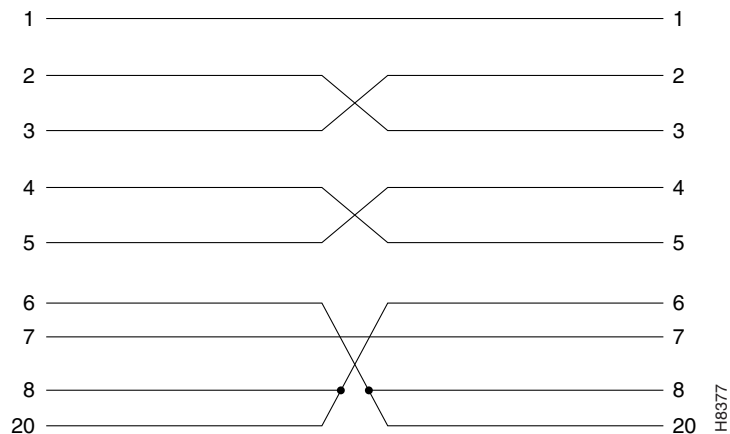
Table A-8 Steps for Attaching a Terminal to the Autodial Modem (continued)

Step	Command	Function
10	AT&V	Verifies entries.
11	AT&W	Saves current settings to nonvolatile memory.

Connect the modem to the IGX AUX port using the cable shown in [Figure A-1](#). Ask the Cisco TAC to assist in the modem testing (see the [“Obtaining Technical Assistance”](#) section on page xxiii).

Modem Cables

The IGX Auto-Dial to Cisco application (also called “call home”) and IGX Auto-Answer (call from Cisco) application use different modem cables. [Figure A-1](#) shows the modem cable pinout for IGX Auto-Dial to Cisco TAC. [Figure A-2](#) shows the modem cable pinout for IGX Auto-Answer (call from Cisco TAC).

Figure A-1 Pinout for Customer to Auto-Dial Cisco (Call Home)**Figure A-2 Cable Pinout for Auto-Answer by Customer's Modem**

Cabling Summary



Note

EIA/TIA-232 and EIA/TIA-449 existed as recommended standards RS-232 and RS-449 before the Electronics Industries Association (EIA) and Telecommunications Industry Association (TIA) accepted them as standards.



Warning

To prevent accidental discharge in the event of a power line cross, route on-premise wiring away from power cables and off-premise wiring, or use a grounded shield to separate the on-premise wiring from the power cables and off-premise wiring. A power line cross is an event, such as a lightning strike, that causes a power surge. Off-premise wiring is designed to withstand power line crosses. On-premise wiring is protected from power line crosses by a device that provides overcurrent and overvoltage protection. Nevertheless, if the on-premise wiring is in close proximity to, or not shielded from, the off-premise wiring or power cables during a lightning strike or power surge, the on-premise wiring can carry a dangerous discharge to the attached interface, equipment, and nearby personnel. To see translations of this warning, refer to the Regulatory Compliance and Safety Information document that accompanied this product.

UXM-E Cabling

The cabling for the UXM-E appears in [Table A-9](#).

Table A-9 UXM-E Cabling

Model Number	Description
CAB-SMF-Y-SC	Single mode fiber Y-cable with SC male connectors
CAB-T3E3-PL-Y	SMB-BNC Y-cable, Posi-Lok SMB female connector on Y end and BNC female connector on tail end
CAB-T3E3-PL-Y-6	Bundle of 6 SMB-BNC Y-cable
CAB-T3E3-PL-Y-12	Bundle of 12 SMB-BNC Y-cable
CAB-SMF-SC-x	Standard single mode fiber cable with SC male connectors, x ft = 10, 25, 50, 75, 100
CAB-MMF-SC-x	Standard MMF cable with SC male connectors, x ft = 10, 25, 50, 75, 100
CAB-T3E3-PL-AD	SMB-BNC adaptor cable 72 inch
CAB-T3E3-PL-AD-6	Bundle of 6 SMB-to-BNC adaptor cable
CAB-T3E3-PL-AD-12	Bundle of 12 SMB-to-BNC adaptor cable
CAB-5607-10=	DB-15/Y Cable/M15-F15 10 ft
CAB-5614-x	T1/M15-M15 Xover, x ft = 10, 25, 50, 75, 100
CAB-5616-x	T1/M15-M15, x ft = 10, 25, 50, 75, 100
CAB-5685-10=	E1/Y Cable 10 ft

T1 Cabling

Trunk cables connect the customer DSX-1 crossconnect point or T1-E1 channel service unit (CSU) to the IGX node at the BC-T1 or BC-E1 back card. Refer to [Table A-10](#) for details. For information on T1 connector pin assignments, see [Table A-11](#).

Table A-10 T-1 Cabling

Cable Parameter	Description
Cable Type	Western Electric 22 AWG, ABAM individually shielded twisted pair. Two pair per T1 line (1 transmit and 1 receive).
Cable Connector	Male DB-15 subminiature. See Table A-11 for pinouts. The connector pinouts are the same for both the BA-T1 and the MT3 Distribution Panel.
Maximum Cable Length	533 ft (162 m) maximum between the node and the first repeater or CSU.

Table A-11 T1 Connector Pin Assignments

Pin No.	Description
1	Transmit, tip
2	Transmit pair shield
3	Receive, tip
4	Receive pair shield
9	Transmit, ring
11	Receive, ring

E1 Cabling

E1 trunk cables connect the customer DSX-1 crossconnect point or E1 channel service unit (CSU) to the node at the back card. For cabling specifications, see [Table A-12](#). For E1 connector pin assignments, see [Table A-13](#).

Note that variations exist in the pin assignments for some interfaces: [Table A-14](#) and [Table A-15](#) show the D-connector pinouts for the CVM, NTM, UFM, UVM, and FRM.

Table A-12 E1 Cabling

Cable Parameter	Description
Cable Type	75-ohm coaxial cable for balanced line or 100–120-ohm twisted pair for unbalanced line. Balanced lines use two cables per E1 port.
Cable Connector	Two female BNC for balanced connection; male DB-15 for unbalanced connection. See Table A-13 , Table A-14 , and Table A-15 for pinouts.
Max. Cable Length	E1 output complies with G.703, so attenuation must not exceed –6 dB at 1024 kHz (applies to 75-ohm coaxial or 120-ohm twisted pair). Maximum length is 100 meters between the IGX node and the first repeater or CSU.

Table A-13 E1 Connector Pin Assignments

Connector	Description
Rx BNC	Receive E1 from trunk
Tx BNC	Transmit E1 to trunk

Table A-14 D-connector Pinouts for the CVM, NTM, UFM, UVM, and FRM

Pin No.	Description
1	Receive, tip
2	Receive pair shield
3	Transmit, tip
9	Receive, ring
10	Transmit pair shield
11	Transmit, ring

Table A-15 D-connector Pinouts for the CVM, NTM, UFM, UVM, and FRM

Pin No.	Description
1	Transmit, tip
2	Transmit pair shield
3	Receive, tip
4	Receive pair shield
9	Transmit, ring
11	Receive, ring

TTC JJ-20 (J1) Cabling

Table A-16 and Table A-17 describes the J1 cabling and the TTC connector pinouts, respectively.

Table A-16 J1 Cabling

Cable Parameter	Description
Cable type	110-ohm, twisted pair for balanced; 2 cable pairs (1 transmit, 1 receive) per TTC.
Cable connection	Male DB-15 for balanced connection. See Table A-17 for pinouts.
Maximum cable length	Maximum length depends on signal attenuation, which cannot exceed 13 dB.

Table A-17 TTC Connector Pinouts

Pin No.	Description
2	Send tip S(T)
9	Send ring S(R)
4	Receive tip R(T)
11	Receive ring R(R)
1	Ground

Y1 Trunk Cabling

Table A-18 and Table A-19 describe the Y1 cable and the connector pin assignments, respectively.

Table A-18 Y1 Cabling

Cable Parameters	Description
Cable Type	110 ohm twisted pair, balanced operation. Two cable pairs (1 transmit, 1 receive) per Y1 line.
Cable Connection	Male DB-15. See Table A-19 for pinouts.
Max. Cable Length	Maximum cable length is determined by V _{p-p} (Voltage peak-to-peak). The maximum permissible value is 1 V _{p-p} .

Table A-19 Y1 Connector Pinouts

Pin No.	Description
2	Transmit tip T(A)
9	Transmit ring T(B)
4	Receive tip R(A)
11	Receive ring R(B)
1	Shield

Subrate (SR) Cabling

This section lists general data for the subrate cabling and the pinouts for different types of interfaces that support subrate operation. [Table A-20](#) contains general specifications for the subrate cabling. [Table A-21](#), [Table A-22](#), and [Table A-23](#) list the pinouts for V.11, V.35, and EIA/TIA-449 interfaces, respectively. [Table A-24](#) lists T3 connector pin assignments.

Table A-20 Subrate (SR) Cabling

Cable Parameter	Description
Cable Type	100–120-ohm twisted pair telephone cable.
Cable Connector	V.11, DB-15 subminiature, male. V.35, 34-pin M block (Winchester), male. MIL188/RS-449, DB-37 subminiature, male. See Table A-21 through Table A-23 for pinouts.
Max. Cable Length	Depends on operating speed. Ranges are 400 meters for 256 kbps though 50 meters for 1.92 Mbps.

Table A-21 V.11 Connector Pinouts

Pin No.	Description
1	Shield ground
2	TX-A
9	TX-B
3	CA
10	CB
4	RX-A
11	RX-B
5	IA
12	IB
6	SA
13	SB
7	Not used
8	Signal ground
14	Not used
15	Not used

Table A-22 V.35 Connector Pinouts

Pin No.	Name	Source	Description
A	Gnd.	Both	Protective (shield) ground
B	Sig. Gnd.	Both	Signal ground
C	RTS	DTE	Request to send
D	CTS	DCE	Clear to send
E	DSR	DCE	Data Set ready
F	DCD	DCE	Data carrier detect (RLSD)
H	DTR	DTE	Data terminal ready
J	RI	DCE	Ring indicator
K	TM	DCE	Test mode
L-N	–	–	Not used
P/S	TxD	DTE	Transmit data from DTE
R/T	RxD	DCE	Received data to DTE
U/W	XTC	DTE	External transmitter clock
V/X	RxC	DCE	Receiver clock
Y/AA	TxC	DCE	Transmitter clock
BB-EE	–	–	Not used

Table A-23 EIA/TIA-449 Connector Pinouts

Pin No.	IGX Name	EIA Name	Source	Description
1	Frm. Gnd.		Both	Shield ground
2	SI	SI	DCE	Signaling rate indicator (to DTE)
4/22	TxD	SD	DTE	Transmit data from DTE
5/23	TxC	ST	DCE	Transmitter clock
6/24	RxD	RD	DCE	Received data to DTE
7/25	RTS	RS	DTE	Request to send
8/26	RxC	RT	DCE	Receiver clock
9/27	CTS	CS	DCE	Clear to send
10	LL	LL	DTE	Local loopback
11/29	DSR	DM	DCE	Data set ready
12/30	DTR	TR	DTE	Data terminal ready
13/31	DCD	RR	DCE	Data carrier detect (RLSD)
14	RL	RL	DTE	Remote loopback
15	RI	IC	DCE	Ring indicator
16	SF	SF	DTE	Signal rate select (to DCE)
17/35	XTC	TT	DTE	External transmitter Clock

Table A-23 EIA/TIA-449 Connector Pinouts (continued)

Pin No.	IGX Name	EIA Name	Source	Description
18	TM	TM	DCE	Test mode
19	Sig. Gnd.	SG	Both	Signal ground
20	–	RC	DCE	Receive common
28	BSY	IS	DTE	Busy (in service)
32	SS	SS	DTE	Select standby
33	SQ	SQ	DCE	Signal quality detect
34	NS	NS	DTE	New synchronization
36	SB	SB	DCE	Standby indicator
37	–	SC	DTE	Send common
3, 21	–	–	–	Spare

Table A-24 T3 Connector Pinouts

Connector	Description
Rx BNC	Receive T3 from trunk
Tx BNC	Transmit T3 to trunk

UFM Cabling

[Table A-25](#) lists the cables that can connect to the UFM back cards for synchronous and asynchronous circuits.

Table A-25 UFM Cabling

Cable Parameter	Description
Cable type	Standard V.35 or X.21
Cable connectors	X.21 DTE: DB-60, male (provides two X.21 ports) X.21 DCE: DB-60, male (provides two X.21 ports) V.35 DTE: DB-60, male (provides two V.35 ports) V.35 DCE: DB-60, male (provides two V.35 ports) HSSI: DB-50, male
Maximum cable length	Not to exceed interface standards

Cabling for the UFM-U Back Cards

This section describes the standard cabling and the Y-cabling scheme for the unchannelized back cards. The back cards are the UFI-12V.35, UFI-12X.21, and UFI-4HSSI. Because of the port variety and because the cables are either DCE or DTE, a significant number of cable configurations exist.

[Table A-26](#) shows cable names, part numbers, and descriptions.

The connectors on the UFI cards are high density. Each UFI-12V.35 and UFI-12X.21 card has six 60-pin connectors. Each of these connectors has two ports. If your specification dictates that both ports on a connector are active, you must have a cable with wiring for two ports. If a part number in [Table A-26](#) has the form “CAB-2...,” the cable has wiring for two ports. Note that if both ports on a connector are active, both ports must be either DCE or DTE, because the cable itself is either DCE or DTE. If a connector has only one active port, the cable can be the less expensive, single-port version. An HSSI connector has 50 pins and supports one port.

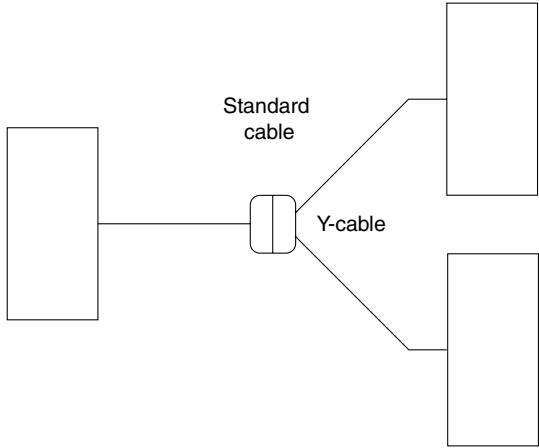
Table A-26 UFM-U Back Card Cables

Card	Model Number	PCB Connector	Destination Connector	Cable Description
HSSI	CAB-HSI 1	50-pin Male	50-pin Male	HSSI Cable, UFI is DCE
HSSI	CAB-HS1-DTE	50-pin, Male	50-pin Male	HSSI Cable, UFI is DTE
HSSI	CAB-Y-HS1	Two, 50-pin Male	50-pin Female	HSSI Y-cable, 3 ft
V.35	CAB-V35MC	DB-60F	V.35	V.35 Cable, DCE, Male, 10 ft
V.35	CAB-V35MT	DB-60F	V.35	V.35 Cable, DTE, Male, 10 ft
V.35	CAB-V35FC	DB-60F	V.35	V.35 Cable, DCE, Female, 10 ft
V.35	CAB-V35FT	DB-60F	V.35	V.35 Cable, DTE, Female, 10 ft
X.21	CAB-X21MT	DB-60F	X.21	X.21 Cable, DTE, Male, 10 ft
X.21	CAB-X21FC	DB-60F	X.21	X.21 Cable, DCE, Female, 10 ft
V.35	CAB-2V35MT	DB-60 Male	Two V.35	V.35 Cable, DTE, Male 10 ft
V.35	CAB-2V35FC	DB-60 Male	Two V.35	V.35 Cable, DCE, Female 10 ft
V.35 & X.21	CAB-Y-UFI	2xDB-60 Male	DB-60 Female	UFI-specific Y-cable
X.21	CAB-2X21MT	DB-60 Male	Two X.21	X.21 Cable, DTE, Male, 10 ft
X.21	CAB-2X21FC	DB-60 Male	Two X.21	X.21 Cable, DCE, Female, 10 ft

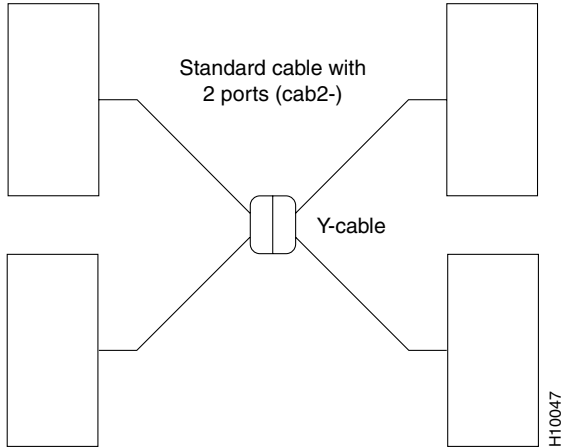
Port redundancy through the use of a Y-cable requires two card sets, at least one Y-cable, and the standard cabling. On a UFI-4HSSI, Port 1 is the only port that supports Y-cable redundancy. On the V.35 and X.21 UFIs, redundancy at more than one connector requires a corresponding number of Y-cables and standard cables. The standard cables are either single-port for HSSI, V.35, or X.21 or dual-port for the X.21 and V.35 UFIs.

To set up the Y-cabling, you attach a branch of the Y at the primary and redundant connectors then attach the near end of the standard cable to the base of the Y. [Figure A-3](#) illustrates single and dual-cabling in a Y-cable setup. The single-cable arrangement applies to HSSI, V.35, and X.21. The dual-port redundancy setup applies to a UFI-12X.21 or UFI-12V.35, where both ports within the UFI connector are used in a Y-cable redundancy scheme.

Figure A-3 Y-Cabling with a UFI-4HSSI, UFI-12V.35, or UFI-12X.21 Port



UFI-4HSSI, UFI-12V.35, or UFI-12X.21



UFI-12X.21 or UFI-12V.35

H10047

UFI X.21 and V.35 DTE Port Pin Assignments

Table A-27 lists the UFI X.21 and V.35 DTE pin assignments at the DB-60 connector on the card.

Table A-27 UFI X.21 and V.35 DTE Connector Pinouts

Pin No.	Name	Source	Direction	Description
7/14	SG	Both	—	Signal ground
9/22	RxC	DCE	Input	Receive clock
5/18	TxC	DCE	Input	Transmit clock
3/16	RxD	DCE	Input	Receive data
2/15	TxD	DTE	Output	Transmit data

Table A-27 UFI X.21 and V.35 DTE Connector Pinouts (continued)

Pin No.	Name	Source	Direction	Description
6/19	XTC	DTE	Output	External transmit clock
4/17	DTR	DTE	Output	Data terminal ready
10/23	DSR	DCE	Input	Data set ready
11	RTS	DTE	Output	Request to send
24	CTS	DCE	Input	Clear to send
12	LLB	DTE	Output	Local loopback command
13	RLB	DTE	Output	Remote loopback
26	TM	DTE	Output	Test mode
20	SG	Both	—	Signal ground
25	DCD	DCE	Input	Data carrier detect
1	—	DCE	Input	Port in DCE mode

UFI X.21 and V.35 DCE Port Pin Assignments

Table A-28 lists the UFI X.21 and V.35 DCE pin assignments at the DB-60 connector on the card.

Table A-28 UFI X.21 and V.35 DCE Connector Pinouts

Pin No.	Name	Source	Direction	Description
7/14	SG	Both	—	Signal ground
8/21	RxC	DCE	Output	Receive clock
6/19	TxC	DCE	Output	Transmit clock
3/16	TxD	DTE	Input	Transmit data
2/15	RxD	DCE	Output	Receive data
9/22	XTC	DTE	Input	External transmit clock
4/17	DSR	DCE	Output	Data set ready
10/23	DTR	DTE	Input	Data terminal ready
11	CTS	DCE	Output	Clear to send
24	RTS	DTE	Input	Request to send
25	LLB	DTE	Input	Local loopback command
26	RLB	DTE	Input	Remote loopback
13	TM	DTE	Output	Test mode
20	SG	Both	—	Signal ground
12	DCD	DCE	Output	Data carrier detect
1	—	DTE	Input	Port in DTE mode

V.35 DCE Female Cable Pin Assignments

Table A-29 lists the V.35 DCE female cable pin assignments.

Table A-29 V.35 DCE Female Cable Pinouts

Signal	Pin No. (from J3)	Wire	Pin No. (to J1)	Signal
Signal ground	55/56	Shorting group		Signal ground
Signal ground	50/51	Shorting group		Signal ground
Shield ground	46	Shield	A	Shield ground
v11-TXD	17/18	Twisted Pair #1	T/R	RD
v11-TXCOUT	19/20	Twisted Pair #2	AA/Y	SCT
v11-RXCOUT	21/22	Twisted Pair #3	X/V	SCR
v11-RXCIN	25/26	Twisted Pair #4	W/U	SCTE
v11-RXD	27/28	Twisted Pair #5	S/P	SD
v28-DSR/v28-CTS	34/35	Twisted Pair #6	H/C	DTR/RTS
v28-RTS/v28-DTR	42/43	Twisted Pair #7	D/E	CTS/DSR
v28-LL-DCD/Not used	44/16	Twisted Pair #8	F/B	RLSD/—
v28-DCD-LL/Not used	33/16	Twisted Pair #9	K/B	LT/—
Shield ground	45	Shield	A	Shield ground
v11-TXD	3/4	Twisted Pair #1	T/R	RD
v11-TXCOUT	5/6	Twisted Pair #2	AA/Y	SCT
v11-RXCOUT	7/8	Twisted Pair #3	X/V	SCR
v11-RXCIN	29/30	Twisted Pair #4	W/U	SCTE
v11-RXD	31/32	Twisted Pair #5	S/P	SD
v28-DSR/v28-CTS	38/36	Twisted Pair #6	H/C	DTR/RTS
v28-RTS/v28-DTR	40/41	Twisted Pair #7	D/E	CTS/DSR
v28-LL-DCD/Not used	39/15	Twisted Pair #8	F/B	RLSD/—
v28-DCD-LL/Not used	37/15	Twisted Pair #9	K/B	LT/—



Note

The CAB-2-V.35 DCE 1 Winchester connector corresponds to an odd UFM-U back card port and the CAB-2-V.35 DCE 2 Winchester connector corresponds to an even UFM-U back card port.

V.35 DTE Male Cable Pin Assignments

Table A-30 V.35 DTE Male Cable Pinouts

Signal	Pin No. (from J3)	Wire	Pin No. (to J1)	Signal
p2_mode_0/Ground/p2_mode_DCE	55/56/54	Shorting group	—	—
p1_mode_0/Ground/p1_mode_DCE	50/51/52	Shorting group	—	—
Shield ground	46	Shield	A	Shield ground
v11-TXD	17/18	Twisted Pair #1	S/P	SD
v11-TXCOUT	19/20	Twisted Pair #2	W/U	SCTE
v11-TXCIN	23/24	Twisted Pair #3	AA/Y	SCT
v11-RXCIN	25/26	Twisted Pair #4	X/V	SCR
v11-RXD	27/28	Twisted Pair #5	T/R	RD
v28-DSR/v28-CTS	34/35	Twisted Pair #6	E/D	DSR/CTS
v28-RTS/v28-DTR	42/43	Twisted Pair #7	C/H	RTS/DTR
v28-LL-DCD/Not used	44/16	Twisted Pair #8	K/B	LT/—
v28-DCD-LL/Not used	33/16	Twisted Pair #9	F/B	RLSD/—
Shield ground	45	Shield	A	Shield ground
v11-TXD	3/4	Twisted Pair #1	S/P	SD
v11-TXCOUT	5/6	Twisted Pair #2	W/U	SCTE
v11-TXCIN	13/14	Twisted Pair #3	AA/Y	SCT
v11-TXCIN/v11-RXCIN	29/30	Twisted Pair #4	X/V	SCR
v11-RXD	31/32	Twisted Pair #5	T/R	RD
v28-DSR/v28-CTS	38/36	Twisted Pair #6	E/D	DSR/CTS
v28-RTS/v28-DTR	42/43	Twisted Pair #7	C/H	RTS/DTR
v28-LL-DCD/Not used	39/15	Twisted Pair #8	K/B	LT/—
v28-DCD-LL/Not used	37/15	Twisted Pair #9	F/B	RLSD/—



Note

The CAB-2-V.35 DTE 1 Winchester connector corresponds to an odd UFM-U back card port and the CAB-2-V.35 DTE 2 Winchester connector corresponds to an even UFM-U back card port.

UFI HSSI Port Pin Assignments

Table A-31 UFI HSSI Connector Pinouts

Pin No.	Name	Source	Direction	Description
1/26	SG	Both	—	Signal ground
2/27	RT	DCE	Output	Receive timing
3/28	CA	DCE	Output	DCE available
4/29	RD	DCE	Output	Receive data
5/30	LC	DTE	Output	DCE loop request
6/31	ST	DCE	Output	Send timing
7/32	SG	Both	—	Signal ground
8/33	TA	DTE	Input	DTE available
9/34	TT	DCE	Input	Terminal timing
10/35	LA	DTE	Input	Loopback circuit A
11/36	SD	DTE	Input	Send data
12/37	LB	DTE	Input	Loopback circuit B
13/38	SG	Both	—	Signal ground
14/39	DT	DTE	Input	Send timing in DTE
15 to 18	—	DCE	Output	Undefined: to DCE
19/44	SG	Both	—	Signal ground
20 to 23	—	DTE	Input	Undefined: from DCE
24/49	TM	DTE	Output	Test mode
25/50	SG	Both	—	Signal ground

The UFI-HSSI interface is native DCE. The interface pin assignment is done in such a way that the UFI interface can be connected to the HSSI interface of a Cisco router, which is a native DTE, using a straight pin-to-pin HSSI standard cable attached to a UFI back card or a Cisco router in either DTE or DCE modes.

A UFI card in DCE mode can be connected to any DTE interface using the same standard Cisco cable.

When UFI is configured in DTE mode, it needs the HSSI-DTE cable to connect to a DCE interface. The wiring details are shown in [Table A-32](#) for cable number 72-1265-01.

Table A-32 Wiring Details for the HSSI-DTE Cable

Pin No. J1 to J2	Name	Direction	Description
1/26 to 1/26	SG	—	Signal ground
2/27 to 9/34	RT/TT	Output	Receive timing/terminal timing
3/28 to 8/33	CA/TA	Output	DCE available/DTE available
4/29 to 11/36	RD/SD	Output	Receive data/send data
5/30 to 10/35	LC/LA	Output	DCE loop request/loopback circuit A

Table A-32 Wiring Details for the HSSI-DTE Cable (continued)

Pin No. J1 to J2	Name	Direction	Description
6/31 to 14/39	ST/DT	Output	Send timing/send timing in DTE
7/32 to 7/32	SG	—	Signal ground
8/33 to 3/28	TA/CA	Input	DTE available/DCE available
9/34 to 2/27	TT/RT	Input	Terminal timing/receive timing
10/35 to 5/30	LA/LC	Input	Loopback circuit A/DCE loop request
11/36 to 4/29	SD/RD	Input	Send data/receive data
12/37 to 24/49	LB/TM	Input	Loopback circuit B/test mode
13/38 to 13/38	SG	—	Signal ground
14/39 to 6/31	DT/ST	Input	Send timing in DTE/send timing
15 through 18 to 40 through 43	not used	—	Not used
19/44 to 19/44	SG	—	Signal ground
20 through 23 to 45 through 48	not used	—	Not used
24/49 to 12/37	TM/LB	Output	Test mode/loopback circuit B
25/50 to 25/50	SG	—	Signal ground

FRI V.35 Port Pin Assignments

Table A-33 contains a listing of IGX V.35 pin assignments for the Frame Relay FRI card. A standard V.35 cable is used for this application.

Table A-33 FRI V.35 Pinouts

Pin No.	Name	Source	Description
A	Gnd.	both	Protective (Shield) ground
B	Sig. Gnd.	both	Signal ground
C	RTS	DTE	Request to send
D	CTS	DCE	Clear to send
E	DSR	DCE	Data set ready
F	DCD	DCE	Data carrier detect
H	DTR	DTE	Data terminal ready
L	LLB	DTE	Local loopback command to user device
N	RLB	DTE	Remote loopback command to user device
n	TM	DTE	Test mode indicates user device. ready for test
P/S	TxD	DTE	Transmit data from DTE
R/T	RxD	DCE	Receive Data to DTE

Table A-33 FRI V.35 Pinouts (continued)

Pin No.	Name	Source	Description
U/W	XTC	DTE	External Transmitter Clock
V/X	RxC	DCE	Receiver Clock
Y/a	TxC	DCE	Transmitter Clock

Data Cabling

This section describes the cables for the LDM and HDM card sets. The HDM and LDM are high-speed and low-speed data cards.

Table A-34 HDM and LDM Cabling

Cable Parameter	Description
Cable Type	Standard EIA/TIA-232C/D (V.24), V.35, or EIA/TIA-449/422 (with adapter cable for X.21).
Cable Connectors	EIA/TIA-232C/D (V.24): DB-25 Subminiature, male. V.35: 34-pin M block-type (Winchester), male. EIA/TIA-449/422: DB-37 Subminiature, male.
Max. Cable Length	Not to exceed interface standards.

HDM EIA/TIA-232D Port Pin Assignments

Table A-35 contains a listing of IGX EIA/TIA-232D port pin assignments for the HDM's interface card, the SDI. A standard EIA/TIA-232 cable works in this application.

Table A-35 HDM EIA/TIA-232 Connector Pinouts

Pin No.	IGX Name	EIA Name	Source	Description
1	Frame Gnd.	AA	Both	Frame ground
2	TxD	BA	DTE	Transmit data from DTE
3	RxD	BB	DCE	Received data to DTE
4	RTS	CA	DTE	Request to send
5	CTS	CB	DCE	Clear to send
6	DSR	CC	DCE	Data set ready
7				Signal ground
8	DCD	CF	DCE	Data carrier detect (RLSD)
9	+VS		Both	+12V test
10	-VS		Both	-12V test
11	QM		DCE	Equalizer mode (to DTE only)
12	SDCD	SCF	DCE	Secondary data carrier detect
13	SCTS	SCB	DCE	Secondary clear to send
14	STxD	SBA	DTE	Secondary transmit data

Table A-35 HDM EIA/TIA-232 Connector Pinouts (continued)

Pin No.	IGX Name	EIA Name	Source	Description
15	TxC	DB	DCE	Transmitter clock
16	SRxD	SBB	DCE	Secondary received data
17	RxC	DD	DCE	Receiver clock
18	RL		DTE	Remote loopback
19	SRTS	SCA	DTE	Secondary request to send
20	DTR	CD	DTE	Data terminal ready
21	SQ	CG	DCE	Signal quality detect
22	RI	CE	DCE	Ring indicator
23	SF	CH	DTE	Signal rate select (to DCE)
23	SI	CI	DCE	Signaling rate indicator (to DTE)
24	XTC	DA	DTE	External transmitter clock
25	TST		DCE	Test indicator

HDM EIA/TIA-232C (V.24) Port Pin Assignments

Table A-35 contains a listing of IGX EIA/TIA-232C port pin assignments for the SDI data card. A standard EIA/TIA-232 (V.24) cable is used for this application.

Table A-36 HDM EIA/TIA-232C (V.24) Connector Pin Assignments

Pin No.	IGX Name	EIA Name	Source	Description
1	Frame Gnd.	AA	Both	Frame ground
2	TxD	BA	DTE	Transmit data from DTE
3	RxD	BB	DCE	Received data to DTE
4	RTS	CA	DTE	Request to send
5	CTS	CB	DCE	Clear to send
6	DSR	CC	DCE	Data set ready
7				Signal ground
8	DCD	CF	DCE	Data carrier detect (RLSD)
9	+VS		Both	+12V test
10	-VS		Both	-12V test
11	QM Pin 11		DCE DTE	Equalizer mode (to DTE) pin 11 to (DCE)
12	SDCD	SCF	DCE	Secondary data carrier detect
13	SCTS	SCB	DCE	Secondary clear to send
14	STxD	SBA	DTE	Secondary transmit data
15	TxC	DB	DCE	Transmitter clock
16	SRxD	SBB	DCE	Secondary received data

Table A-36 HDM EIA/TIA-232C (V.24) Connector Pin Assignments (continued)

Pin No.	IGX Name	EIA Name	Source	Description
17	RxC	DD	DCE	Receiver clock
18	DCR		DCE	Divided receiver clock
19	SRTS	SCA	DTE	Secondary request to send
20	DTR	CD	DTE	Data terminal ready
21	SQ	CG	DCE	Signal quality detect
22	RI	CE	DCE	Ring indicator
23	SFCI	CH CI	DTE DCE	Signal rate select (to DCE) Signaling rate indicator (to DTE)
24	XTC	DA	DTE	External transmitter clock
25	BSY		DTE	Busy (in service)

HDM EIA/TIA-449/422 Port Pin Assignments

Table A-37 contains a listing of IGX EIA/TIA-449/422 port pin assignments. A standard EIA/TIA-449 cable is used for this application unless the interface is X.21.

Table A-37 HDM EIA/TIA-449/422 Connector Pin Assignments

Pin No.	IGX Name	EIA Name	Source	Description
1			Both	Shield ground
2	SI	SI	DCE	Signaling rate indicator (to DTE)
3				Spare
4/22	TxD	SD	DTE	Transmit data from DTE
5/23	TxC	ST	DCE	Transmitter clock
6/24	RxD	RD	DCE	Received data to DTE
7/25	RTS	RS	DTE	Request to send
8/26	RxC	RT	DCE	Receiver clock
9/27	CTS	CS	DCE	Clear to send
10	LL	LL	DTE	Local loopback
11/29	DSR	DM	DCE	Data set ready
12/30	DTR	TR	DTE	Data terminal ready
13/31	DCD	RR	DCE	Data carrier detect (RLSD)
14	RL	RL	DTE	Remote loopback
15	RI	IC	DCE	Ring indicator
16	SF	SF	DTE	Signal rate select (to DCE)
17/35	XTC	TT	DTE	External transmitter clock
18	TM	TM	DTE	Test mode
19		SG	Both	Signal ground

Table A-37 HDM EIA/TIA-449/422 Connector Pin Assignments (continued)

Pin No.	IGX Name	EIA Name	Source	Description
20		RC	DCE	Receive common
21				Spare
28	BSY	IS	DTE	Busy (in service)
32	SS	SS	DTE	Select standby
33	SQ	SQ	DCE	Signal quality detect
34	NS	NS	DTE	New synchronization
36	SB	SB	DCE	Standby indicator
37		SC	DTE	Send common

See [Table A-38](#) and [Table A-39](#) for Wire Lists for adapter cables for the X.21 application. This adapter cable is available in two models: one is used when the HDM/SDI card set operates as a DCE and the other when the HDM/SDI operates as a DTE. It has a male DB-37 on the IGX end and a female DB-15 (DCE) or male DB-15 (DTE) on the user end.

Table A-38 X.21 Adapter Cable Pin Assignments

DB-37 Pin No. (SDI)	IGX Name	DB-15 Pin No. (User)	Description
1	Drain	1	Frame ground
4	TxD-A	2	Transmit data from DTE
22	TxD-B	9	Transmit data from DTE
6	RxD-A	4	Receive data to DTE
24	RxD-B	11	Receive data to DTE
7	RTS-A	3	Request to send
25	RTS-B	10	Request to send
9	CTS-A	5	Clear to send
27	CTS-A	12	Clear to send
8	RxC-A	6	Receive clock
26	RxC-B	13	Receive clock
19	SG	8	Signal ground

Table A-39 X.21 Adapter Cable Pin Assignments

DB-37 Pin No. (SDI)	IGX Name	DB-15 Pin No. (User)	Description
1	Drain	1	Frame ground
4	TxD-A	2	Transmit data from DTE
22	TxD-B	9	Transmit data from DTE
6	RxD-A	4	Receive data to DTE

Table A-39 X.21 Adapter Cable Pin Assignments (continued)

DB-37 Pin No. (SDI)	IGX Name	DB-15 Pin No. (User)	Description
24	RxD-B	11	Receive data to DTE
7	RTS-A	3	Request to send
25	RTS-B	10	Request to send
9	CTS-A	5	Clear to send
27	CTS-A	12	Clear to send
5	TxC-A	6	Transmit clock
23	TxC-B	13	Transmit clock
19	SG	8	Signal ground
5 to 8	TxC-A		Receive clock ¹
23 to 26	TxC-B		Receive clock ¹

1. Loops Receive Clock to Transmit Clock when necessary.

HDM V.35 Port Pin Assignments

A standard V.35 cable works for this application.

Table A-40 HDM V.35 Connector Pin Assignments

Pin No.	Name	Source	Description
A	Gnd.	Both	Protective (shield) ground
B	Sig. Gnd.	Both	Signal ground
C	RTS	DTE	Request to send
D	CTS	DCE	Clear to send
E	DSR	DCE	Data set ready
F	DCD	DCE	Data carrier detect (RLSD)
H	DTR	DTE	Data terminal ready
J	RI	DCE	Ring indicator
K	TM	DCE	Test mode
P/S	TxD	DTE	Transmit data from DTE
R/T	RxD	DCE	Receive data to DTE
U/W	XTC	DTE	External transmitter clock
V/X	RxC	DCE	Receiver clock
Y/a	TxC	DCE	Transmitter clock

LDM EIA/TIA-232 Port Pin Assignments

Table A-41 lists the EIA/TIA-232 port pin assignments at the DB-15 connector on the LDM's LDI back card. The LDM card supports a limited subset of EIA control leads. The LDI always uses a DCE or DTE DB-15-to-DB-25 adapter cable. Refer to Table A-42 and Table A-43 for wiring lists and the pin-outs for the standard male DB-25 connector to the user data device.

Table A-41 LDM EIA/TIA-232 Connector Pin Assignments

Pin No.	IGX Name	EIA Name	Source	Description
1	Shield	AA	Both	Frame ground
2	TxD	BA	DTE	Transmit data from DTE
3	CTS	CB	DCE	Clear to send
4	RxD	BB	DCE	Received data to DTE
5	RTS	CA	DTE	Request to send
6	XTC	DB	DCE	Transmitter clock
7	RxC	DD	DCE	Receiver clock
8	SG	AB	Both	Signal ground
9	DSR	CC	DCE	Data set ready
10	DTR	CD	DTE	Data terminal ready
11	+VS		Both	+12V test voltage
12	-VS		Both	-12V test voltage
13	DCD	CF	DCE	Data carrier detect (RLSD)
14	RL		DTE	Remote loop (for modem loopback)
15	MOD			Mode select for cable (DTE or DCE)

Table A-42 LDM Adapter Cable Pin Assignments

DB-15 Pin No. (LDI)	IGX Name	DB-25 Pin No. (User)	Description
1	Frm. Gnd.	1	Frame ground
2	RxD	3	Received data to DTE
3	RTS	4	Request to send
4	TxD	2	Transmit data from DTE
5	CTS	5	Clear to send
6	XTC	24	External transmit clock
7	RxC	17	Receive clock
8	SG	7	Signal ground
9	DTR	20	Data terminal ready
10	DSR	6	Data set ready
11	+VS	9	+12V test voltage ¹
12	-VS	10	-12V test voltage ¹

Table A-42 LDM Adapter Cable Pin Assignments (continued)

DB-15 Pin No. (LDI)	IGX Name	DB-25 Pin No. (User)	Description
13	DCD	8	Data carrier detect (RLSD)
14	RL	21	Remote loop output
15	MOD	n.c.	Connects internally to DB-15-8
(3)	LL	18	Local loop output ²

1. You can use one of these pins to force a control pin to stay high or low.
2. No LDI local loop output is available. Try using DTR output: DB-15-9.

**Note**

Two adapter cables are available for the LDI card. The choice of cable determines whether the LDI card functions as a DCE or as a DTE. These can be ordered from Cisco Systems or made by the customer. Make sure that the correct cable is used for the type of user device connected.

Table A-43 LDM Adapter Cable Pin Assignments

DB-15 Pin No. (LDI)	IGX Name	DB-25 Pin No. (User)	Description
1	Shield	1	Frame ground
2	TxD	2	Transmit data from DTE
3	CTS	5	Clear to send
4	RxD	3	Receive data to DTE
5	RTS	4	Request to send
6	RxC	17	Receive clock, connects to DB-25-15 ¹
7	XTC	24	External transmit clock
8	SG	7	Signal ground
9	DSR	6	Data set ready
10	DTR	20	Data terminal ready
11	+VS	9	+12V test voltage ²
12	-VS	10	-12V test voltage ³
13	Not connected	Not connected	Not used
14	DCD	8	Data carrier detect (RLSD)
15	MOD	n.c.	Mode select, no connection for DCE cable
Not connected ²	TxC	15	Transmit clock, connects to DB-25-17 ²

1. Pins 15 and 17 connect through a jumper.
2. You can use one of these pins to force a control pin to stay high or low.

Redundancy Cabling

Table A-44 Y-Redundancy Cabling

Cable	Used On	Cisco Part No.
EIA/TIA-232C	SDI	5624
EIA/TIA-232D	SDI	5624
EIA/TIA-232	LDI	5629
V.35	SDI	5635
V.35	SDI	Special DTE/DCE jumper
EIA/TIA-422/449	SDI	5644
T1	BC-T1	5607
E1	BC-E1	5685

Power Cabling

This section describes AC and DC power cabling between the IGX node and the power source. Source-end connector information is not available for all countries, so local codes must be known or obtained by either the customer or the installer. [Table A-45](#) describes AC power cabling. [Table A-46](#) describes DC power cabling.

Table A-45 AC Power Cabling

Piece	Standard
Cable	Cisco provides a 6-ft (1.8 m), 3-conductor cord with an IEC 320 C-19 appliance coupler for mating with the IGX node on the system end. The other end of the power cord should be a grounding-type attachment plug, as described in the paragraphs that follow.
Connector	<p>In North America and Japan:</p> <p>For IGX 8320/8430: NEMA L6-20 Twist Lock</p> <p>For IGX 8410: NEMA L6-20 Twist Lock or NEMA 5-15</p> <p>For Continental Europe: CEE 7/7 (Schuko)</p> <p>For Italy: CEI 23-16/VII (16 A plug)</p> <p>For United Kingdom and Ireland: BS 1363</p> <p>For Australia and New Zealand: AS 3112</p> <p>For those countries not appearing in the preceding list, use a power cord with an IEC 320 C-19 appliance coupler for the system end and an appropriate grounding-type attachment plug at the other end, in accordance with local standards.</p>

Table A-46 DC Power Cabling

Piece	Standard
Cable	You provide a 3-conductor cord. The other end of the power cord should be a grounding-type attachment. The wire gauge is 10 to 12 AWG or 4 sq. mm.
Connector	At the system end, Cisco provides a pluggable wire block with screw-type clamping for the three conductors. The customer or installer attaches the customer-supplied wiring to this block.

SCM Cabling

SCM cabling connects the network management ports on the SCM to Cisco WAN Manager (formerly StrataView Plus) network management computers, control terminals, and modems. This cabling also provides the connection for an external clock source.

Auxiliary and Control Port Cabling

- Interface: The IGX SCM auxiliary and control ports are configured as an EIA/TIA-232 DCE port.
- Suggested cable: 24 AWG, 25-pair. A straight-through EIA/TIA-232 cable is used for a terminal or printer connection. A null modem cable ([Figure A-4](#)) is needed when interfacing with modems on either port.
- Cable length: 50 ft (15 m) maximum.
- Cable connector: DB-25, subminiature, male. [Table A-47](#) contains a list of the port pin assignments.

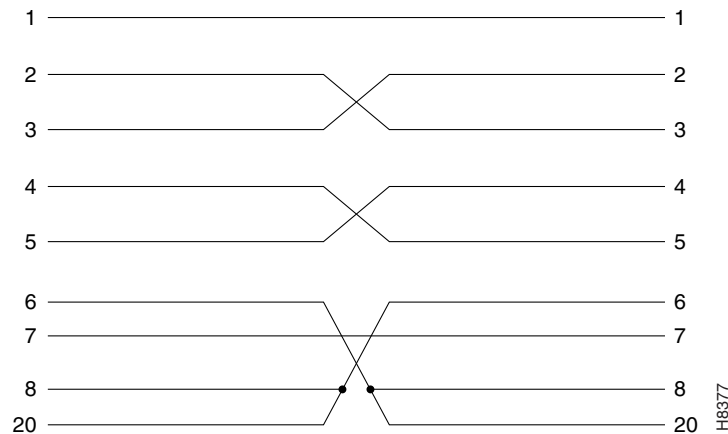
Table A-47 Auxiliary and Control Connector Pin Assignments

Pin No.	Name	Source	Description
1	FG	both	Frame ground
2	TxD	DTE	Transmit data
3	RxD	DCE	Receive data
4	RTS	DTE	Request to send
5	CTS	DCE	Clear to send
6	DSR	DCE	Data set ready
7	SG	both	Signal ground
8	CD	DCE	Carrier detect
20	DTR	DTE	Data term ready

Null Modem Cable

Figure A-4 shows a null modem cable that connects some of the 1200 and 2400 baud modems to the IGX control and auxiliary ports.

Figure A-4 Null Modem Cable



External Clock Input Cabling

Two separate clock inputs exist, and can be used simultaneously on the IGX. They are labelled External-1 and External-2. Both clock inputs require an EIA/TIA 422 balanced square wave signal at either 1.544 or 2.048 MB per second.



Note

Standard DS1 or E1 BITS clock sources using AMI bipolar pulse stream signals are not compatible with IGX external clock inputs.

Table A-48 External Clock Cabling

Cable Parameter	Description
Interface	Balanced EIA/TIA 422
Suggested cable	24 AWG, individually shielded, 1- or 2-pair
Cable connector	DB-15, subminiature, male. See Table A-49 for pinouts
Maximum cable length	50 ft (15 m)

Table A-49 External Clock Connector Pin Assignments

Pin No.	Description
1	External Clk 1-A
9	External Clk 1-B
2	Shield ground pair 1
3	External Clk 2-A

Table A-49 External Clock Connector Pin Assignments (continued)

Pin No.	Description
11	External Clk 2-B
4	Shield ground pair 1
5	8.192 MHz test output (factory use only)

External Alarm Cabling

This cable connects network alarm outputs to either the DTI Faceplate or the ARI card alarm connector. [Table A-50](#) lists particulars for the physical interface. [Table A-51](#) lists the pinouts for the network alarm outputs. In [Table A-51](#), note that pins whose names end in “A” are normally open, and pins whose names end in “C” are common.

Table A-50 External Alarm Cabling

Parameter	Description
Interface	Dry-contact relay closure
Wire	24 AWG, shielded, 10 pairs
Connector	DB-37, subminiature, male

Table A-51 External Alarm Connector Pin Assignments

Pin No.	Name	Description
1	CHASSIS	Chassis ground
2		Reserved
3	NWMAJA	Network major alarm
4	NWMAJC	Network major alarm
5		Reserved
6		Reserved
7		Reserved
8		Reserved
9		Reserved
10	MNVISA	Minor visual alarm
11		Reserved
12	MNVISC	Minor visual alarm
13		Reserved
14		Unused
15		Unused
16	MJAUDC	Major audible alarm
17	MJAUDA	Major audible alarm

Table A-51 External Alarm Connector Pin Assignments (continued)

Pin No.	Name	Description
18		Unused
19		Unused
20		Reserved
21		Reserved
22		Reserved
23	NWMINA	Network minor alarm
24		Reserved
25	NWMINC	Network minor alarm
26		Reserved
27		Reserved
28		Reserved
29	MNAUDA	Minor audible alarm
30		Reserved
31	MNAUDC	Minor audible alarm
32		Unused
33		Unused
34		Unused
35	MJVISC	Major visual alarm
36	MJVISA	Major visual alarm
37		Unused

Standard IGX Cables

[Table A-52](#) lists the cables you can order directly from Cisco Systems. The length of the cable appears as a suffix to the model number. For example 5610-50 indicates a 50-foot cable. Cables are generally available in standard lengths of 10 ft (3 m), 25 ft (7.6 m), 50 ft (15 m), 75 ft (22.8 m) and 100 ft (30 m). Lengths of 101 ft (30 m) to 600 ft (183 m) are available through special order.

Where applicable, [Table A-52](#) indicates the connector gender (male-female) as well as the number of pins. For example T1/M15-M15 indicates a cable terminated with a male DB-15 at both ends.


Note

Most cables listed as T1 can also be used for E1 service.


Note

Transmit direction is towards the Y trunk.

Table A-52 Standard IGX Cables

Model	Description	Usage
5608	T1, pigtail to RJ48	CSU to telco demarc
5614	T1/M15-M15 turnover	E1 trunk to CSU
5616	T1/M15-M15	—
5680	BNC-DB-15	E1 trunk
5685	T1/M15-M15 turnover, Y-cable	E1 trunk redundancy
5630	V.35/M34-F34	Subrate trunk or data circuit
5636E	V.35 Y-cable	Subrate trunk or data circuit redundancy
5645	EIA/TIA-422/X.21 adapter-DTE	IGX is DTE
5646	EIA/TIA-422/X.21 adapter-DCE	IGX is DCE
5644	EIA/TIA-422 Y-cable	Subrate trunk or data circuit redundancy
5695	X.21/DB-15 Y-cable	Subrate trunk or data circuit redundancy
5620	EIA/TIA-232/M25-F25	Control port to control terminal, StrataView Plus, or external window device
5621	EIA/TIA-232/M25-M25 special	Control or Aux. port to modem
5625	V.35/M15-F25	LDI8 (DCE) to data device
5626E	V.35/M15-M25	LDI8 (DTE) to data device
5629	EIA/TIA 232/M15-M15, Y-cable	LDI redundancy

Cisco Cabinet Dimensions

This section illustrates the space requirements for various system configurations in the Cisco cabinet and a typical cable management setup. It also contains a table with the height of Cisco WAN switching components in inches, centimeters, and rack-mount units (RMUs). This can help in the calculation of height requirements for individual system configurations. The last illustration shows the bracket installation in the Cisco cabinet (for a BPX 8620 node, in this case). The illustrated components are:

- BPX 8620
- IGX 8410, 8420, and 8430 switches
- Cisco MGX 8220 edge concentrator

The sequence of illustrations in this chapter is as follows:

- Cisco Cabinet
- Cable Management
- Examples of System Configurations
- Table of Component Heights

Figure A-5 Back View of Cisco Cabinet

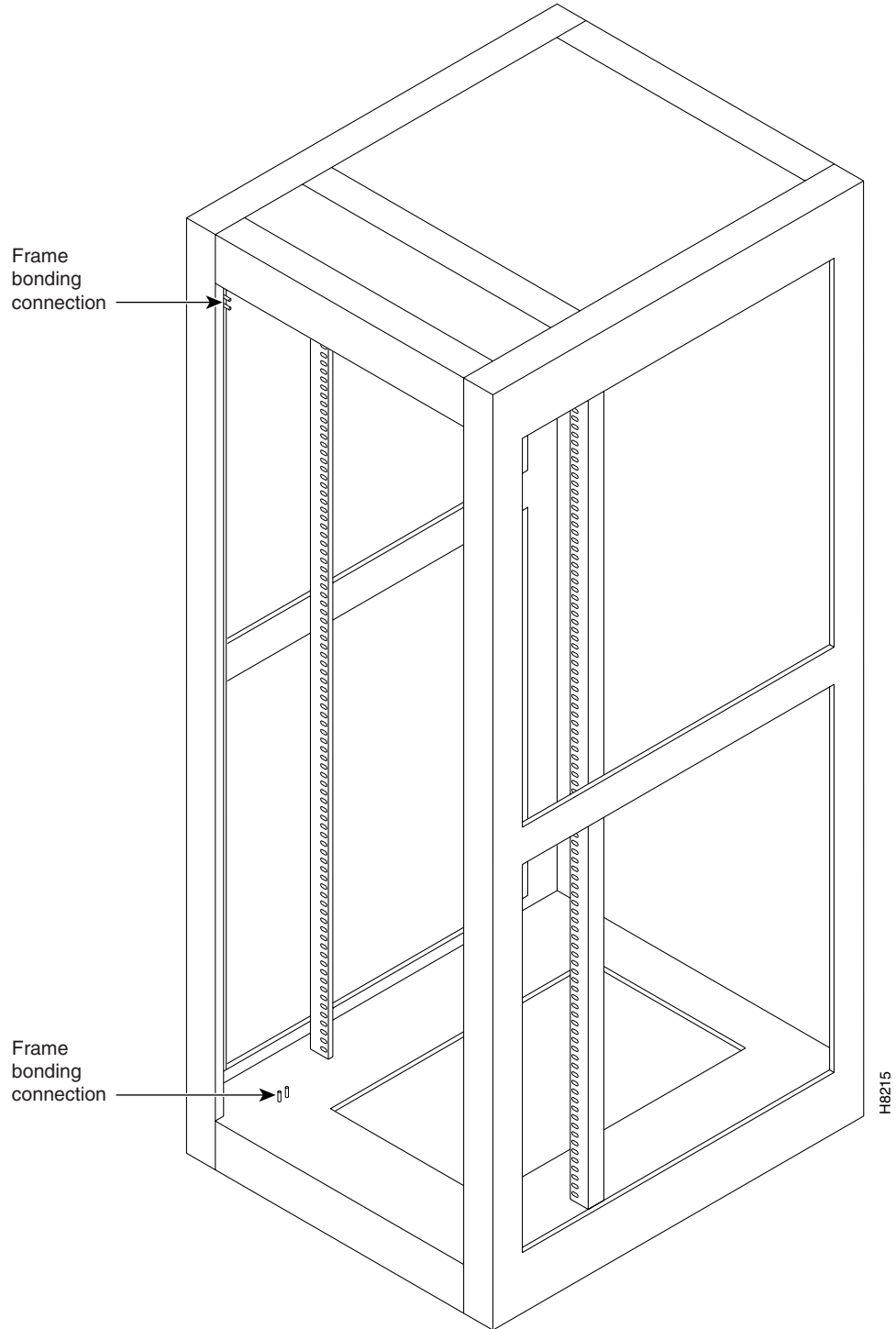
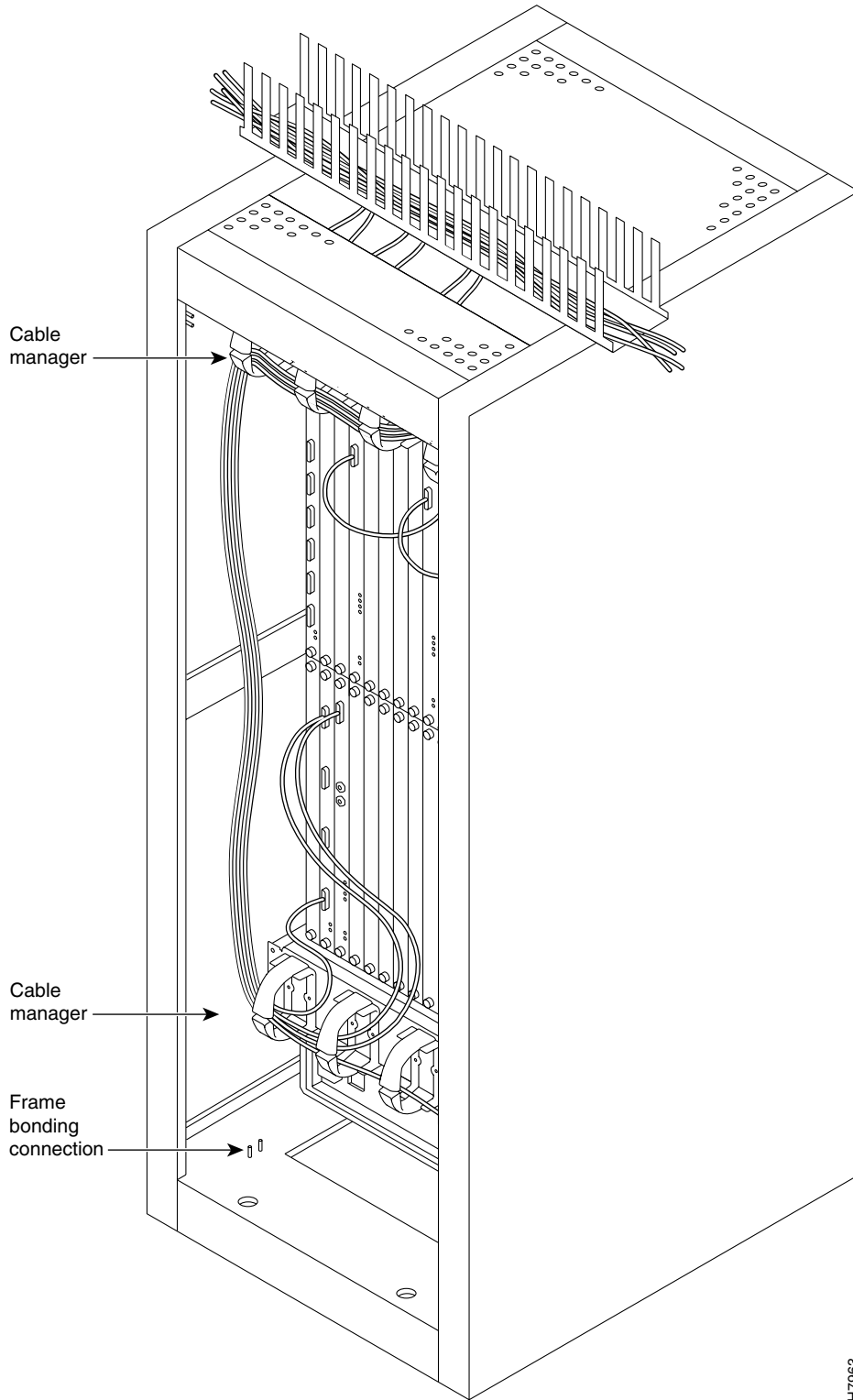


Figure A-6 Cable Management



H7963

Figure A-7 IGX 8430 Switch, AC and DC-Powered

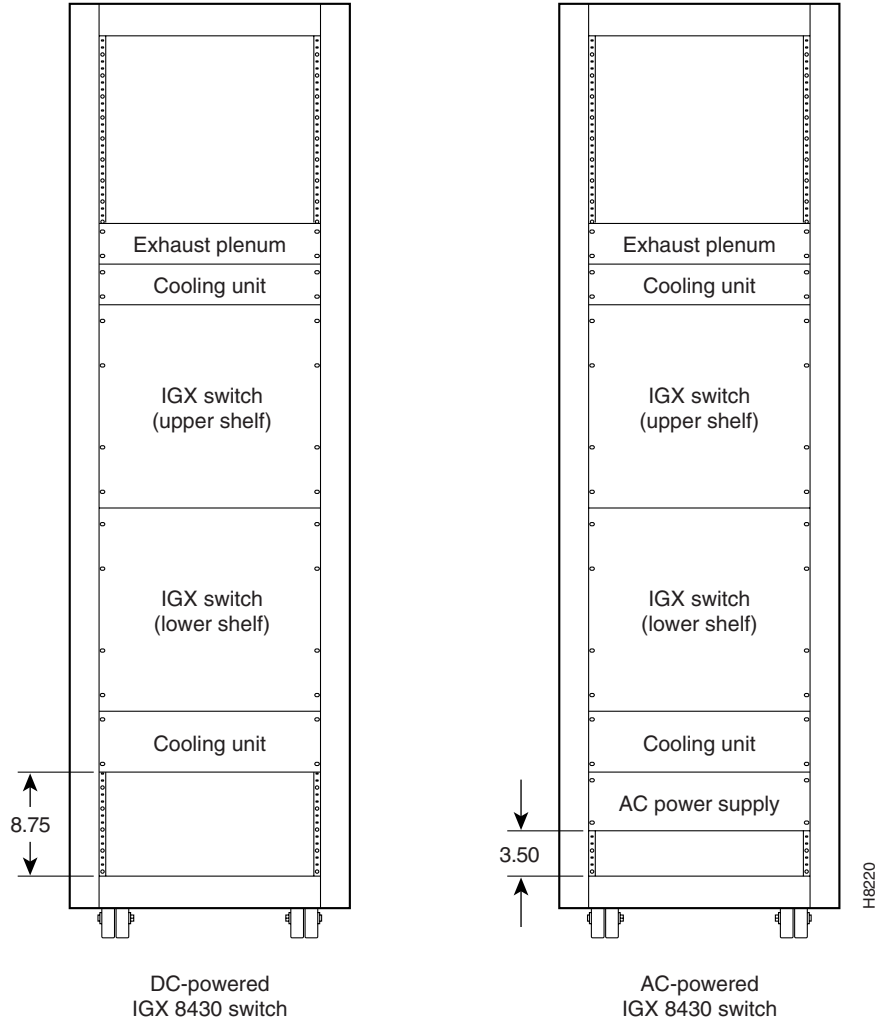


Figure A-8 IGX 8420 Switch, DC-Powered and AC-Powered

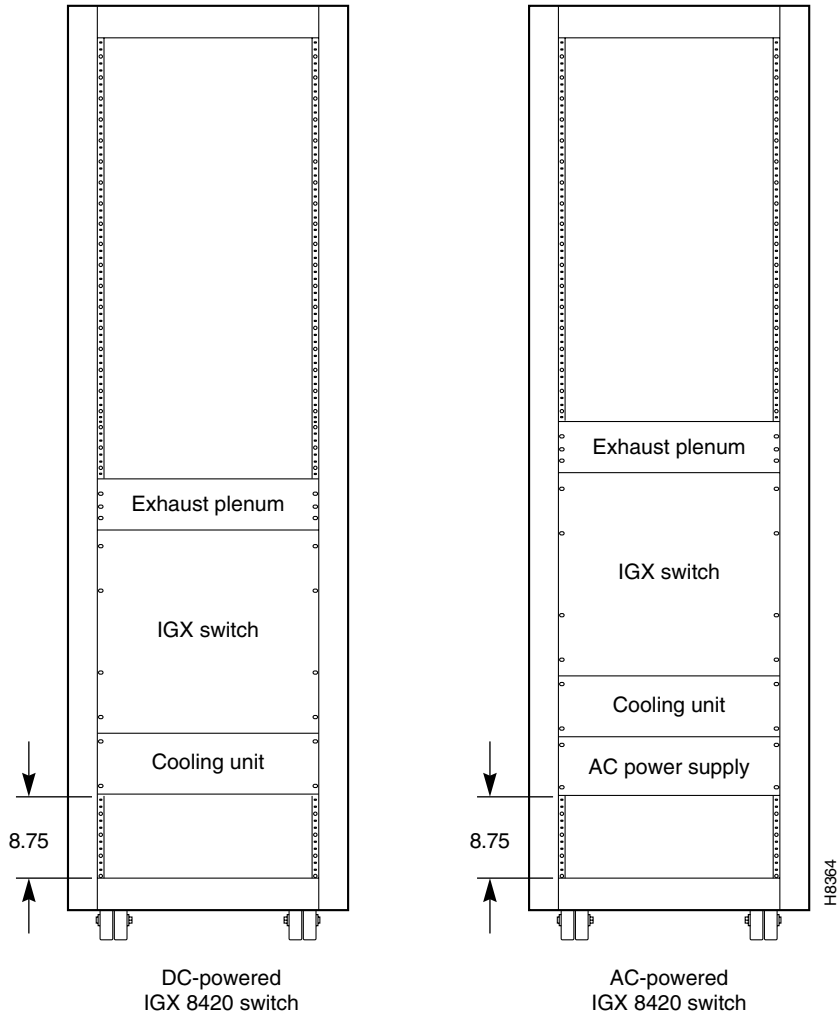
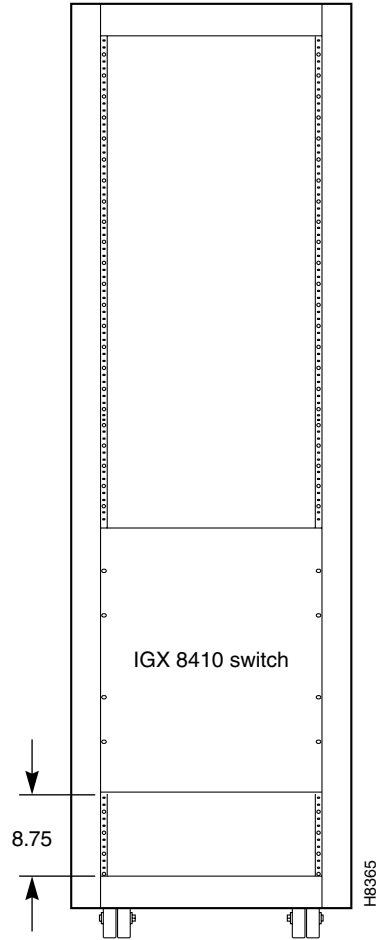


Figure A-9 IGX 8410 Switch, AC or DC-Powered



AC or DC-powered
IGX 8410 switch

Figure A-10 Single BPX Switch, AC and DC-Powered

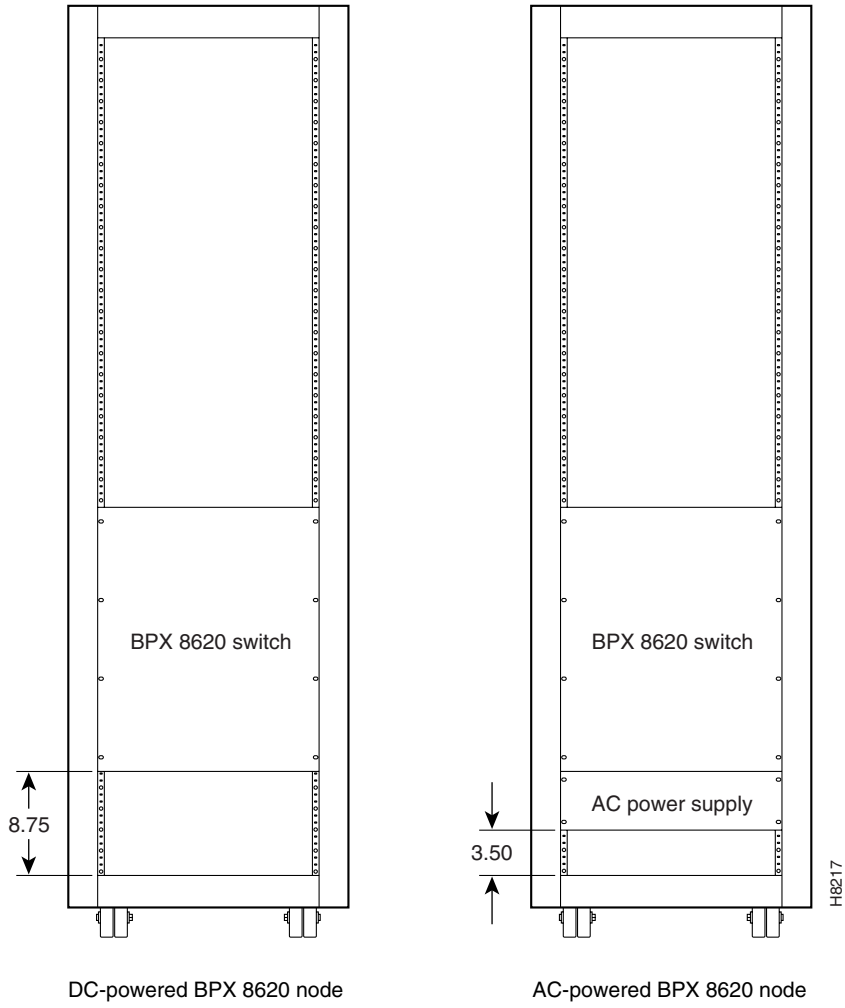
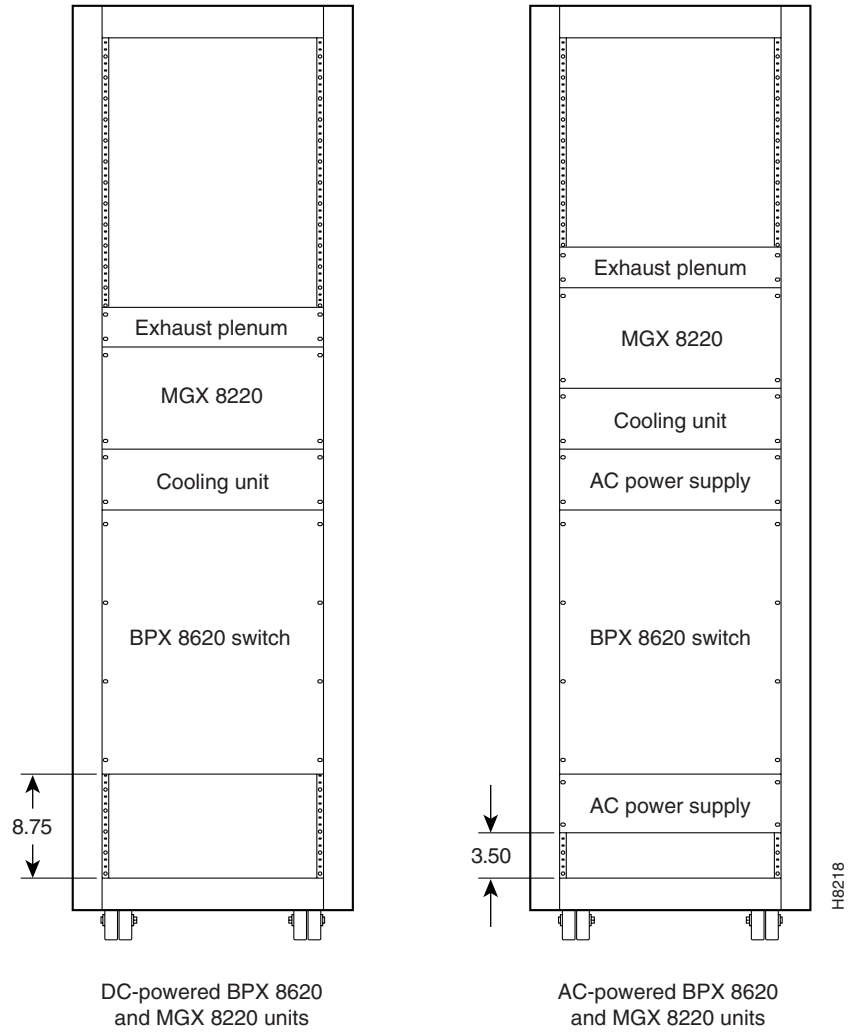


Figure A-11 Single BPX Node and MGX 8220 Edge Concentrator, AC and DC-Powered



DC-powered BPX 8620 and MGX 8220 units

AC-powered BPX 8620 and MGX 8220 units

Figure A-12 BPX Node, MGX 8220 Edge Concentrator, and ESP, AC and DC-Powered

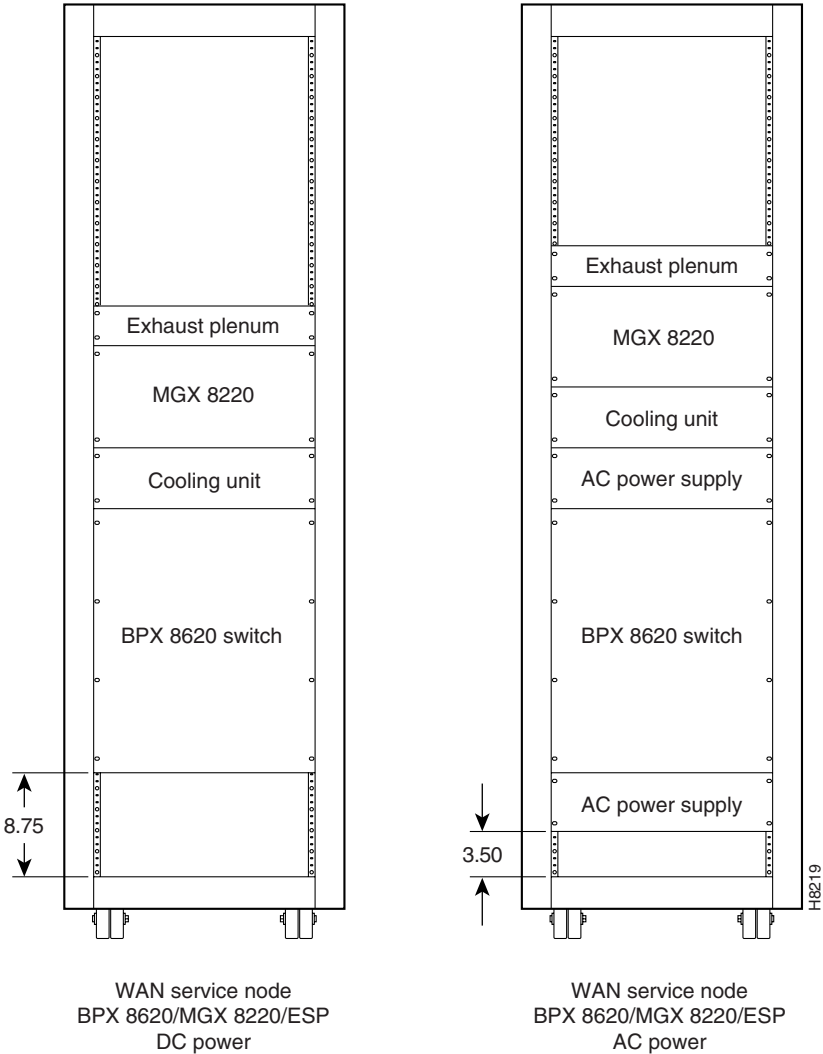
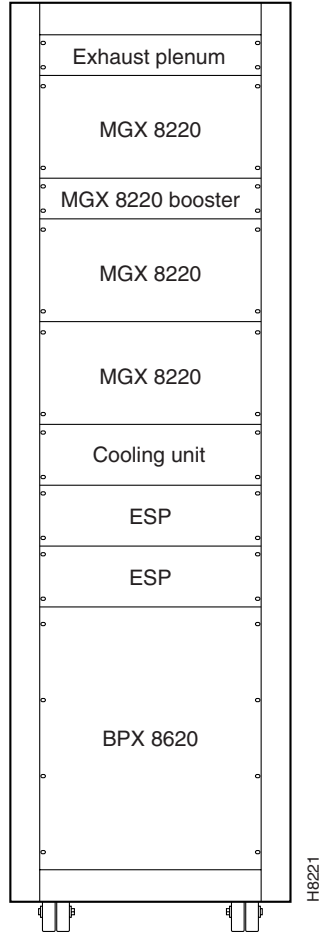
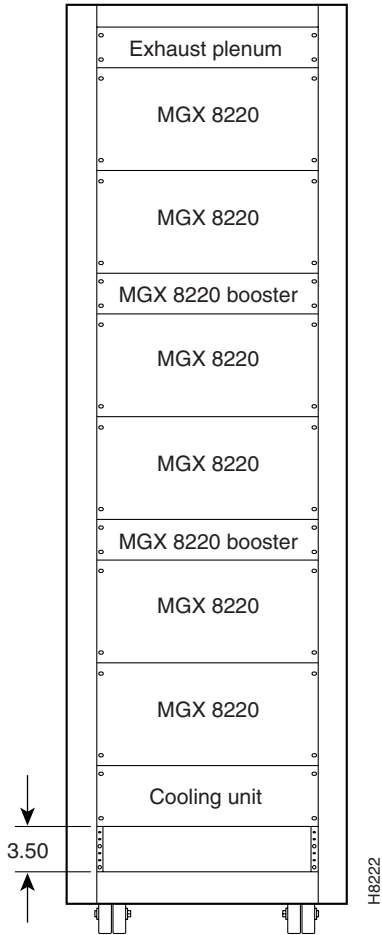


Figure A-13 BPX Node With 2 ESP Systems and 3 MGX 8220 Shelves, DC-Powered



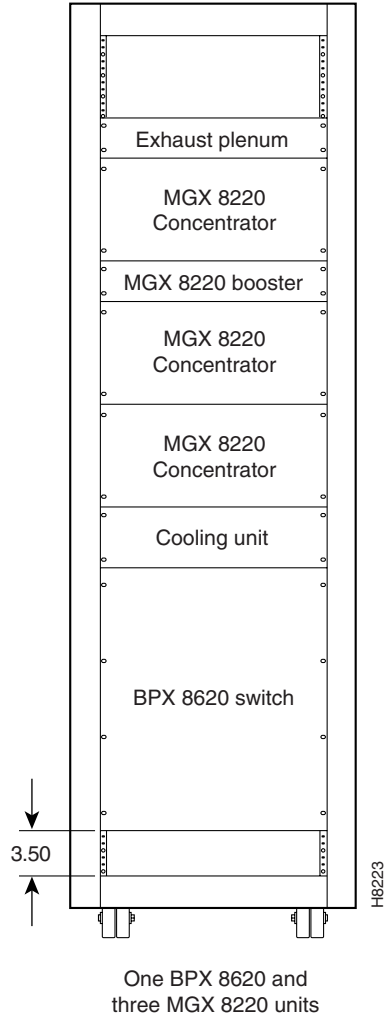
WAN service node
BPX 8620/MGX 8220/ESP
DC power

Figure A-14 Six MGX 8220 Edge Concentrators, DC-Powered



Six MGX 8220 edge concentrators

Figure A-15 BPX Node With Three MGX 8220 Edge Concentrators, DC-Powered

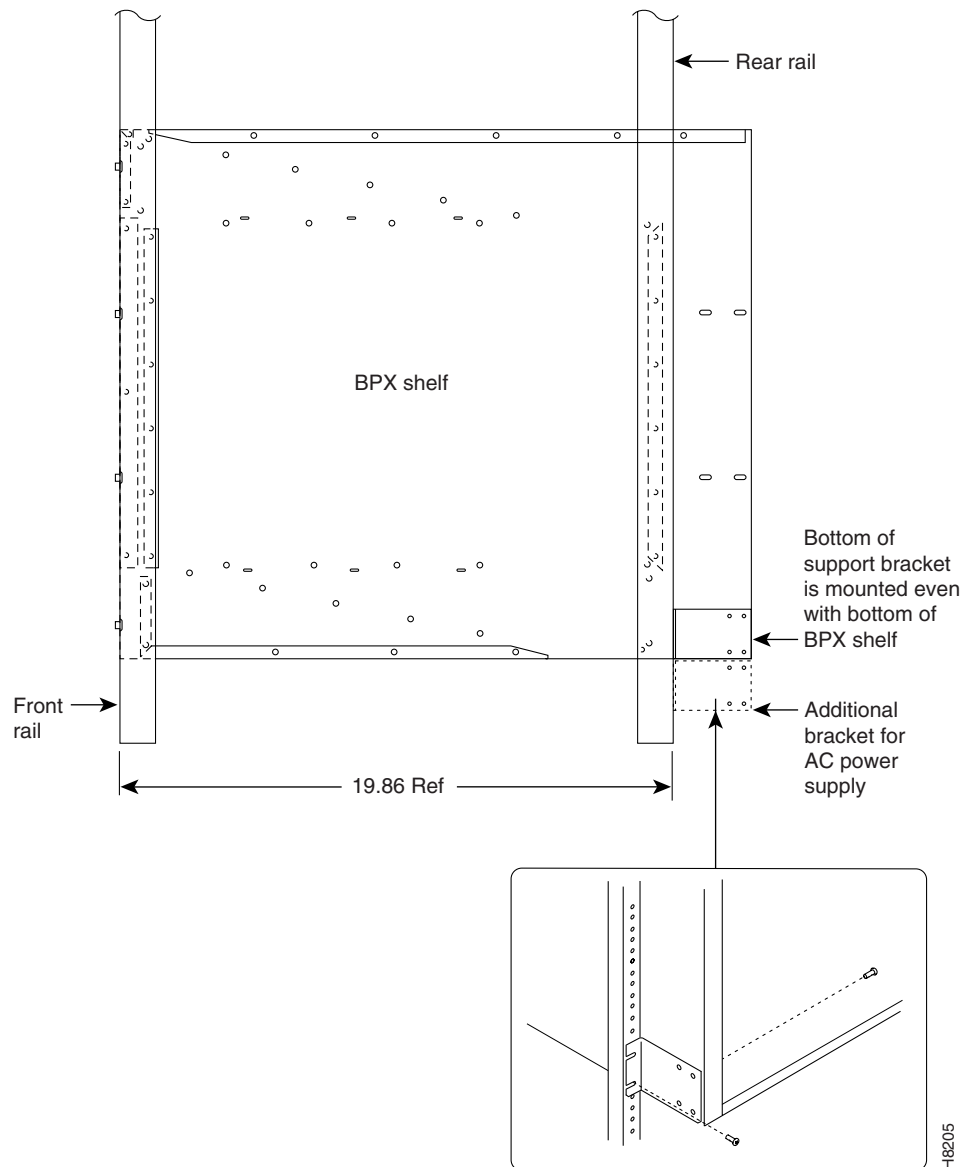


Components	Unit Height		
	Inches	Centimeters	RMUs
MGX 8220 card cage	8.75	22.225	5
MGX 8220 AC power supply shelf	5.25	13.335	3
MGX 8220 booster fan assembly	3.5	8.89	2
MGX 8220 cooling assembly	5.25	13.335	3
MGX 8220 exhaust plenum	3.5	8.89	2
BPX AC power supply shelf	5.25	13.335	3
BPX card cage	22.75	57.785	13
IGX AC power supply shelf	5.25	13.335	3
IGX booster fan assembly	3.5	8.89	2
IGX card cage	17.5	44.45	10
IGX cooling assembly	5.25	13.335	3
IGX exhaust plenum	3.5	8.89	2
IGX node	24.5	62.23	14
VNS	5.25	13.335	3
Cabinet	Unit Height		
	Inches	CM	RMUs
Cisco cabinet	71.75	1822.45	41
Other cabinets	75.25	1911.35	43

**Note**

The depth of the cabinet supplied by Cisco is 36 in., the width is 23 in., and the weight (empty of equipment with side panels installed) is 233 lbs.

Figure A-16 Mounting Brackets (BPX Example)



Where to Go Next

For software configuration and service provisioning information, see the *Cisco IGX 8400 Series Provisioning Guide*, [Chapter 1, “Introduction to the Cisco IGX 8400 Series.”](#)

For more information on switch software commands, refer to the *Cisco WAN Switching Command Reference*, [Chapter 1, “Command Line Fundamentals.”](#)



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