# Catalyst 3500 Series XL Hardware Installation Guide

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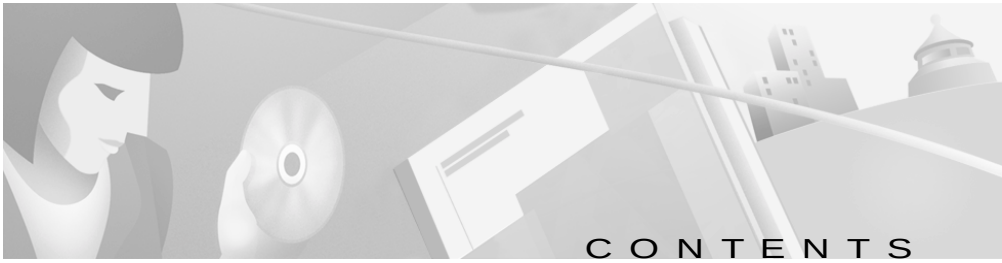

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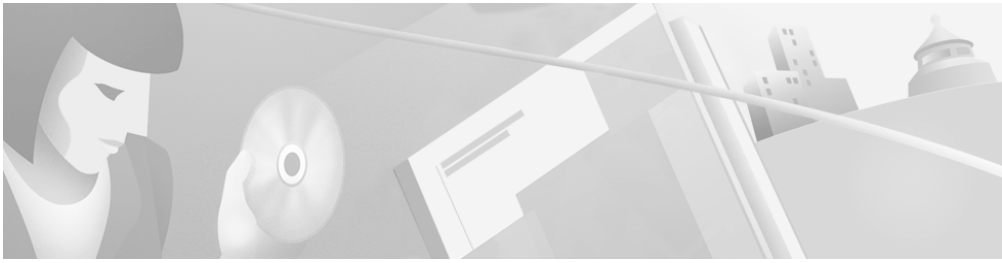

# Preface

## Audience

This guide is for the networking or computer technician responsible for installing and configuring a Catalyst 3500 series XL switch. We assume that you are familiar with the concepts and terminology of Ethernet and local area networking.

## Purpose

The *Catalyst 3500 Series XL Hardware Installation Guide* documents the hardware features of Catalyst 3500 series XL switches. It describes the physical and performance characteristics of the switches in the series, explains how to install a switch and set up its initial configuration, provides troubleshooting information, and describes how to assign IP information to the switch.

# Organization

This guide is organized into the following chapters:

Chapter 1, “Product Overview,” is a physical and functional overview of the switch. It describes the switch ports, the standards they support, and the switch LEDs. Examples of how the switch could be installed suggest possible deployment strategies.

Chapter 2, “Installing and Starting Up the Switch,” contains the procedures for installing a switch on a rack, wall, table, or shelf. It also describes how to set up the switch initial configuration.

Chapter 3, “Troubleshooting,” describes how to identify and resolve some of the problems that might arise when you are installing the switch.

Appendix A, “Technical Specifications,” lists the physical and environmental specifications for the switches and the regulatory agency approvals.

Appendix B, “Connector and Cable Specifications,” describes the connectors, cables, and adapters that can be used to connect to the switch.

Appendix C, “Translated Safety Warnings,” contains translations in various languages of the warnings in this guide.

# Conventions

This guide uses the following conventions to convey instructions and information:

Command descriptions use these conventions:

- Commands and keywords are in **boldface**.
- Arguments for which you supply values are in *italic*.

Examples use these conventions:

- Terminal sessions and system displays are in `screen` font.
- Information you enter is in **`boldface screen`** font.
- Nonprinting characters, such as passwords or tabs, are in angle brackets (< >).

Notes, cautions, and warnings use the following conventions and symbols:

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

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

**Warning** **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 Appendix C, "Translated Safety Warnings."**

**Waarschuwing** **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 standaard maatregelen om ongelukken te voorkomen. Voor vertalingen van de waarschuwingen die in deze publicatie verschijnen, kunt u het document *Regulatory Compliance and Safety Information* (Informatie over naleving van veiligheids- en andere voorschriften) raadplegen dat bij dit toestel is ingesloten.**

**Varoitus** **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 julkaisussa esiintyvien varoitusten käännökset löydät laitteen mukana olevasta *Regulatory Compliance and Safety Information* -kirjasesta (määräysten noudattaminen ja tietoa turvallisuudesta).**

**Attention** **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 le document *Regulatory Compliance and Safety Information* (Conformité aux règlements et consignes de sécurité) qui accompagne cet appareil.**

**Warnung** **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 finden Sie im Dokument *Regulatory Compliance and Safety Information* (Informationen zu behördlichen Vorschriften und Sicherheit), das zusammen mit diesem Gerät geliefert wurde.**

**Avvertenza** **Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di lavorare su qualsiasi apparecchiatura, occorre conoscere i pericoli relativi ai circuiti elettrici ed essere al corrente delle pratiche standard per la prevenzione di incidenti. La traduzione delle avvertenze riportate in questa pubblicazione si trova nel documento *Regulatory Compliance and Safety Information* (Conformità alle norme e informazioni sulla sicurezza) che accompagna questo dispositivo.**

**Advarsel** **Dette varselsymbolet betyr fare. Du befinner deg i en situasjon som kan føre til personskade. Før du utfører arbeid på utstyr, må du vare oppmerksom på de faremomentene som elektriske kretser innebærer, samt gjøre deg kjent med vanlig praksis når det gjelder å unngå ulykker. Hvis du vil se oversettelser av de advarslene som finnes i denne publikasjonen, kan du se i dokumentet *Regulatory Compliance and Safety Information* (Overholdelse av forskrifter og sikkerhetsinformasjon) som ble levert med denne enheten.**

**Aviso** **Este símbolo de aviso indica perigo. Encontra-se numa situação que lhe poderá causar danos físicos. Antes de começar a trabalhar com qualquer equipamento, familiarize-se com os perigos relacionados com circuitos eléctricos, e com quaisquer práticas comuns que possam prevenir possíveis acidentes. Para ver as traduções dos avisos que constam desta publicação, consulte o documento *Regulatory Compliance and Safety Information* (Informação de Segurança e Disposições Reguladoras) que acompanha este dispositivo.**

**¡Advertencia!** **Este símbolo de aviso significa peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considerar los riesgos que entraña la corriente eléctrica y familiarizarse con los procedimientos estándar de prevención de accidentes. Para ver una traducción de las advertencias que aparecen en esta publicación, consultar el documento titulado *Regulatory Compliance and Safety Information* (Información sobre seguridad y conformidad con las disposiciones reglamentarias) que se acompaña con este dispositivo.**

**Varning!** **Denna varningssymbol 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 vanligt förfarande för att förebygga skador. Se förklaringar av de varningar som förkommer i denna publikation i dokumentet *Regulatory Compliance and Safety Information* (Efterrättelse av föreskrifter och säkerhetsinformation), vilket medföljer denna anordning.**

# Related Publications

For more information about Catalyst 3500 series XL switches and related products, refer to the following publications:

- *Quick Start: Catalyst 3500 Series XL Cabling and Setup*
- *Cisco IOS Desktop Switching Software Configuration Guide*
- *Cisco IOS Desktop Switching Command Reference* (online only)
- Cisco Cluster Management Suite online help provides detailed procedures for using a Web browser to change configuration settings and to display switch information. Online help also provides detailed information about the fields on each window.
- *Release Notes for the Catalyst 2900 Series XL and Catalyst 3500 Series XL Cisco IOS Release 12.0(5)XU*
- *Catalyst GigaStack Gigabit Interface Converter Hardware Installation Guide*
- *Release Notes for the Catalyst GigaStack Gigabit Interface Converter*

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- Telnet: cco.cisco.com
- Modem using standard connection rates and the following terminal settings: VT100 emulation; 8 data bits; no parity; and 1 stop bit.
  - From North America, call 408 526-8070
  - From Europe, call 33 1 64 46 40 82

You can e-mail questions about using CCO to cco-team@cisco.com.

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|---|---|
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| Kanji (Japanese) | japan-tac@cisco.com |
| Hangul (Korean) | korea-tac@cisco.com |
| Spanish | tac@cisco.com |
| Thai | thai-tac@cisco.com |

In North America, TAC can be reached at 800 553-2447 or 408 526-7209. For other telephone numbers and TAC e-mail addresses worldwide, consult the following web site: http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml.

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# Product Overview

This chapter provides the following topics that describe the Catalyst 3500 series XL switches:

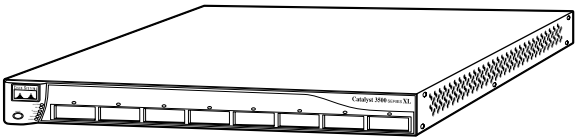
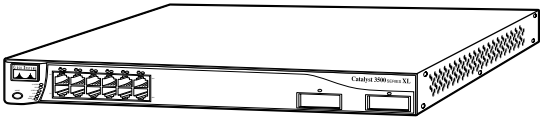
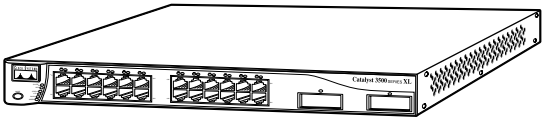
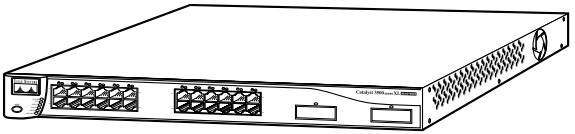
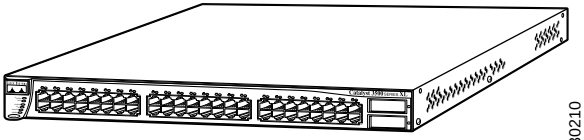
- Switch features
- Descriptions of the front and rear panels
- Management options
- Examples of the Catalyst 3500 XL switches in different network topologies

## Features

The Catalyst 3500 series XL switches—also referred to as Catalyst 3500 XL switches—are stackable 10/100 Ethernet switches to which you can connect workstations and Cisco IP Phones and other network devices such as servers, routers, and other switches. These switches also can be deployed as backbone switches, aggregating 10/100 and Gigabit Ethernet traffic from other network devices. A feature specific to the Catalyst 3524-PWR XL switch is its ability to provide inline power to Cisco IP Phones. (Phone adapters are not required when connecting to the Catalyst 3524-PWR XL 10/100 switch ports.)

Figure 1-1 shows the switch models in the series, and Table 1-1 and Table 1-2 list their features.

***Figure 1-1 Catalyst 3500 Series XL Switches***

| Switch | Description | |
|---|---|---|
| WS-C3508G-XL | 8 GBIC[1]-based gigabit module slots |  |
| WS-C3512-XL | 12 autosensing10/100 Ethernet ports<br><br>2 GBIC-based gigabit module slots |  |
| WS-C3524-XL | 24 autosensing 10/100 Ethernet ports<br><br>2 fixed GBIC-based gigabit module slots |  |
| WS-C3524-PWR-XL | 24 autosensing 10/100 inline-power Ethernet ports<br><br>2 GBIC-based gigabit module slots |  |
| WS-C3548-XL | 48 autosensing 10/100 Ethernet ports<br><br>2 GBIC-based gigabit module slots |  |

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1. GBIC = Gigabit Interface Converter

*Table 1-1 Catalyst 3508G XL Features*

| Feature | Description |
|---|---|
| Performance and Configuration | • 8 GBIC-based 1000BaseX Gigabit Ethernet slots<br>• Support for up to 250 port-based virtual LANs (VLANs)<br>• Inter-Switch Link (ISL) and IEEE 802.1Q trunking support on all ports<br>• IEEE 802.1p capable<br>• High-speed EtherChannel connections between switches and servers<br>• 8192 MAC addresses<br>• Cisco Group Management Protocol (CGMP) to limit the flooding of IP multicast traffic<br>• Broadcast storm control to prevent performance degradation from broadcast storms<br>• Switch Port Analyzer (SPAN) port monitoring on any port<br>• Support for command switch redundancy<br>• Support for Cisco Gigabit Interface Converter (GBIC) modules<br>– GigaStack GBIC module<br>– 1000BaseSX GBIC module<br>– 1000BaseLX/LH GBIC module<br>– 1000BaseZX GBIC module (support for up to four 1000BaseZX GBICs with the Catalyst 3508G XL switch) |
| Management | • Cisco IOS command-line interface (CLI) through the console port or Telnet<br>• CiscoView device-management application<br>• Cluster Management Suite, a web-based tool for managing switch clusters or an individual switch through a single IP address<br>• Simple Network Management Protocol (SNMP) |
| Power Redundancy | • Connection for optional Cisco 600W Redundant Power System (RPS) that operates on AC input and supplies DC output to the switch |

*Table 1-2 Catalyst 3512, 3524, 3524-PWR, and 3548 XL Features*

| Feature | Description |
|---|---|
| Performance and Configuration | • Autonegotiation of speed and duplex operation on 10/100 Ethernet ports<br>• 12, 24, or 48 10/100 Ethernet ports and 2 GBIC-based Gigabit Ethernet slots<br>• Support for up to 250 port-based VLANs<br>• ISL and IEEE 802.1Q trunking support on all ports<br>• Support for voice VLAN ID (VVID)<br>• High-speed EtherChannel connections between switches and servers<br>• 8192 MAC addresses<br>• IEEE 802.1p capable<br>• CGMP to limit the flooding of IP multicast traffic<br>• Broadcast storm control to prevent performance degradation from broadcast storms<br>• SPAN port monitoring on any port<br>• Support for command switch redundancy<br>• Support for Cisco GBIC modules<br>– GigaStack GBIC<br>– 1000BaseSX GBIC module<br>– 1000BaseLX/LH GBIC module<br>– 1000BaseZX GBIC module |

*Table 1-2 Catalyst 3512, 3524, 3524-PWR, and 3548 XL Features (continued)*

| Feature | Description (continued) |
|---|---|
| Management | • Cisco IOS CLI through the console port or Telnet<br>• CiscoView device-management application<br>• Cluster Management Suite, a web-based tool for managing switch clusters or an individual switch through a single IP address<br>• SNMP |
| Power Redundancy | • Connection for optional Cisco RPS 600 that operates on AC input and supplies DC output to the Catalyst 3512, 3524, and 3548 XL switches<br>• Connection for optional Cisco RPS 300 that operates on AC input and supplies DC output to the Catalyst 3524-PWR XL switch |
| Inline Power (Catalyst 3524-PWR XL switch only) | • Ability to provide inline power for Cisco IP Phones from all 24 10/100 Ethernet ports<br>• Auto-detection and control of inline phone power on a per-port basis on all 10/100 ports<br>• Support for fan-fault and over-temperature detection through Visual Switch Manager (VSM) |

# Front-Panel Description

The front panel of the Catalyst 3508G XL switch (Figure 1-2) has eight 1000BaseX GBIC module slots but no 10/100 ports. The front panel of the Catalyst 3512, 3524, 3524-PWR and 3548 XL switches (Figure 1-3, Figure 1-4, Figure 1-5, and Figure 1-6) have 10/100 RJ-45 ports and two 1000BaseX GBIC module slots. All Catalyst 3500 XL switches have a set of LEDs and a Mode button. (The Catalyst 3548 XL switch has a Mode label that you press.) These front-panel components are described in this section.

***Figure 1-2 Catalyst 3508G XL Switch***

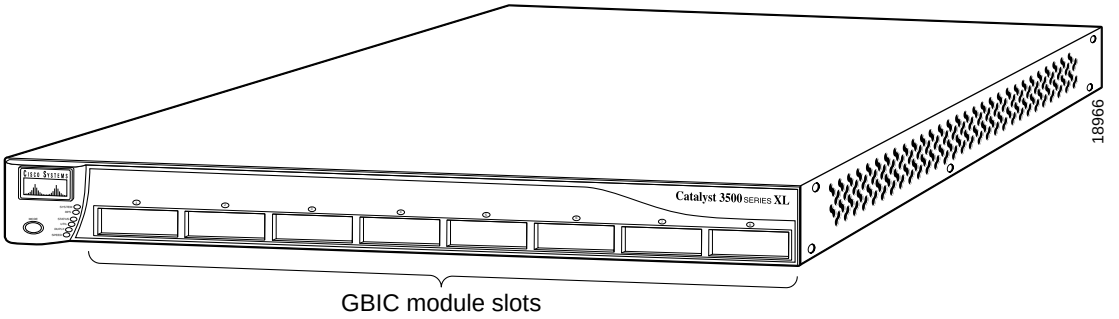



***Figure 1-3 Catalyst 3512 XL Switch***

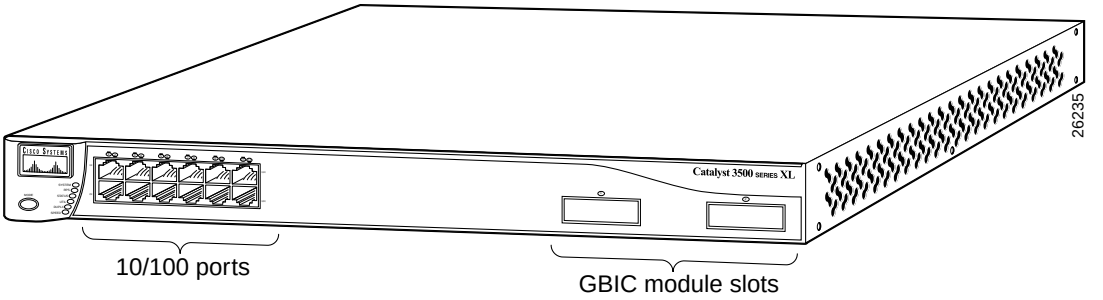


***Figure 1-4 Catalyst 3524 XL Switch***

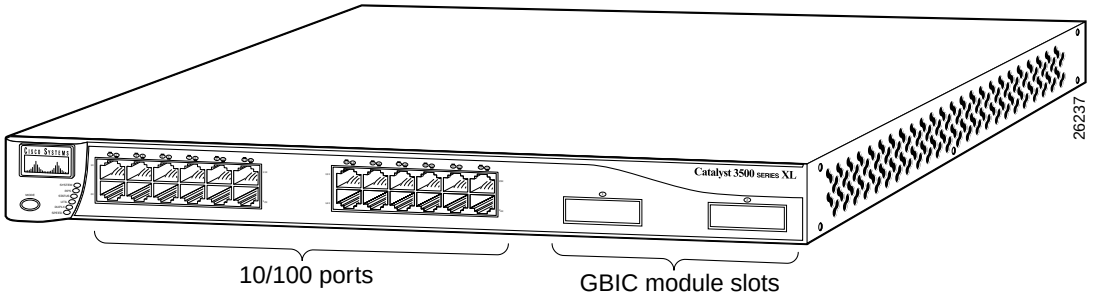



***Figure 1-5 Catalyst 3524-PWR XL Switch***

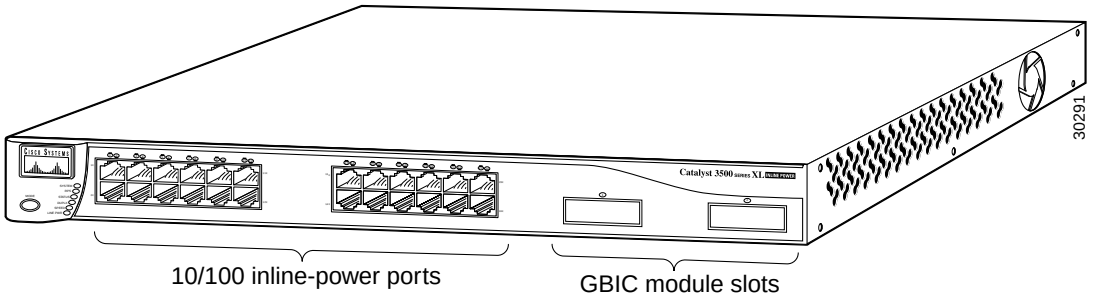
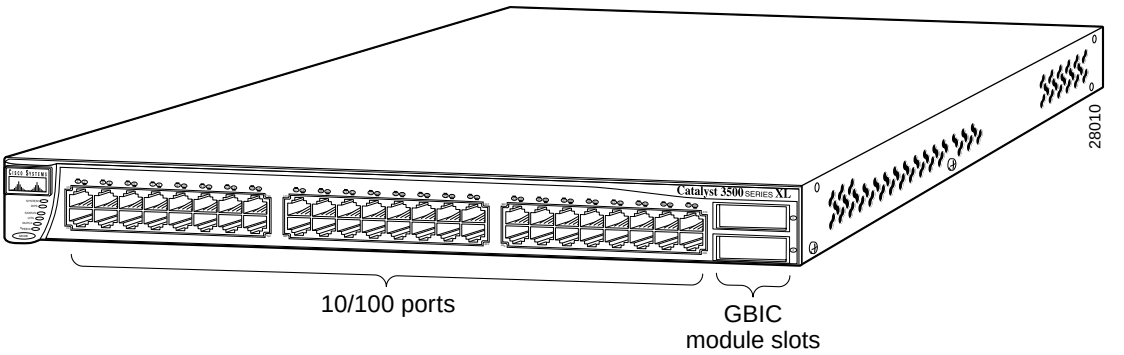



***Figure 1-6 Catalyst 3548 XL Switch***



# 10/100 Ports

The 10/100 ports on the Catalyst 3512, 3524, 3524-PWR, and 3548 XL switches are grouped in pairs. For example, in Figure 1-3, Figure 1-4, Figure 1-5, and Figure 1-6, ports 1 and 2 are the left-most pair. The first member of the pair (port 1) is above the second member (port 2). Port 3 is above port 4, and so on.

The 10/100 switch ports can connect, up to a distance of 100 meters, to any compatible network device:

- 10BaseT-compatible devices such as workstations, Cisco IP Phones, and hubs through standard RJ-45 connectors and Category 3, 4, or 5 cabling
- 100BaseTX-compatible devices such as high-speed workstations, Cisco IP Phones, servers, hubs, routers, and other switches through standard RJ-45 connectors and Category 5 cabling

**Note** Category 5 cable is required for 100BaseTX traffic. Ports operating at 10 Mbps can use Category 3 and 4 cables, but these cables do not work for ports operating at 100 Mbps.

When connecting the switch to workstations, servers, routers, and Cisco IP Phones, be sure that the cable is a straight-through, twisted-pair cable. When connecting the switch to switches or hubs, use a crossover cable. Pinouts for the cables are described in Appendix B, “Connector and Cable Specifications.”

The 10/100 switch ports can be explicitly set to operate in any combination of half duplex, full duplex, 10 Mbps, or 100 Mbps. These ports also can be set for speed and duplex autonegotiation, compliant with IEEE 802.3u. When set for autonegotiation, the port can sense the speed and duplex settings of the attached device and advertises its own capabilities. If the connected device also supports autonegotiation, the switch port negotiates the best connection (that is, the fastest line speed that both devices support and full-duplex transmission, if the attached device supports it) and configures itself accordingly.

The 10/100 ports on the Catalyst 3512, 3524, 3524-PWR, and 3548 XL switches provide protocol support for Cisco IP Phones. The Catalyst 3548 and 3524-PWR XL switches also support per-port priority override. Refer to the *Cisco IOS Desktop Switching Software Configuration Guide* for more information about these features.

Cisco IP Phones—connected to the 10/100 ports on the Catalyst 3512, 3524, and 3548 XL switches—must be connected to an AC power source. However, the Catalyst 3524-PWR XL 10/100 ports can:

- Provide –48V DC power to the following phones: Cisco IP Phone 7960, Cisco IP Phone 7940, and Cisco IP Phone 7910
- Automatically detect if a Cisco IP Phone is connected

On a per-port basis, you can control whether or not a Catalyst 3524-PWR XL 10/100 port automatically provides power when a Cisco IP Phone is connected. CMS and the CLI provide two inline power settings for each 10/100 port: Auto and Never. When you select the Auto setting for inline power on a port, the port only provides power if a Cisco IP Phone is connected to it. The Auto setting is the default. However, when you select the Never setting for inline power on a port, the port does not provide power even if a Cisco IP Phone is connected to it.

You also can connect the Cisco IP Phone to a Catalyst 3524-PWR XL 10/100 port and to an AC power source for redundant power. The power source to which the Cisco IP Phone is first connected becomes its primary power source, and the second power source is its backup. If the primary source fails, the second power source becomes the primary power source to the Cisco IP Phone. During the power transfer, the phone might reboot or reestablish link with the switch.

For information about Cisco IP Phones, refer to the documentation that came with your Cisco IP Phone.

# GBIC Module Slots

The Cisco Gigabit Interface Converter (GBIC) module slots support the following modules to provide flexibility in media and distance options:

- 1000BaseSX GBIC module for fiber connections of up to 550 meters.
- 1000BaseLX/LH GBIC module for fiber connections of up to 10 kilometers.
- 1000BaseZX GBIC module for fiber connections of up to 100 kilometers.
- GigaStack GBIC module for creating a 1-Gbps stack configuration of up to nine Catalyst 3500 XL switches. The GigaStack GBIC supports one full-duplex link (in a point-to-point configuration) or up to nine half-duplex links (in a stack configuration) to other Gigabit Ethernet devices. Using the required Cisco proprietary signaling and cabling, the maximum distance for a GigaStack GBIC-to-GigaStack GBIC connection is 1 meter.

You can install up to two GBICs in the Catalyst 3512, 3524, 3524-PWR and 3548 XL switches and up to eight GBICs in the Catalyst 3508G XL switch.

**Note** GBIC modules are not factory-installed on these switches, but you can order GBIC modules separately.

Figure 1-7 and Figure 1-8 show how a GBIC module is inserted into a GBIC module slot on the switch. Refer to the documentation that came with your GBIC module for complete GBIC module information.

***Figure 1-7 Installing a 1000BaseX GBIC Module in the Switch***

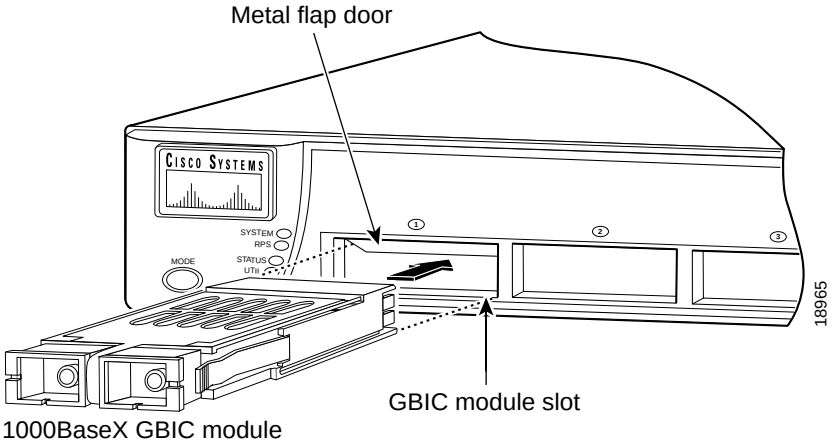
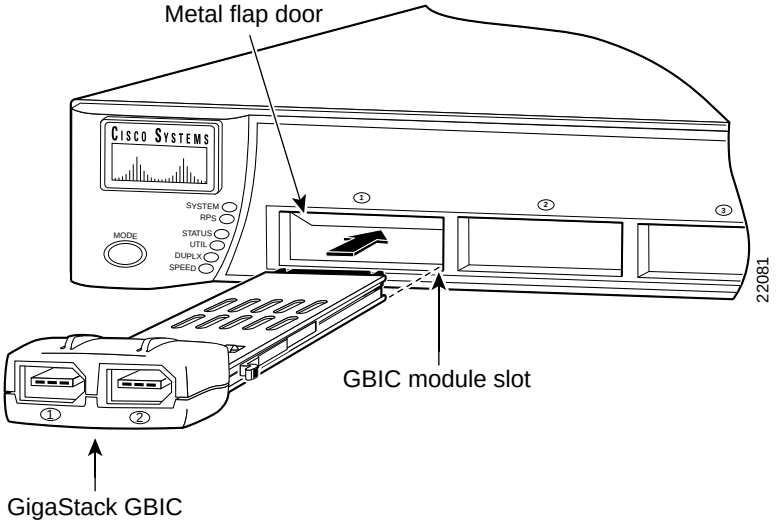



***Figure 1-8 Installing a GigaStack GBIC Module in the Switch***



# LEDs

You can use the switch LEDs described in this section to monitor switch activity and its performance. Figure 1-9, Figure 1-10, Figure 1-11, and Figure 1-12 show the location of the LEDs and the Mode button that you use to select one of the port modes.

All of the LEDs described in this section except the utilization meter (UTL) are visible on the VSM home page and Cluster Manager page. The *Cisco IOS Desktop Switching Software Configuration Guide* describes how to use the Cluster Management Suite to monitor individual switches and how to use cluster management software to monitor all the switches in a cluster.

***Figure 1-9 Catalyst 3508G XL LEDs***

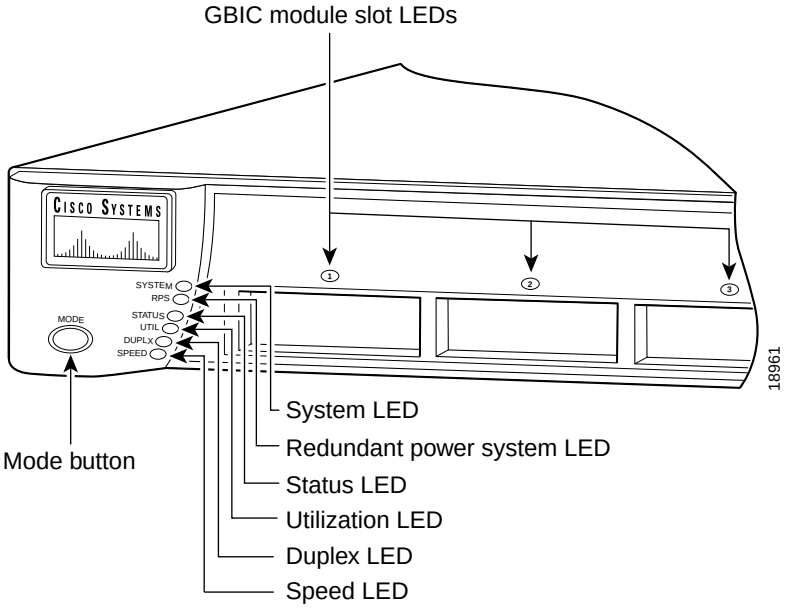


***Figure 1-10 Catalyst 3512 and 3524 XL LEDs***

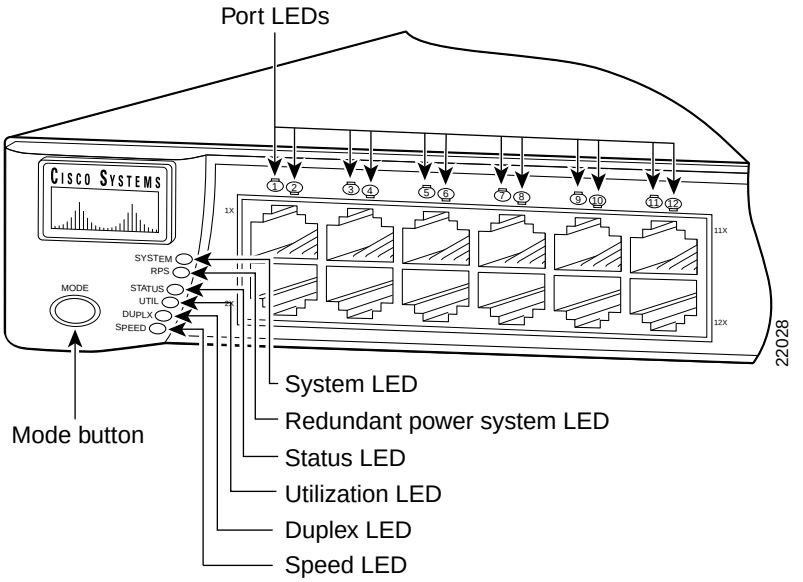


***Figure 1-11 Catalyst 3524-PWR XL LEDs***

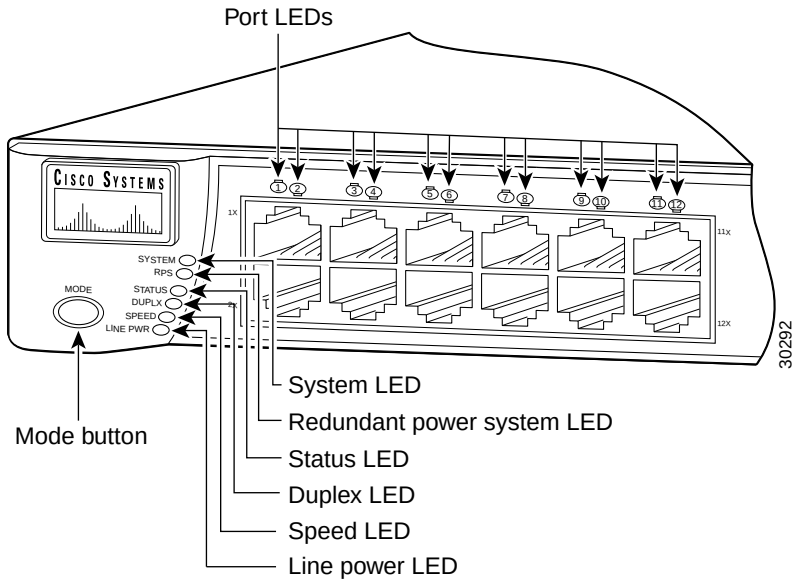
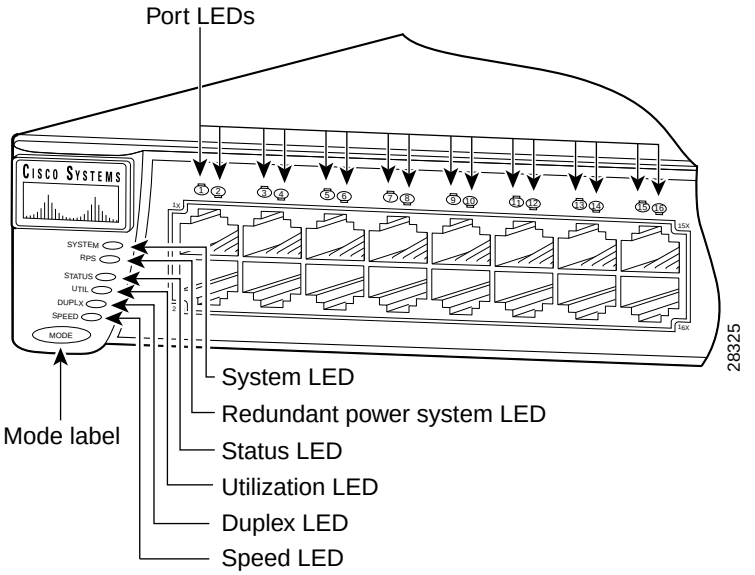


*Figure 1-12 Catalyst 3548 XL LEDs*




## System LED

The System LED shows whether the system is receiving power and is functioning properly. Table 1-3 lists the LED colors and their meanings.

*Table 1-3 System LED*

| Color | System Status |
|---|---|
| Off | System is not powered on. |
| Green | System is operating normally. |
| Amber | System is receiving power but is not functioning properly. |

For information on the System LED colors during POST, see the "Powering On the Switch and Running POST" section on page 2-15.

## RPS LED

The Redundant Power System (RPS) LED shows the RPS status. Table 1-4 and Table 1-5 list the LED colors and their meanings.

**Note** The Cisco RPS 600 (model PWR600-AC-RPS) supports the Catalyst 3512, 3524, 3548, and 3508 XL switches.

*Table 1-4 RPS LED for the Catalyst 3508, 3512, 3524, and 3548 XL Switches*

| Color | RPS Status |
|---|---|
| Off | RPS is off or is not installed. |
| Solid green | RPS is operational. |
| Blinking green | RPS and the switch AC power supply are both powered on. If the switch power supply fails, the switch powers down and restarts after 15 seconds, using power from the RPS. The switch goes through its normal boot sequence when it restarts.<br>**Note** This is not a recommended configuration. For more information see the "RPS Connector on the Catalyst 3508, 3512, 3524, and 3548 XL Switches" section on page 1-25. |
| Amber | RPS is connected but not functioning properly. One of the power supplies in the RPS could be powered down, or a fan on the RPS could have failed.<br>**Note** If you are using an RPS with a revision level lower than Z3 with a Catalyst 3508G XL or a Catalyst 3548 XL switch, the switch RPS LED might display amber (normally indicating an RPS malfunction) even when the RPS is functioning properly. The LEDs display correctly for RPS revision level Z3 or later. The label on the bottom of the RPS shows the revision level. |

**Note** The Cisco RPS 300 (model PWR300-AC-RPS) supports the Catalyst 3524-PWR XL switch.

***Table 1-5 RPS LED for the Catalyst 3524-PWR XL Switch***

| Color | RPS Status |
|---|---|
| Off | RPS is off or is not installed. |
| Solid green | RPS is connected and operational. |
| Blinking green | RPS is backing up another switch in the stack. |
| Solid amber | RPS is connected but not functioning properly. One of the power supplies in the RPS could be powered down, or a fan on the RPS could have failed. |
| Blinking amber | Internal power supply of the switch is down, and redundancy is lost. The switch is operating on the RPS. |

For more information about the failure conditions on the Cisco RPS 300, refer to the *Cisco Redundant Power System 300 Hardware Installation Guide*.

## Port LEDs and Modes

Each 10/100 port and module slot has a port LED. These port LEDs, as a group or individually, display information about the switch and about the individual ports. The port modes (Table 1-6) determine the type of information displayed through the port LEDs.

To select or change a mode, press the Mode button until the desired mode is highlighted. When you change port modes, the meaning of the port LED colors also changes. Table 1-7 and Table 1-8 explain how to interpret the port LED colors after you change the port mode.

**Note** To change the port mode in the Catalyst 3548 XL switch, press the Mode label.

*Table 1-6 Port Mode LEDs*

| Mode LED | Port Mode | Description |
|---|---|---|
| STAT | Port status | The port status. This is the default mode. |
| UTL | Switch utilization | The current bandwidth in use by the switch. |
| DUPLX | Port duplex mode | The port duplex mode: full duplex or half duplex. |
| SPEED | Port speed | The port operating speed: 10, 100, or 1000 Mbps. |
| LINE PWR | Port inline power | The inline power status: on or off. |

*Table 1-7 Meaning of LED Colors in Different Modes on the Catalyst 3508, 3512, 3524, and 3548 XL Switches*

| Port Mode | LED Color | Meaning |
|---|---|---|
| STATUS (port status) | Off | No link. |
| | Solid green | Link present. |
| | Flashing green | Activity. Port is transmitting or receiving data. |
| | Alternating green-amber | Link fault. Error frames can affect connectivity, and errors such as excessive collisions, CRC errors, and alignment and jabber errors are monitored for a link-fault indication. |
| | Solid amber | Port is not forwarding. Port was disabled by management or an address violation or was blocked by Spanning Tree Protocol (STP).<br>**Note** After a port is reconfigured, the port LED can remain amber for up to 30 seconds as STP checks the switch for possible loops. |
| UTL (utilization) | Green | The LEDs display backplane utilization on a logarithmic scale.<br>If all port LEDs are green, the switch is using 50 percent or more of its total bandwidth capacity. If the right-most LED is amber, the switch is using less than 50 percent of its total bandwidth. If the LED to the left of the right-most LED is amber, the switch is using less than 25 percent of its total capacity, and so on.<br>See Figure 1-13, Figure 1-15, and Figure 1-16 for details. |
| DUPLEX | Off | Port is operating in half duplex. |
| | Green | Port is operating in full duplex. |
| SPEED (speed) | **10/100 ports** | |
| | Off | Port is operating at 10 Mbps. |
| | Green | Port is operating at 100 Mbps. |
| | **1000BaseX ports** | |
| | Off | Port is not operating. |
| | Green | Port is operating at 1000 Mbps. |

*Table 1-8 Meaning of LED Colors in Different Modes on the Catalyst 3524-PWR XL Switch*

| Port Mode | LED Color | Meaning |
|---|---|---|
| STATUS (port status) | Off | No link. |
| | Solid green | Link present. |
| | Flashing green | Activity. Port is transmitting or receiving data. |
| | Alternating green-amber | Link fault. Error frames can affect connectivity, and errors such as excessive collisions, CRC errors, and alignment and jabber errors are monitored for a link-fault indication. |
| | Solid amber | Port is not forwarding. Port was disabled by management or an address violation or was blocked by Spanning Tree Protocol (STP).<br>**Note** After a port is reconfigured, the port LED can remain amber for up to 30 seconds as STP checks the switch for possible loops. |
| DUPLEX | Off | Port is operating in half duplex. |
| | Green | Port is operating in full duplex. |
| SPEED (speed) | **10/100 ports** | |
| | Off | Port is operating at 10 Mbps. |
| | Green | Port is operating at 100 Mbps. |
| | **1000BaseX ports** | |
| | Off | Port is not operating. |
| | Green | Port is operating at 1000 Mbps. |
| LINE PWR (inline power) | Off | Inline power is off. |
| | Green | Inline power is on.<br>If the Cisco IP Phone is receiving power from an AC power source, the port LED is off even if the IP phone is connected to the switch port. The LED turns green only when the switch port is providing power. |

Figure 1-13, Figure 1-14, Figure 1-15, and Figure 1-16 show the bandwidth utilization percentages displayed by the right-most LEDs.

**Note** The port LEDs on the Catalyst 3524-PWR XL switch do not show bandwidth utilization. To find out the switch bandwidth usage, use the Device Bandwidth Graph on VSM.

***Figure 1-13 Bandwidth Utilization for the Catalyst 3508G XL Switch***

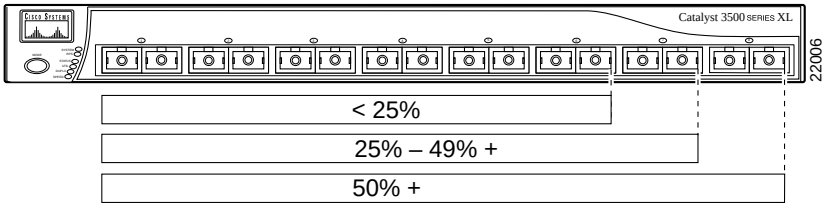



***Figure 1-14 Bandwidth Utilization for the Catalyst 3512 XL Switch***

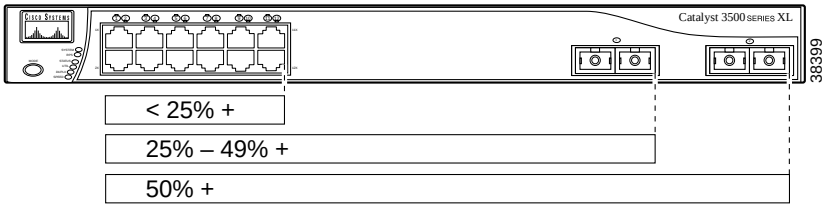


*Figure 1-15 Bandwidth Utilization for the Catalyst 3524 XL Switch*

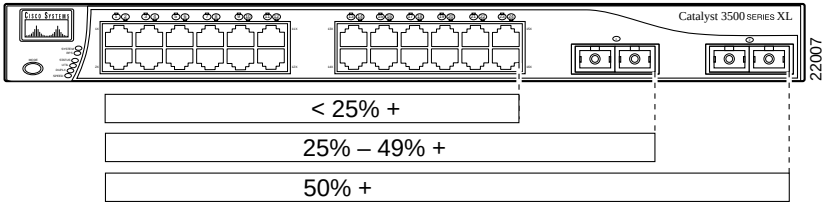
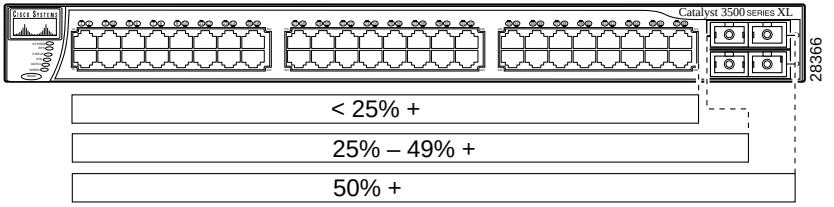



*Figure 1-16 Bandwidth Utilization for the Catalyst 3548 XL Switch*




If all port LEDs on the Catalyst 3548 XL switch are green, the switch is using 50 percent or more of its total bandwidth capacity. If all 10/100 port LEDs are green and the lower GBIC LED is amber, the switch is using between 25 and 50 percent of its total bandwidth. If all 10/100 port LEDs are green and if both the GBIC LEDs are amber, the switch is using less than 25 percent of its total capacity, and so on.

# Rear-Panel Description

Switch rear panels have an AC power connector, an RPS connector, and an RJ-45 console port (see Figure 1-17, Figure 1-19, Figure 1-18, and Figure 1-20), which are described in this section.

***Figure 1-17 Catalyst 3508G XL Rear Panel***

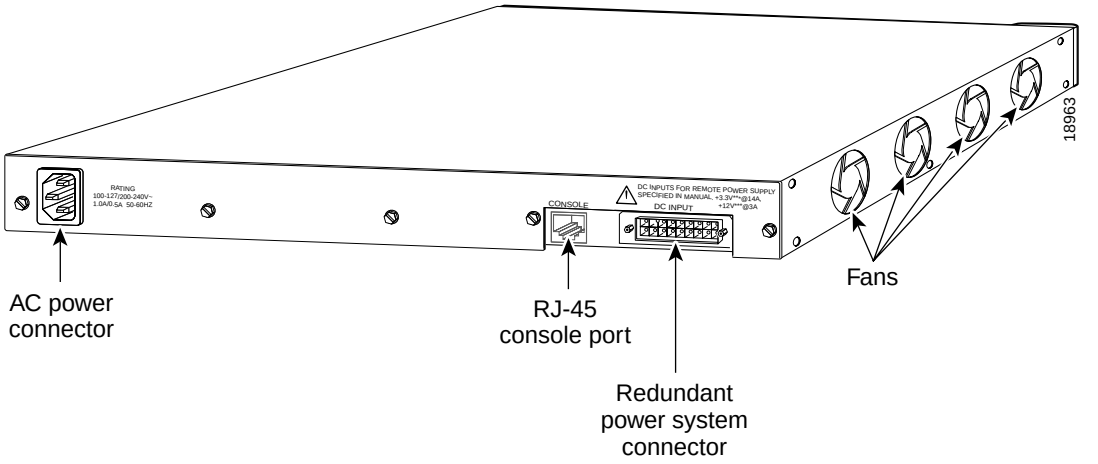



***Figure 1-18 Catalyst 3512 and 3524 XL Rear Panel***

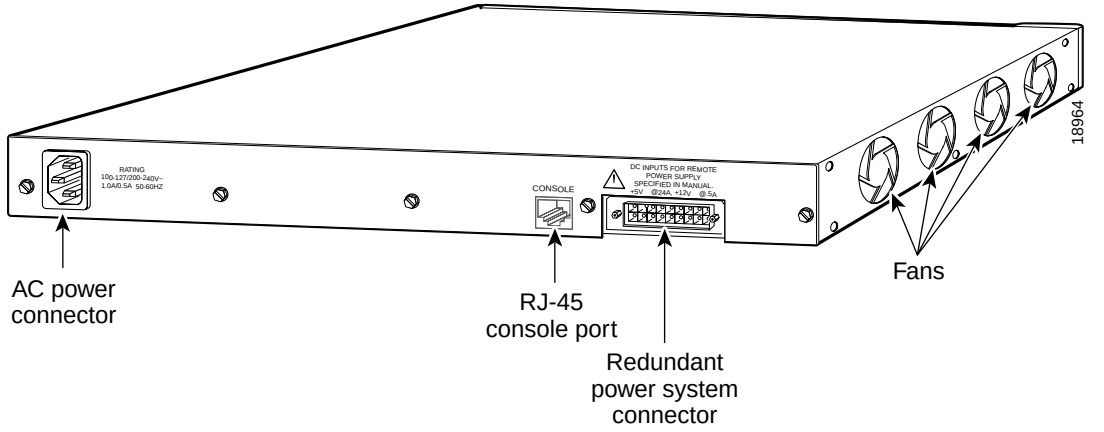


***Figure 1-19 Catalyst 3524-PWR XL Rear Panel***

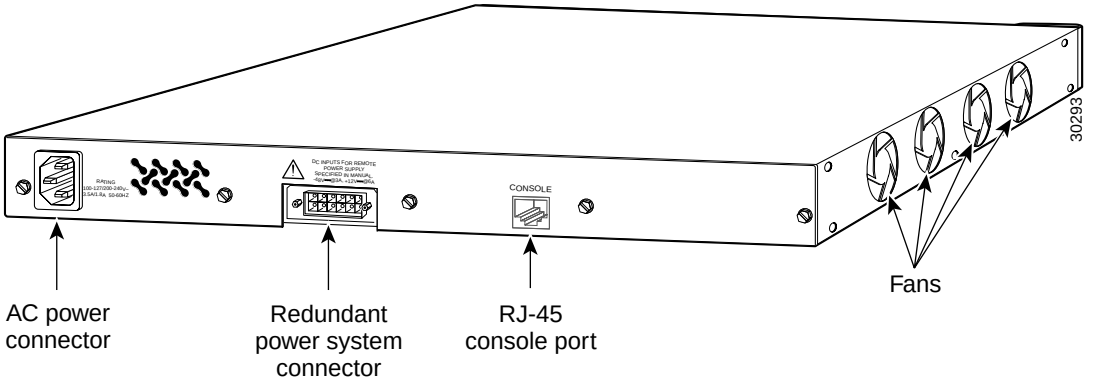
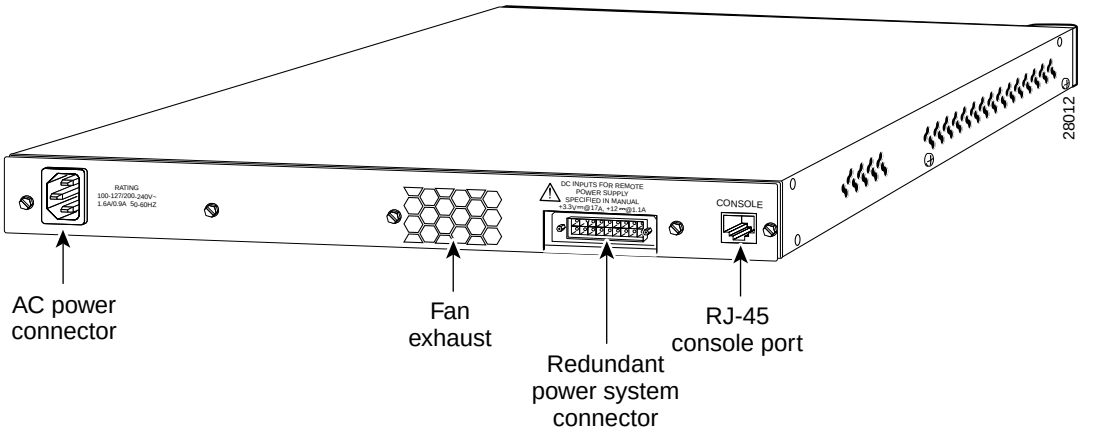



***Figure 1-20 Catalyst 3548 XL Rear Panel***



# Power Connectors

You can provide power to the switch either through the internal power supply or through the Cisco RPS.

## Internal Power Supply Connector

The internal power supply is an autoranging unit that supports input voltages between 100 and 240 VAC. If you plan to use the internal power supply, use the supplied AC power cord to connect the AC power connector to an AC power outlet.

## Cisco RPS Connector

Specific Cisco RPS models support specific Catalyst 3500 XL switches:

- Cisco RPS 600 (model PWR600-AC-RPS)—Supports the Catalyst 3512, 3524, 3548, and 3508 XL switches
- Cisco RPS 300 (model PWR300-AC-RPS)—Supports the Catalyst 3524-PWR XL switch

### RPS Connector on the Catalyst 3508, 3512, 3524, and 3548 XL Switches

The Cisco RPS 600 (model PWR600-AC-RPS) provides a quasi-redundant power source for four external devices that use up to 150W DC each. Use a one-to-one cable (one connector at each cable end) to connect four external devices to the four DC output power modules. The power source is quasi-redundant because there are two AC input power modules for the Cisco RPS and one DC output power module for each external device. The AC input to the Cisco RPS is fully redundant, but the DC output to the external devices is not.

**Warning** **Attach only the Cisco RPS (model PWR600-AC-RPS) to the RPS receptacle.**

**Note** Do not connect the switch power cord to an AC outlet if the switch is also connected to a powered-on RPS. The switches do not support the fully-redundant configuration described in the RPS documentation. The redundant-with-reboot configuration is not recommended. For more information on the Cisco RPS 600, refer to the *Cisco Redundant Power System Hardware Installation Guide*.

### RPS Connector on the Catalyst 3524-PWR XL Switch

The Cisco RPS 300 (model PWR300-AC-RPS) has two output levels: –48V and 12V with a total output power of 300W. It provides a fully-redundant power source for up to six switches. It automatically senses when one of the switches has experienced power failure and automatically sends power to the affected switch. Although it supports up to six switches, it can power only one switch at a time. If more than one switch fails at the same time, the subsequent switches will not be powered.

**Warning** **Attach only the Cisco RPS (model PWR300-AC-RPS) to the RPS receptacle.**

For more information on the Cisco RPS 300, refer to the *Cisco Redundant Power System 300 Hardware Installation Guide*.

## Console Port

You can connect a Catalyst 3500 XL switch to a PC by means of the console port and the supplied rollover cable and DB-9 adapter. You need to provide a RJ-45-to-DB-25 female DTE adapter if you want to connect the switch console port to a terminal. You can order a kit (part number ACS-DSBUASYN=) containing that adapter from Cisco. For console port and adapter pinout information, see the “Cable and Adapter Specifications” section on page B-4.

# Management Options

Catalyst 3500 XL switches offer several management options:

- Cisco Cluster Management Suite

  This suite is made up of four web-based applications that you use to create, monitor, and configure a cluster of switches or an individual switch. You use the Cluster Builder, Cluster View, and Cluster Manager applications to create, configure, and monitor clusters. You use the Visual Switch Manager (VSM) application to manage individual and standalone switches. For more information, refer to the *Cisco IOS Desktop Switching Software Configuration Guide* and the online help for these applications.

- Cisco IOS command-line interface (CLI)

  Connect a PC or terminal directly to the console port, located on the rear panel of the switch, to access the CLI. If the switch is connected to your network, you can use a Telnet connection to manage the switch from a remote location. See the *Cisco IOS Desktop Switching Command Reference* for more information.

- CiscoView application

  The CiscoView device-management application displays the switch image that you can use to set configuration parameters and to view switch status and performance information. The CiscoView application, which you purchase separately, can be a standalone application or part of an SNMP network-management platform. See the CiscoView documentation for more information.

- Simple Network Management Protocol (SNMP) network management

  You can manage switches from an SNMP-compatible management station that is running platforms such as HP OpenView or SunNet Manager. The switch supports a comprehensive set of MIB extensions and MIB II, the IEEE 802.1D bridge MIB, and four Remote Monitoring (RMON) groups. See the documentation that came with your SNMP application for more information.

# Network Configuration Examples

This section provides network configuration concepts and includes examples of using the switch to create dedicated network segments and interconnecting the segments through Fast Ethernet and Gigabit Ethernet connections.

## Design Concepts for Using the Switch

As your network users compete for network bandwidth, it takes longer to send and receive data. When you configure your network, consider the bandwidth required by your network users and the relative priority of the network applications they use. Table 1-9 describes what can cause network performance to degrade and describes how you can configure your network to increase the bandwidth available to your network users.

*Table 1-9 Considerations for Increasing Network Performance*

| Network Demands | Suggested Design Methods |
|---|---|
| • Too many users on a single network segment and a growing number of users accessing the Internet | • Create smaller network segments so that fewer users share the bandwidth, and place the network resources in the same logical network as the users who access those resources most.<br>• Use full-duplex operation between the switch and its connected workstations. |
| • The increased power of new PCs, workstations, and servers<br>• High demand from networked applications (such as e-mail with large attached files) and from bandwidth-intensive applications (such as multimedia) | • Connect global resources—such as servers and routers to which network users require equal access—directly to the Fast Ethernet or Gigabit Ethernet switch ports so that they have their own Fast Ethernet or Gigabit Ethernet segment.<br>• Use the Fast EtherChannel or Gigabit EtherChannel feature between the switch and its connected servers and routers. |
| • An evolving demand for IP telephony | • Use quality of service (QoS) to prioritize applications such as IP telephony during congestion and to help control both delay and jitter within the network. Use switches that support at least two queues per port to prioritize voice and data traffic as either high or low priority based on 802.1p/Q. |

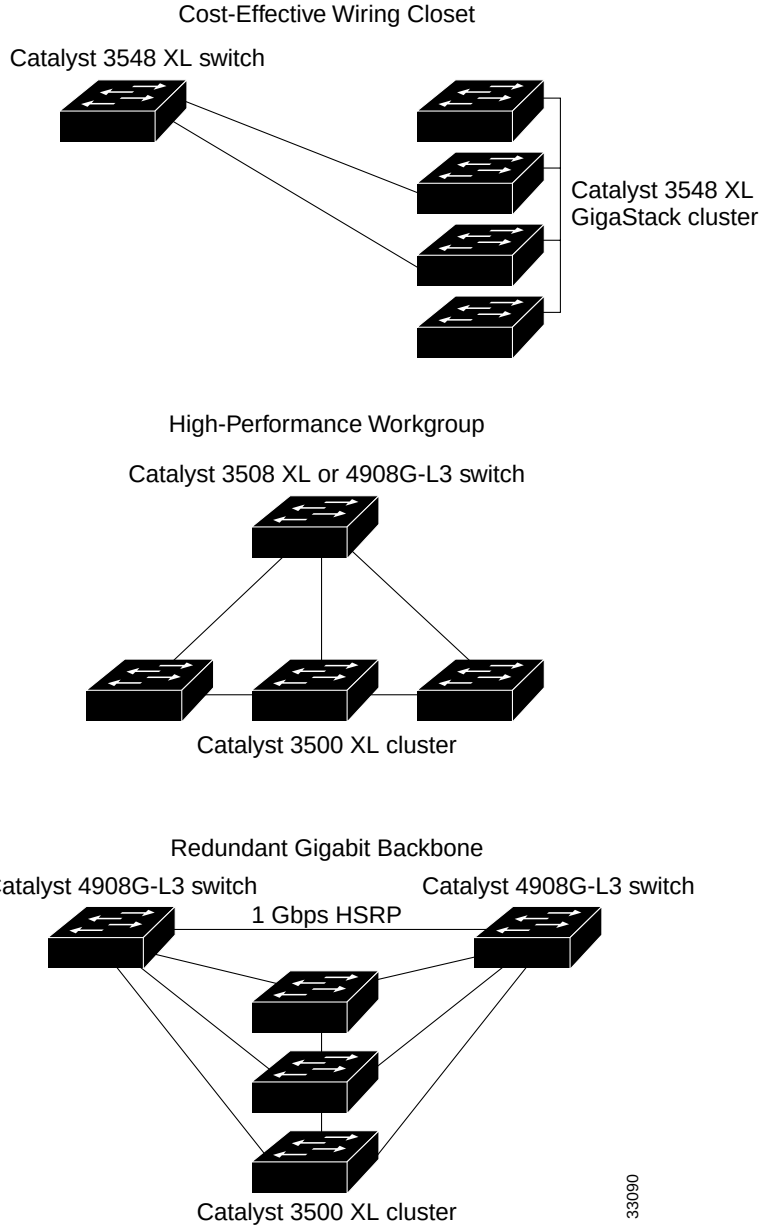
You can connect the switch to other devices and create backup paths by using Fast Ethernet or gigabit links or Fast EtherChannel or Gigabit EtherChannel links. Using the Hot Standby Redundancy Protocol (HSRP), you can create backup paths between Catalyst 4908G-L3 switches. Figure 1-21 illustrates three configuration examples for using the Catalyst 3500 XL switches to create the following:

- Cost-effective wiring closet—A cost-effective way to connect many users to the wiring closet is to connect up to nine Catalyst 3500 XL switches through GigaStack GBIC connections. When you use a stack of Catalyst 3548 XL switches, you can connect up to 432 users. To preserve connectivity between the switches in case one switch in the stack fails, connect the bottom switch to the top switch to create a GigaStack loopback.

  Using gigabit GBIC modules on two of the switches, you can have redundant uplink connections to a gigabit backbone switch such as the Catalyst 3508G XL switch. If one of the redundant connections fails, the other can serve as a backup path. You can configure the stack members and the Catalyst 3508G XL switch as a switch cluster to manage them through a single IP address.

- High-performance workgroup—For users who require high-speed access to network resources, use gigabit GBIC modules to connect the switches directly to a backbone switch in a star configuration. Each switch in this configuration provides users a dedicated 1-Gbps connection to network resources in the backbone. Compare this with the switches in a GigaStack configuration, where the 1-Gbps connection is shared among the switches. Using gigabit GBIC modules also provides flexibility in media and distance options:
  - 1000BaseSX GBIC module: Fiber connections of up to 550 m
  - 1000BaseLX/LH GBIC module: Fiber connections of up to 10 km
  - 1000BaseZX GBIC module: Fiber connections of up to 100 km
- Redundant gigabit backbone—To enhance network reliability and load balancing for different VLANs and subnets, you can connect the Catalyst 3500 XL switches, again in a star configuration, to two backbone switches. If one of the backbone switches fails, the second backbone switch preserves connectivity between the switches and network resources.

***Figure 1-21 Example Configurations with Catalyst 3500 XL Switches***



# Small- to Medium-Sized Network Configuration

Figure 1-22 illustrates a configuration for a network that has up to 250 users. Users in this network require e-mail, file-sharing, database, and Internet access.

You optimize network performance by placing workstations on the same logical segment as the servers they access most often. This divides the network into smaller segments (or workgroups) and reduces the amount of traffic that travels over a network backbone, thereby increasing the bandwidth available to each user and improving server response time.

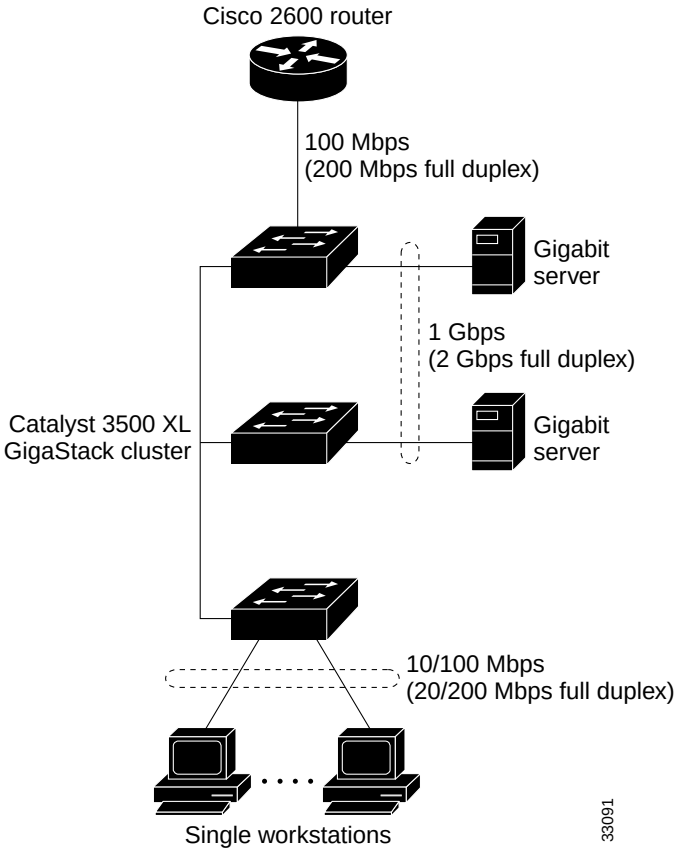
A *network backbone* is a high-bandwidth connection (such as Fast Ethernet or Gigabit Ethernet) that interconnects segments and network resources. It is required if numerous segments require access to the servers. The Catalyst 3500 XL switches in this network are connected through a GigaStack GBIC on each switch to form a 1-Gbps network backbone. This GigaStack also can be configured as a switch cluster, with primary and secondary command switches for redundant cluster management.

Workstations are connected directly to the 10/100 switch ports for their own 10- or 100-Mbps access to network resources (such as web and mail servers). When a workstation is configured for full-duplex operation, it receives up to 200 Mbps of dedicated bandwidth from the switch.

Servers are connected to the gigabit GBIC module ports on the switches, allowing 1-Gbps throughput to users when needed. When the switch and server ports are configured for full-duplex operation, the links provide 2 Gbps of bandwidth. For networks that do not require gigabit performance from a server, connect the server to a Fast Ethernet or Fast EtherChannel switch port.

Connecting a router to a Fast Ethernet switch port provides multiple, simultaneous access to the Internet through one line.

***Figure 1-22 Small- to Medium-Sized Network Configuration***



# Collapsed Backbone and Switch Cluster Configuration

Figure 1-23 illustrates a configuration for a network of approximately 500 employees. This network uses a collapsed backbone and switch clusters. A collapsed backbone has high-bandwidth uplinks from all segments and subnetworks to a single device, such as a gigabit switch, which serves as a single point for monitoring and controlling the network. You can use a Catalyst 4908G-L3 switch, as illustrated, or a Catalyst 3508G XL switch to create a gigabit backbone. A Catalyst 4908G-L3 backbone switch provides the benefits of inter-VLAN routing and allows the router to focus on WAN access.

The workgroups are created by clustering the Catalyst switches except the Catalyst 4908G-L3 switch. Using the Cisco Cluster Management Suite, you can group the switches into multiple clusters, as illustrated, or into a single cluster. You can manage a cluster through the IP address of its primary and secondary command switches, regardless of the geographic location of the cluster members.

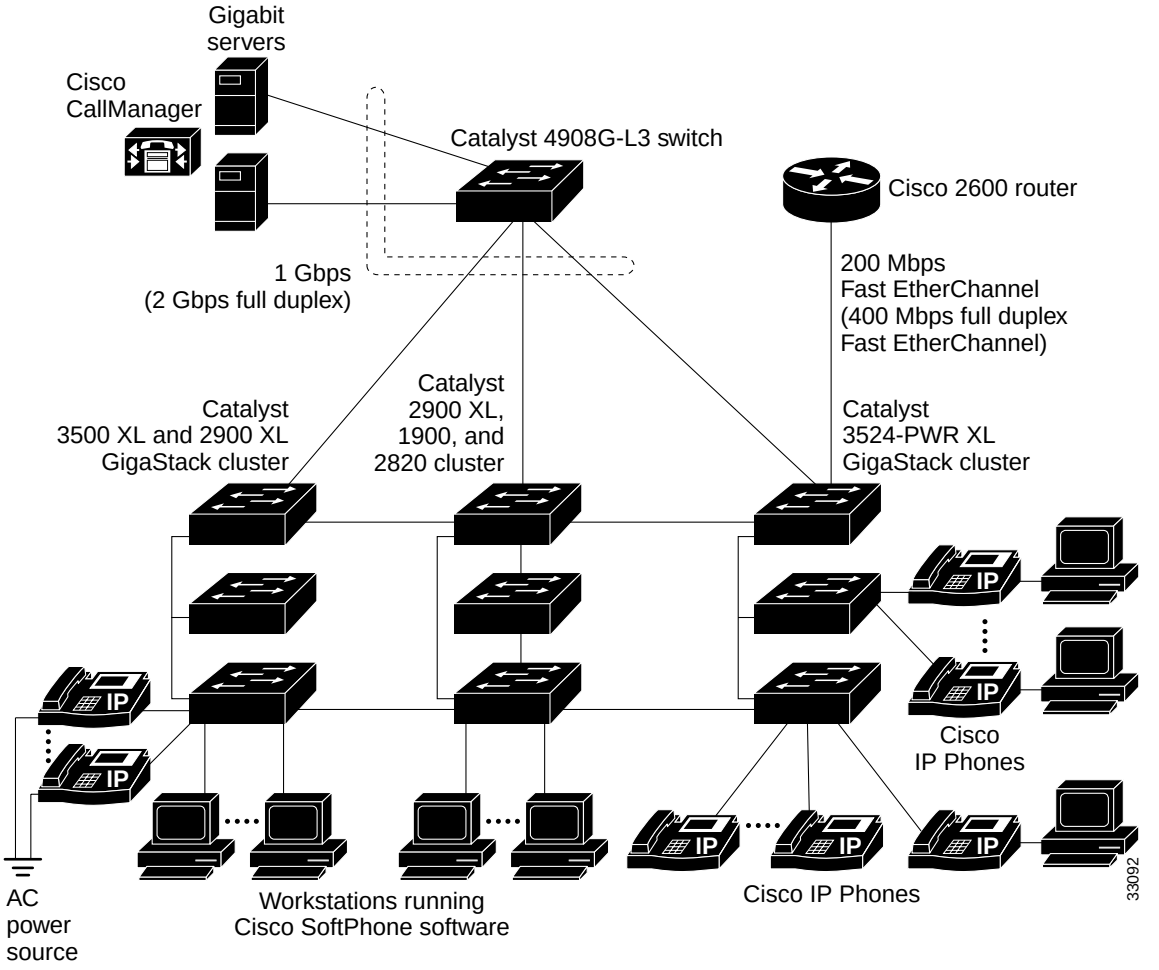
This network also includes voice and data subnetworks, where Cisco IP Phones are connected—using standard straight-through, twisted-pair cable with RJ-45 connectors—to the 10/100 inline-power ports on the Catalyst 3524-PWR XL switches and to the 10/100 ports on the Catalyst 3500 and 2900 XL switches. These multiservice switch ports automatically detect if an IP phone is connected. You also configure each port for 802.1p/Q QoS to give forwarding priority to voice traffic over data traffic. Cisco CallManager controls call processing, routing, and IP phone features and configuration. Users with workstations running Cisco SoftPhone software can place, receive, and control calls from their PCs. Using Cisco IP Phones, Cisco CallManager software, and Cisco SoftPhone software integrates telephony and IP networks, where the IP network supports both voice and data.

Each 10/100 inline-power port on the Catalyst 3524-PWR XL switches provides –48V DC power to the Cisco IP Phone. The IP phone can receive redundant power when it also is connected to an AC power source. IP phones connected to switches other than the Catalyst 3524-PWR XL switches receive power from an AC power source.

Grouping servers in a centralized location provides benefits such as security and easier maintenance. The gigabit connections to a server farm provide the workgroups full access to the network resources (such as a call-processing server running Cisco CallManager software, a Dynamic Host Configuration Protocol (DHCP)/Bootstrap Protocol (BOOTP) server, or an IPTV multicast server).

The connection between the Catalyst 3524-PWR XL switch and the router is configured for Fast EtherChannel, increasing the bandwidth to 200 Mbps (400 Mbps in full duplex).

***Figure 1-23 Collapsed Backbone and Switch Cluster Configuration***



# Large Campus Configuration

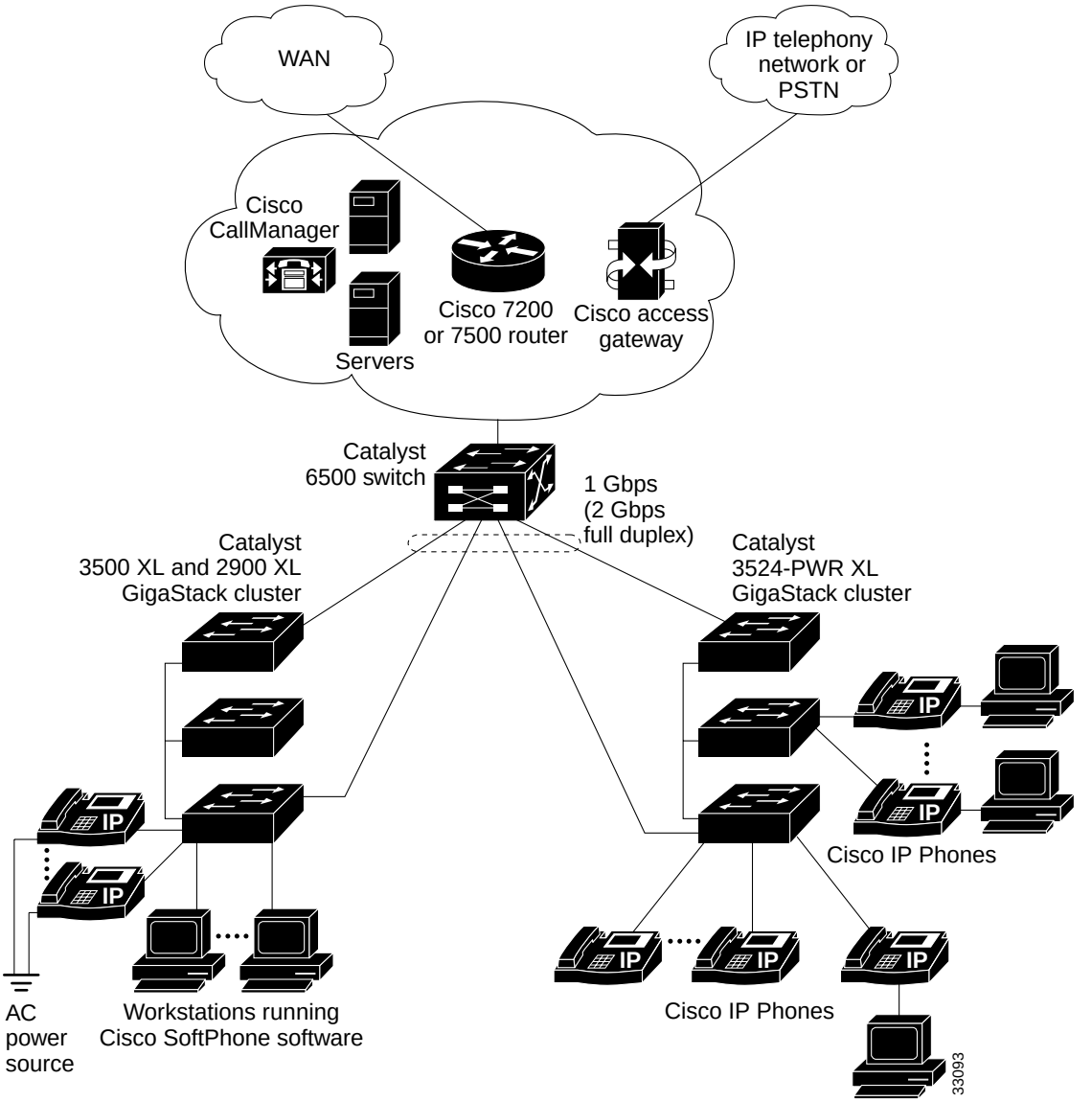
Figure 1-24 illustrates a configuration for a network of more than 1000 users. Because it can aggregate up to 130 gigabit connections, a Catalyst 6500 multilayer switch is used as the backbone switch.

You can use the earlier workgroup configurations to create workgroups with gigabit uplinks to the Catalyst 6500 switch. For example, you can use switch clusters that have a mix of Catalyst 3500 and 2900 XL switches.

The Catalyst 6500 switch provides the workgroups with gigabit access to core resources:

- Cisco 7000 series router for access to the WAN and the Internet.
- Server farm that includes a call-processing server running Cisco CallManager software. Cisco CallManager controls call processing, routing, and IP phone features and configuration.
- Cisco Access gateway (such as Cisco Access Digital Trunk Gateway or Cisco Access Analog Trunk Gateway) that connects the IP network to the Public Switched Telephone Network (PSTN) or to users in an IP telephony network.

***Figure 1-24 Large Campus Configuration***



CHAPTER 2

# Installing and Starting Up the Switch

This chapter describes how to install and start up your Catalyst 3500 XL switches and to interpret the power-on self-test (POST) that ensures proper operation. Read the topics, and perform the procedures in the order that they are presented:

- Pre-installation information and guidelines
- Installation procedures
- Power-on procedures
- Connection procedures
- Set up procedures for initial configuration
- Default configuration settings
- Where to go next

# Preparing for Installation

## Warnings

These warnings are translated into several languages in Appendix C, "Translated Safety Warnings."

**Warning** **This equipment is to be installed and maintained by service personnel only as defined by AS/NZS 3260 Clause 1.2.14.3 Service Personnel.**

**Warning** **Only trained and qualified personnel should be allowed to install or replace this equipment.**

**Warning** **Read the installation instructions before you connect the system to its power source.**

**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.**

**Warning** **Do not stack the chassis on any other equipment. If the chassis falls, it can cause severe bodily injury and equipment damage.**

**Warning** **The plug-socket combination must be accessible at all times because it serves as the main disconnecting device.**

**Warning** To prevent the switch from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature of 113°F (45°C). To prevent airflow restriction, allow at least 3 inches (7.6 cm) of clearance around the ventilation openings.

**Warning** The device is designed to work with TN power systems.

**Warning** When installing the unit, the ground connection must always be made first and disconnected last.

**Warning** This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that a fuse or circuit breaker no larger than 120 VAC, 15A U.S. (240 VAC, 16A international) is used on the phase conductors (all current-carrying conductors).

**Warning** This equipment is intended to be grounded. Ensure that the host is connected to earth ground during normal use.

**Warning** Care must be given to connecting units to the supply circuit so that wiring is not overloaded.

**Warning** Unplug the power cord before you work on a system that does not have an on/off switch.

**Warning** Do not touch the power supply when the power cord is connected. For systems with a power switch, line voltages are present within the power supply even when the power switch is off and the power cord is connected. For systems without a power switch, line voltages are present within the power supply when the power cord is connected.

**Warning** **Do not work on the system or connect or disconnect cables during periods of lightning activity.**

**Warning** **Ultimate disposal of this product should be handled according to all national laws and regulations.**

The following warning applies to the Catalyst 3508, 3512, 3524, and 3548 XL switches:

**Warning** **Attach only the Cisco RPS (model PWR600-AC-RPS) to the RPS receptacle.**

The following warning applies to the Catalyst 3524-PWR XL switch:

**Warning** **Attach only the Cisco RPS (model PWR300-AC-RPS) to the RPS receptacle.**

# EMC Regulatory Statements

## U.S.A.

U.S. regulatory information for this product is in the front matter of this manual.

## Taiwan

警告使用者：
這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者 會被要求採取某些適當的對策。

15456

# Installation Guidelines

When determining where to place the switch, be sure to observe these guidelines:

- For 10/100 ports, cable lengths from the switch to connected devices are up to 100 meters.
- For 1000BaseX ports, cable lengths from the switch to the connected devices are up to 10,000 meters. For specific cable lengths, refer to the documents that came with your GBICs.
- For the GigaStack GBIC ports, cable lengths from the switch to the connected devices are up to 1 meter. For specific cable lengths, refer to the document that came with the GigaStack GBIC.
- Operating environment is within the ranges listed in Appendix A, “Technical Specifications.”
- Clearance to front and rear panels is such that
  - Front-panel indicators can be easily read.
  - Access to ports is sufficient for unrestricted cabling.
  - Rear-panel power connector is within reach of an AC power receptacle.
- Airflow around the switch and through the vents is unrestricted.
- Temperature around the unit does not exceed 113°F (45°C).

**Note** If the switch is installed in a closed or multirack assembly, the temperature around it might be greater than normal room temperature.

- Cabling is away from sources of electrical noise, such as radios, power lines, and fluorescent lighting fixtures.

# Verifying Package Contents

**Note** Carefully remove the contents from the shipping container, and check each item for damage. If any item is missing or damaged, contact your Cisco representative or reseller for support. Return all packing materials to the shipping container, and save it.

The switch is shipped with the following items:

- *Quick Start: Catalyst 3500 Series XL Cabling and Setup*
- This *Catalyst 3500 Series XL Hardware Installation Guide*
- *Cisco IOS Desktop Switching Software Configuration Guide*
- *Release Notes for the Catalyst 2900 Series XL and Catalyst 3500 Series XL Cisco IOS Release 12.0(5)XU*
- Cisco Documentation CD-ROM
- AC power cord
- Mounting kit containing:
  - Four rubber feet for mounting the switch on a table
  - Two mounting brackets
  - Four Phillips flat-head screws for attaching the brackets to the switch
  - Four Phillips truss-head screws for attaching the brackets to the switch
  - Four Phillips machine screws for attaching the brackets to a rack
  - One cable guide and one black Phillips machine screw for attaching the cable guide to one of the mounting brackets
- One RJ-45-to-RJ-45 rollover cable
- One RJ-45-to-DB-9 female adapter
- Cisco Information Packet, containing warranty, safety, and support information

# Installing the Switch in a Rack

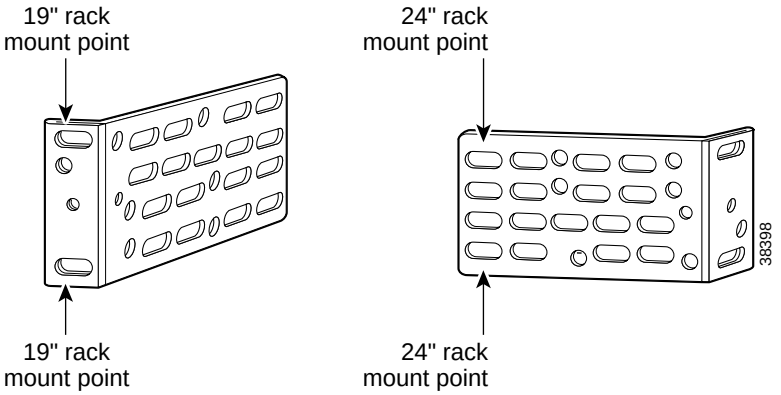
**Warning** **To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety:**

- This unit should be mounted at the bottom of the rack if it is the only unit in the rack.
- When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.
- If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.

The rack-mounting brackets supplied with the switch can be attached to a 19- or 24-inch rack. Figure 2-1 shows which mounting holes attach to the rack.

**Note** The illustrations in this section show the Catalyst 3508G XL switch as an example. Other switches in the series (Catalyst 3512, 3524, 3524-PWR, and 3548 XL) can also be installed as shown here.

**Figure 2-1 Bracket Mounting Points**



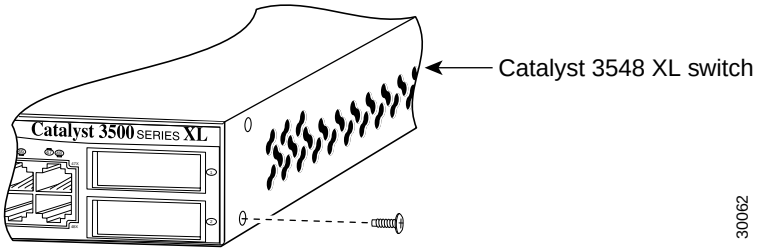
To install the switch in a 19-inch or a 24-inch standard rack, follow the instructions described in these procedures:

- Removing screws from the switch
- Attaching the brackets to the switch
- Mounting the switch in a rack
- Attaching the optional cable guide

# Removing Screws from the Switch

If you plan to install the Catalyst 3548 XL switch in a rack, you must first remove the front side screws in the switch chassis so that the mounting brackets can be attached. Figure 2-2 shows how to remove the chassis screw from one side of the switch. Follow the same procedure for the opposite side.

***Figure 2-2 Removing Screws from the Catalyst 3548 XL Switch***



# Attaching the Brackets to the Switch

The bracket orientation and the screws you use depend on whether you are attaching the brackets for a 19-inch or a 24-inch rack. Use two of the supplied screws to attach each bracket, according to the following guidelines:

- For a 19-inch rack, use the supplied number-8 Phillips flat-head screws to attach the long side of the bracket to the switch.
- For a 24-inch rack, use the supplied number-8 Phillips truss-head screws to attach the short side of the bracket to the switch.

Figure 2-3 and Figure 2-4 show how to attach a bracket to one side of the switch. Follow the same steps to attach the second bracket to the opposite side.

***Figure 2-3 Attaching Brackets for 19- and 24-Inch Racks (Front Panel Forward)***

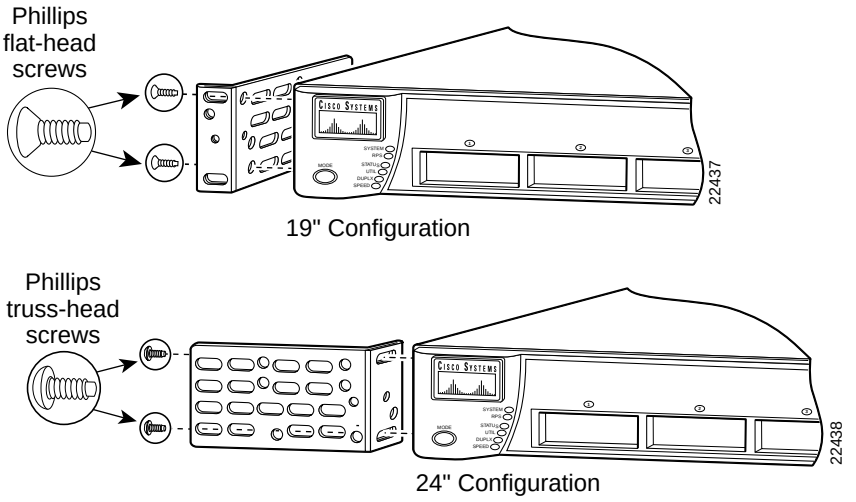
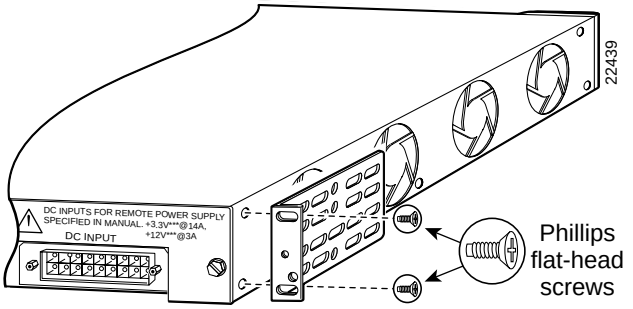
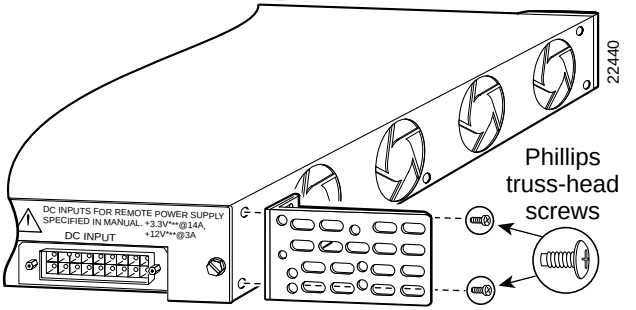


***Figure 2-4 Attaching Brackets for 19- and 24-Inch Racks (Rear Panel Forward)***




19" Configuration

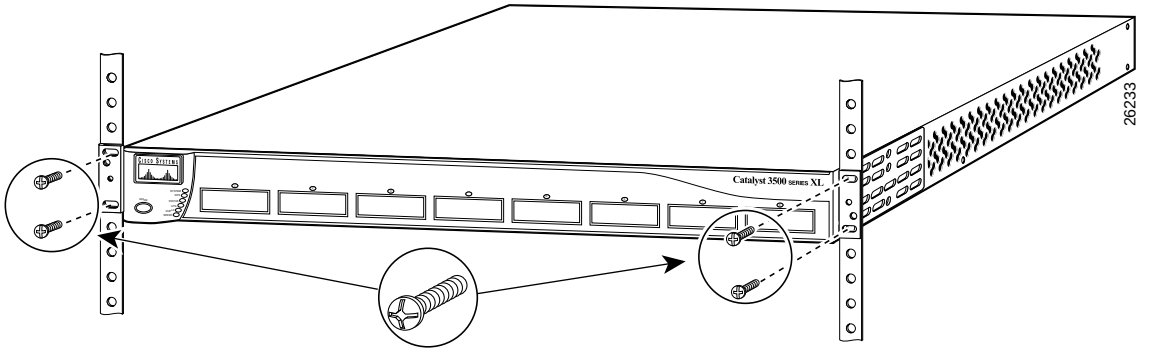



24" Configuration

# Mounting the Switch in a Rack

After the brackets are attached to the switch, use the four supplied number-12 Phillips machine screws to securely attach the brackets to the rack, as shown in Figure 2-5.

***Figure 2-5 Mounting the Switch in a Rack***




After the switch is mounted in the rack, attach the power cord to the switch. If you are using the Cisco RPS, see the Cisco RPS documentation for installation instructions.

After the power is connected, the System LED turns amber for 2 seconds, and then it flashes green while the switch completes the series of POST tests described in the "Powering On the Switch and Running POST" section on page 2-15.

# Attaching the Optional Cable Guide

We recommend attaching the cable guides to prevent the cables from obscuring the front panel of the switch and the other devices installed in the rack. If the switch is in a 19-inch or 24-inch rack, use the supplied black screw, as shown in Figure 2-6, to attach the cable guide to the left or right bracket.

**Note** The Catalyst 3548 XL switch ships with a special cable guide as shown in Figure 2-7. This cable guide secures up to 48 cables. Use the supplied black screw to mount it on the left bracket.

***Figure 2-6 Attaching the Cable Guide to a 3512, 3524, 3524-PWR, or 3508 XL Switch***

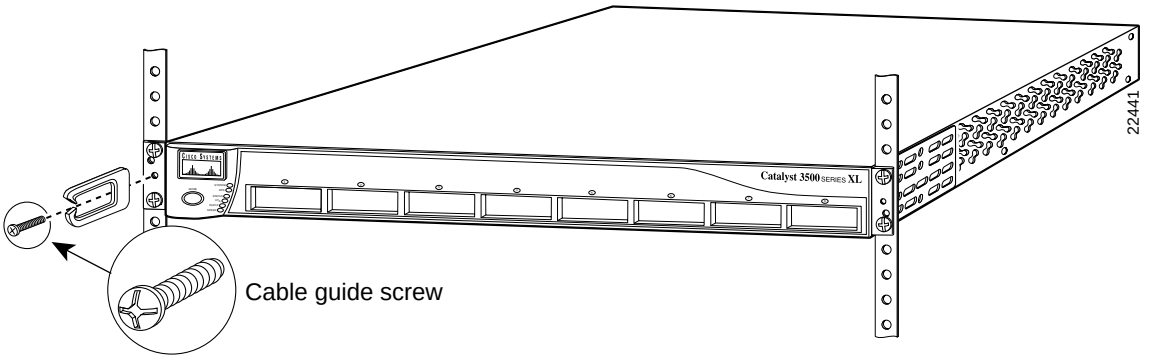
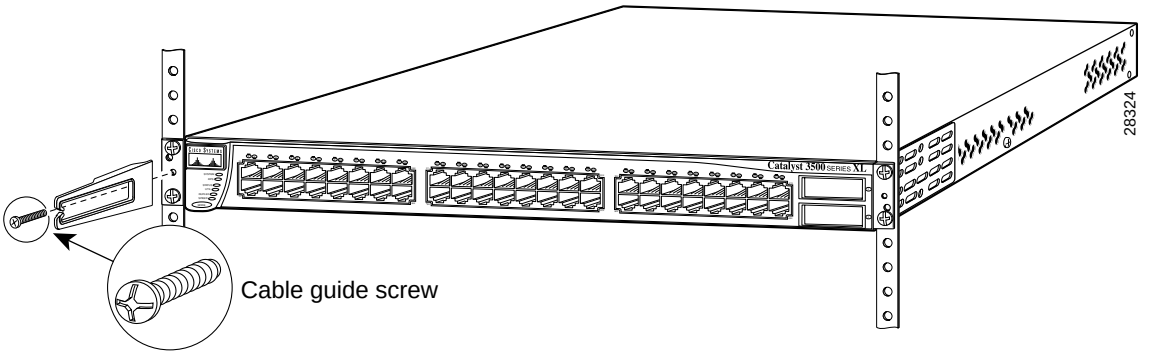



***Figure 2-7 Attaching the Cable Guide to a 3548 XL Switch***



# Installing the Switch on a Wall

This section describes the steps required to attach the switch to a wall:

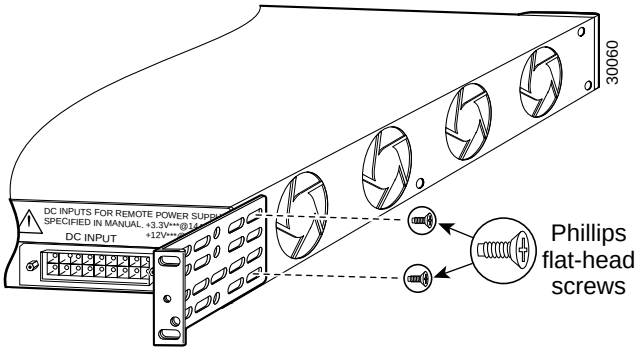
- Attaching the brackets to the switch
- Attaching the switch to a wall

## Attaching the Brackets to the Switch

Use two of the supplied number-8 Phillips flat-head screws to attach the long side of the bracket to the switch.

Figure 2-8 shows how to attach the brackets to one side of the switch. Follow the same steps to attach the second bracket to the opposite side.

***Figure 2-8 Attaching Brackets for Wall-Mounting***

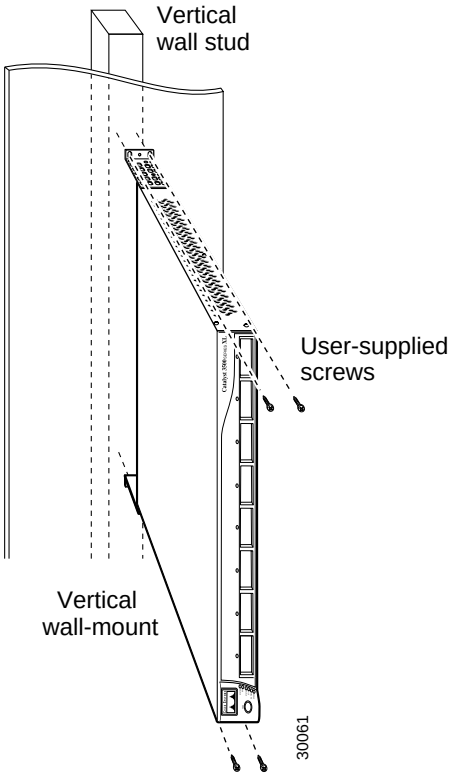



For vertical wall-mounting

# Attaching the Switch to a Wall

For best support of the switch and cables, make sure the switch is attached securely to a wall stud or to a firmly attached plywood mounting backboard, as shown in Figure 2-9.

***Figure 2-9 Attaching the Switch to a Wall***




After the switch is mounted on the wall, attach the power cord to the switch. If you are using the RPS, see the Cisco RPS documentation.

After the power is connected, the system LED turns amber for 2 seconds, and then it flashes green while the switch completes a series of self-tests described in the "Powering On the Switch and Running POST" section on page 2-15.

# Installing the Switch on a Table or Shelf

Follow these steps to install the switch on a table or shelf:

**Step 1** Locate the adhesive strip with the rubber feet in the mounting-kit envelope. Attach the four rubber feet to the recessed areas on the bottom of the unit.

**Step 2** Place the switch on the table or shelf near an AC power source.

**Step 3** Connect the power cord to the switch rear panel and to the power outlet. If you are using the RPS, see the RPS documentation for installation instructions.

After the power is connected, the system LED turns amber for 2 seconds, and then it flashes green while the switch completes POST.

# Powering On the Switch and Running POST

If your configuration has an RPS, see the "Power Connectors" section on page 1-25 and the Cisco RPS documentation.

To power on the switch after you install it, follow these steps:

**Step 1** Make sure that you have started the emulation software program (such as ProComm, HyperTerminal, tip, or minicom) from your management station.

**Step 2** Connect one end of the AC power cord to the AC power connector on the switch.

**Step 3** Connect the other end of the power cord to an AC power outlet.

As the switch powers on, it begins POST, a series of eight tests that run automatically to ensure that the switch functions properly. When the switch begins POST, the port LEDs turn amber for 2 seconds, and then they turn green. The System LED flashes green, and the RPS LED turns off. As each test runs, the port LEDs, starting with number 1, turn off. The port LEDs for ports 2 to 8 each turn off in turn as the system completes a test.

When POST completes successfully, the port LEDs return to the status mode display, indicating that the switch is operational. If a test fails, the port LED associated with the test turns amber, and the system LED turns amber. If POST fails, refer to Chapter 3, "Troubleshooting," to determine a course of action.

POST failures are usually fatal. Call Cisco Systems immediately if your switch does not pass POST.

# Connecting to the 10/100 Ports

The switch 10/100 Ethernet ports configure themselves to operate at the speed of attached devices. If the attached ports do not support autonegotiation, you can explicitly set the speed and duplex parameters.

Connecting devices that do not autonegotiate or that have their speed and duplex parameters manually set can reduce performance or result in no linkage. To maximize performance, choose one of these methods for configuring the 10/100 Ethernet ports:

- Let the ports autonegotiate both speed and duplex.
- Set the port speed and duplex parameters on both ends of the connection.

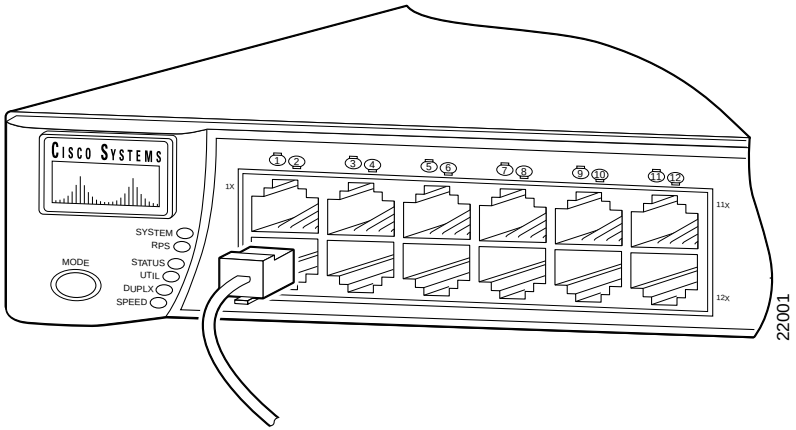
You can configure the 10/100 ports on the Catalyst 3524-PWR XL switch to either automatically provide inline power when a Cisco IP Phone is connected or to never provide inline power even if a Cisco IP Phone is connected. The default setting is Auto.

**Caution** It takes a Catalyst 3524-PWR XL 10/100 port up to 10 seconds to initially detect, power, and link to a Cisco IP Phone. If you disconnect the Cisco IP Phone before link has been established, you must wait 10 seconds before connecting another network device (other than another Cisco IP Phone) to that switch port. Failure to do so can result in damage to that network device.

Follow these steps to connect to 10BaseT and 100BaseTX devices:

**Step 1** When connecting to workstations, servers, routers, and Cisco IP Phones, connect a straight-through Category 5 cable to an RJ-45 connector on the front panel (Figure 2-10). When connecting to switches or repeaters, use a crossover Category 5 cable. Pinouts for the cables are described in the "Crossover and Straight-Through Cable Pinouts" section on page B-4.

***Figure 2-10 Connecting to a 10/100 Switch Port***




**Note** The Catalyst 3524-PWR XL switch can connect to a Cisco IP Phone through a straight-through, twisted-pair cable. The rear panel of the Cisco IP Phone might have more than one RJ-45 jack. Use the LAN-to-phone jack to connect the phone to the Catalyst 3524-PWR XL switch. Refer to the documentation that came with your Cisco IP Phone for information about connecting devices to it.

**Step 2** Connect the other end of the cable to an RJ-45 connector of the other device. The port LED comes on when both the switch and the connected device have established link.

The port LED is amber while Spanning Tree Protocol (STP) discovers the topology and searches for loops. This takes about 30 seconds, and then the port LED turns green.

If the port LED does not come on, the device at the other end might not be turned on, or there might be a cable problem or a problem with the adapter installed in the attached device. See Chapter 3, "Troubleshooting," for solutions to cabling problems.

**Step 3** Reconfigure and reboot the connected device if necessary.

**Step 4** Repeat steps 1 through 3 to connect each device.

# Connecting to the GBIC Module Ports

**Note** Install the Gigabit Interface Converters (GBICs) as described in the "GBIC Module Slots" section on page 1-10, and then connect to the 1000BaseX ports.

For detailed instructions on installing, removing, and cabling the GBICs (1000BaseSX module or the 1000BaseLX/LH module), refer to the GBIC documentation.

For detailed instructions on installing and cabling the GigaStack GBICs, see the *Catalyst GigaStack Gigabit Interface Converter Hardware Installation Guide*.

## Connecting to a 1000BaseX GBIC Module Port

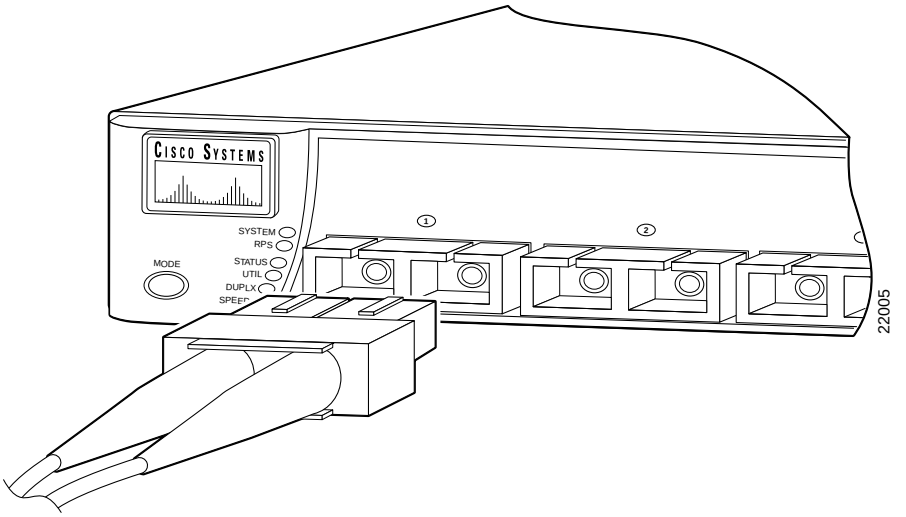
**Caution** Do not remove the rubber plugs from the fiber-optic port or the rubber caps from the fiber-optic cable until you are ready to connect the cable. The plugs and caps protect the fiber-optic port and cable from contamination and ambient light.

Follow these steps to connect to the 1000BaseX port:

**Step 1** Remove the rubber plugs from the fiber-optic port on the module, and store them for future use.

**Step 2** Insert the SC connector in the fiber-optic receptacle, as shown in Figure 2-11.

***Figure 2-11 Connecting to a 1000BaseX Port***

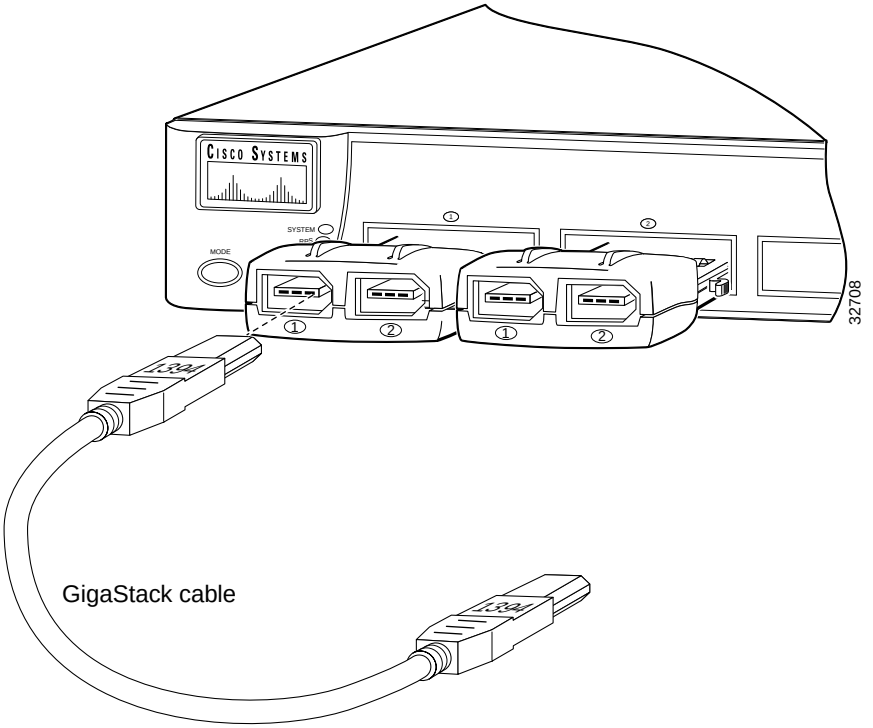



**Note** The port status is amber while Spanning Tree Protocol discovers the topology and searches for loops. This takes about 30 seconds. The port LED then turns green.

# Connecting to a GigaStack GBIC Module Port

Connect the GigaStack cable connector to the GigaStack GBIC as shown in Figure 2-12.

***Figure 2-12 Connecting to a GigaStack Port***




For more information on the GigaStack GBIC connections and configuration scenarios, see the *Catalyst GigaStack Gigabit Interface Converter Hardware Installation Guide.*

# Connecting a PC or Terminal to the Console Port

Use the supplied rollover cable and DB-9 adapter to connect a PC to the switch console port. You need to provide a RJ-45-to-DB-25 female DTE adapter if you want to connect the switch console port to a terminal. You can order a kit (part number ACS-DSBUASYN=) containing that adapter from Cisco. For console port and adapter pinout information, see the "Cable and Adapter Specifications" section on page B-4.

The PC or terminal must support VT100 terminal emulation. The terminal-emulation software—frequently a PC application such as Hyperterminal or Procomm Plus—makes communication between the switch and your PC or terminal possible during the setup program.

Follow these steps to connect the PC or terminal to the switch:

**Step 1** Be sure that your PC- or terminal-emulation software is configured to communicate with the switch via hardware flow control.

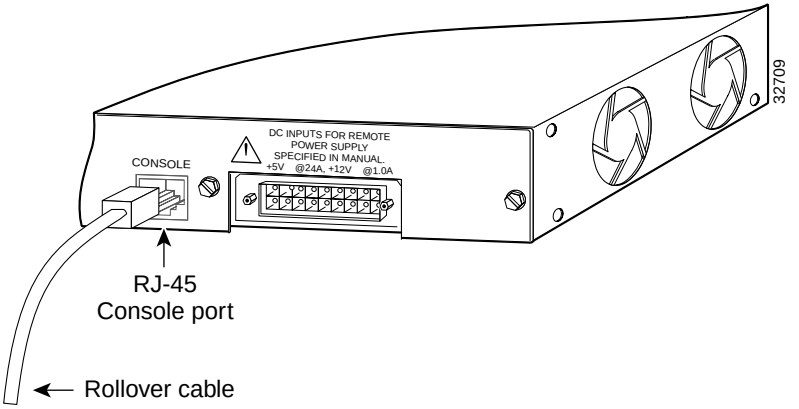
**Step 2** Configure the baud rate and character format of the PC or terminal to match these console port default characteristics:

- 9600 baud
- 8 data bits
- 1 stop bit
- No parity

After you have gained access to the switch, you can change the port baud rate. See the *Cisco IOS Desktop Switching Software Configuration Guide* for instructions.

**Step 3** Using the supplied rollover cable, insert the RJ-45 connector into the console port, as shown in Figure 2-13. See the "Identifying a Rollover Cable" section on page B-5 for a description of the pinout.

***Figure 2-13 Connecting to the Console Port***




**Step 4** Attach the supplied RJ-45-to-DB-9 female DTE adapter to a PC or attach an appropriate adapter to the terminal.

**Step 5** Insert the other end of the supplied rollover cable in the attached adapter.

**Step 6** Boot the terminal-emulation program if you are using a PC or terminal.

# Assigning Switch Information

You can assign the switch IP address information, host and cluster names, and passwords by two methods:

- Using the setup program in the switch
- Using a BOOTP server

This section describes each method.

## Using the Setup Program

You can use an automatic setup program to assign IP information and to create a default configuration for continued operation. Later, you can use the Cluster Management Suite or the command-line interface (CLI) to customize your configuration. To run the setup program, access the switch from the PC terminal that you connected to the console port. (See the "Connecting a PC or Terminal to the Console Port" section on page 2-22.)

**Note** If the switch will be a cluster member, it is not always necessary to assign IP information or a password, as the switch will be managed through the IP address of the command switch. If you are configuring a command switch or standalone switch, you need to assign IP information.

The first time that you access the switch, it runs a setup program that prompts you for IP and other configuration information necessary for the switch to communicate with local routers and the Internet. This information also is required if you plan to use the Cluster Management Suite to configure and manage the switch.

**Note** If the switch will be a cluster member managed through the IP address of the command switch, it is not necessary to assign IP information or a password. If you are configuring the switch as a standalone switch or as a command switch, you must assign IP information. Refer to the *Cisco IOS Desktop Switching Software Configuration Guide* for more information.

You will need the following information from your system administrator:

Switch IP address _____.____.____.____

Subnet mask (netmask) _____.____.____.____

Default gateway (router) _____.____.____.____

Enable secret password _____

Use this procedure to create an initial configuration for the switch:

**Note** Be sure the rollover cable is connecting a PC serial port to the switch console port. The data characteristics are 9600 baud, 8 data bits, 1 stop bit, and no parity. Use the supplied rollover cable and DB-9 adapter to connect a PC to the switch console port. You need to provide a RJ-45-to-DB-25 female DTE adapter if you want to connect the switch console port to a terminal. You can order a kit (part number ACS-DSBUASYN=) containing that adapter from Cisco. For console port and adapter pinout information, see the "Cable and Adapter Specifications" section on page B-4.

**Step 1** Enter **Y** at the prompt:

```
Continue with configuration dialog? [yes/no]: y
```

If this prompt does not appear, enter **enable**, and press **Return**. Enter **setup**, and press **Return** to restart the setup program.

**Step 2** Enter the switch IP address, and press **Return**:

```
Enter IP address: ip_address
```

**Step 3** Enter the subnet mask (IP netmask) address, and press **Return**:

```
Enter IP netmask: ip_netmask
```

**Step 4** Enter **Y** to specify a default gateway (router):

```
Would you like to enter a default gateway address? [yes]: y
```

**Step 5** Enter the IP address of the default gateway, and press **Return**:

```
IP address of the default gateway: ip_address
```

**Step 6** Enter a host name for the switch, and press **Return**:

**Note** On a command switch, the host name is limited to 28 characters; on a member switch to 31 characters. Do not use *-n*, where *n* is a number, as the last characters in a host name for any switch.

```
Enter host name: host_name
```

**Step 7** Enter a secret password (which ensures switch security), and press **Return**:

**Note** The secret password can be from 1 to 25 alphanumeric characters, can start with a number, is case-sensitive, and allows spaces but ignores leading spaces.

```
Enter enable secret: secret_password
```

**Step 8** Enter **Y** to enter a Telnet password:

```
Would you like to configure a Telnet password? [yes]: y
```

**Step 9** Enter the Telnet password, and press **Return**:

**Note** The Telnet password can be from 1 to 25 alphanumeric characters, is case-sensitive, allows spaces, but ignores leading spaces.

```
Enter Telnet password: telnet_password
```

**Step 10** Enter **Y** to configure this switch as the cluster command switch. Enter **N** to configure it as a member switch or as a standalone switch.

**Note** If you enter **N** to configure the switch as a member switch or as a standalone, it appears as a candidate switch in Cluster Builder and the Step 11 message is not displayed.

```
Would you like to enable as a cluster command switch? y
```

**Step 11** Assign a name to the cluster, and press **Return**:

**Note** The cluster name can be 1 to 31 alphanumeric characters, dashes, or underscores.

```
Enter cluster name: cls_name
```

**Step 12** Verify that the addresses are correct in the initial configuration displayed:

```
The following configuration command script was created:

ip subnet-zero
interface VLAN1
ip address ip_address ip_netmask
ip default-gateway ip_address
hostname host_name
enable secret 5 $1$jJql$VA6U.6uTjsa56Xx2yy/t30
line vty 0 15
password telnet_password
snmp community private rw
snmp community public ro
cluster enable cls_name
!
end
!
Use this configuration? [yes/no]:
```

**Step 13** If the information is correct, enter **Y** at the prompt, and press **Return** to use the displayed configuration. When you see the message "Press RETURN to get started," the setup program is complete. You can use your browser and the Cluster Management Suite or use the CLI to manage the switch.

If the information is not correct, enter **N** at the prompt, press **Return**, and begin again at Step 1.

---

The *Cisco IOS Desktop Switching Software Configuration Guide* describes how to set a password to protect the switch against unauthorized Telnet access and how to access the switch if you forget the password.

# Using BOOTP

You can use BOOTP to assign IP information to a Catalyst 3500 XL switch. A database with a list of physical MAC addresses and corresponding IP addresses must be set up on the BOOTP server. Other optional information, such as the corresponding subnet masks and default gateway addresses, can also be stored in the database. The switch must be able to access the BOOTP server through one of its ports.

If the switch starts and no IP address has been assigned, it transmits a BOOTP broadcast request to all of its connected ports, requesting a mapping for its physical MAC address. A valid response includes the IP address, which is mandatory, and the subnet mask and the default gateway, which are optional.

The reception of a valid BOOTP response immediately activates the rest of the system protocol suite, without requiring a system reset. The running configuration is set, but the saved configuration in Flash memory is not automatically updated. To save the IP information, log in to the CLI, and enter the **write memory** command. The IP information is then preserved, and the switch does not issue BOOTP messages the next time it resets.

# Default Configuration Settings

After you assign IP information, the switch can operate with the default configuration settings shown in Table 2-1.

***Table 2-1 Default Configuration Settings***

| Feature | Default Setting |
|---|---|
| **Management** | |
| Switch IP address, subnet mask, and default gateway | User-assigned values entered in the setup program. |
| Cluster command status | Enabled. |
| Cluster name | User-assigned value entered in the setup program. |
| CDP[1] | Enabled. |
| ARP[2] | Enabled. |
| Static address assignment | None assigned. |
| Network View | Always available. |
| VLAN[3] membership | All ports are static-access ports in VLAN 1. |
| **Performance** | |
| Autonegotiation of duplex mode | Enabled. |
| Autonegotiation of port speeds | Enabled. |
| **Flooding Control** | |
| Broadcast storm control | Disabled. |
| Flooding unknown unicast and multicast packets | Enabled. |
| Network port | Disabled. |
| CGMP[4] | Enabled. |
| **Network Redundancy** | |
| Spanning Tree Protocol | Enabled. |
| Port grouping | None assigned. |

*Table 2-1 Default Configuration Settings (continued)*

| Feature | Default Setting |
|---|---|
| **Diagnostics** | |
| SPAN[5] port monitoring | Disabled. |
| Console, buffer, and file logging | Disabled. |
| **Security** | |
| Password | None. |
| Addressing security | Disabled. |
| Trap manager | 0.0.0.0 |
| Community strings | public. |
| Port security | Disabled. |
| **Inline Power** | |
| Inline power mode | Auto. |

1. CDP = Cisco Discovery Protocol
2. ARP = Address Resolution Protocol
3. VLAN = Virtual Local Area Network
4. CGMP = Cisco Group Management Protocol
5. SPAN = Switched Port Analyzer

# Where to Go Next

If the default configuration shown in Table 2-1 is satisfactory, the switch does not need further configuration. You can use any of the following management options to change the default configuration:

- Start the Cluster Management Suite, as described in the *Cisco IOS Desktop Switching Software Configuration Guide*, and configure the switch as a member of a cluster or as an individual switch. Refer to the release notes on CCO for the most current browser requirements.
- Use the CLI to configure the switch from the console. See *Cisco IOS Desktop Switching Command Reference* for information on using the CLI with Catalyst 3500 XL switches.
- Start an SNMP application such as the CiscoView application.

CHAPTER 3

# Troubleshooting

The LEDs on the front panel provide troubleshooting information about the switch. They show failures in the power-on self-test (POST), port-connectivity problems, and overall switch performance. For a full description of the switch LEDs, see the "LEDs" section on page 1-12.

You can also get statistics from the browser interface, from the command-line interface (CLI), or from an Simple Network Management Protocol (SNMP) workstation. See the *Cisco IOS Desktop Switching Software Configuration Guide*, the *Cisco IOS Desktop Switching Command Reference* (online only), or the documentation that came with your SNMP application for details.

This chapter describes the following topics for troubleshooting problems:

- Understanding POST results
- Diagnosing problems

# Understanding POST Results

Table 3-1 lists the eight POST tests and their associated LEDs.

POST tests run automatically each time the switch is powered on. When the switch begins POST, the port LEDs turn amber for 2 seconds, and then they turn green. The System LED flashes green, and the RPS LED turns off. As each test runs, the port LEDs, starting with number 1, turn off. The port LEDs for ports 2 to 8 each turn off in turn as the system completes a test.

When POST completes successfully, the port LEDs return to the status mode display, indicating that the switch is operational. If a test fails, the port LED associated with the test turns amber, and the system LED turns amber.

**Note** POST failures are usually fatal. Call Cisco Systems if your switch does not pass POST.

***Table 3-1 POST Test Descriptions***

| Switch LED | Component Tested |
|---|---|
| LED 1 | DRAM |
| LED 2 | Flash memory |
| LED 3 | Switch CPU |
| LED 4 | System board |
| LED 5 | CPU interface ASIC |
| LED 6 | Switch core ASIC |
| LED 7 | Ethernet controller ASIC |
| LED 8 | Ethernet interfaces |

# Diagnosing Problems

Common switch problems fall into the following categories:

- Poor performance
- No connectivity
- Corrupted software

Table 3-2 describes how to detect and resolve these problems.

*Table 3-2 Common Problems and Their Solutions*

| Symptom | Possible Cause | Resolution |
|---|---|---|
| **Poor performance or excessive errors.** | Duplex autonegotiation mismatch. | See the *Cisco IOS Desktop Switching Software Configuration Guide* for information on identifying autonegotiation mismatches. |
| | **Cabling distance exceeded.**<br>• Port statistics show excessive frame check sequence (FCS), late-collision, or alignment errors.<br>• For 100BaseTX connections:<br>– The distance between the port and the attached device exceeds 100 meters.<br>– If the switch is attached to a repeater, the total distance between the two end stations exceeds the 100BaseT cabling guidelines.<br>• For 10BaseT connections: The distance between the port and the attached device exceeds 100 meters. | • See the *Cisco IOS Desktop Switching Software Configuration Guide* for information on displaying port statistics.<br>• Reduce the cable length to within the recommended distances.<br>See your 100BaseT repeater documentation for cabling guidelines.<br>• Reduce the cable length to within the recommended distances. |
| | **Bad adapter in attached device.**<br>• Excessive errors found in port statistics.<br>• STP checking for possible loops. | • Run adapter card diagnostic utility.<br>• Wait 30 seconds for LED to turn green. |

*Table 3-2 Common Problems and Their Solutions (continued)*

| Symptom | Possible Cause | Resolution |
|---|---|---|
| **No connectivity.** | **Incorrect or bad cable.**<br>The following are indicated by no link at both ends:<br>• A crossover cable was used when a straight-through was required, or vice-versa.<br>• The cable is wired incorrectly.<br>• STP checking for possible loops. | • For the correct pinouts and the proper application of crossover vs. straight-through cables, see the "Crossover and Straight-Through Cable Pinouts" section on page B-4.<br>• Replace with a tested good cable.<br>• Wait 30 seconds for LED to turn green. |
| **Unreadable characters on the management console.** | Incorrect baud rate. | Reset the emulation software to 9600 baud. |
| **System LED is amber on the Catalyst 3508, 3512, or 3524 XL switch.** | Nonfatal or fatal POST error detected. | Use the **show POST** command to see which POST test failed. |

*Table 3-2 Common Problems and Their Solutions (continued)*

| Symptom | Possible Cause | Resolution |
|---|---|---|
| **System LED is amber on the Catalyst 3524-PWR XL.** | • Internal fan fault detected. | • Either check the switch itself or use the **show env** command to check if a fan on the switch has failed. The Catalyst 3524-PWR XL switch can operate normally with one failed fan. Replace the switch at your convenience. |
| | • Switch is overheating. | • Use the **show env** command to check if an overtemperature condition exists. If it does:<br>– Place the switch in an environment that is within 32 to 113°F (0 to 45°C).<br>– Make sure fan intake and exhaust areas are clear.<br>If a multiple-fan failure is causing the switch to overheat, replace the switch. |
| | • Nonfatal or fatal POST error detected. | • Use the **show POST** command to see which POST test failed. |
| **Cisco IP Phone fails to power on when connected to a Catalyst 3524-PWR XL switch.** | Improper cabling. | Make sure the switch is connected to the LAN-to-phone jack on the Cisco IP Phone. |


# Technical Specifications

Table A-1, Table A-2, and Table A-3, list the technical specifications for the Catalyst 3500 series XL switches. Table A-4 lists the regulatory agency approvals.

***Table A-1 Technical Specifications for the Catalyst 3508G XL Switch***

| | |
|---|---|
| **Environmental Ranges** | |
| Operating temperature | 32 to 113°F (0 to 45°C) |
| Storage temperature | –4 to 149°F (–10 to 65°C) |
| Operating humidity | 10 to 85% (noncondensing) |
| Operating altitude | Up to 10,000 ft (3000 m) |
| Storage altitude | Up to 15,000 ft (4570 m) |
| **Power Requirements** | |
| AC input voltage | 100 to 127/200 to 240 VAC (autoranging) 50 to 60 Hz |
| DC input voltages | +3.3V ⎓ @14A,<br>+12V ⎓ @3A |
| Power consumption | 82.2W<br>280 Btus per hour |
| **Physical Dimensions** | |
| Weight | 12 lb (5.45 kg) |
| Dimensions (H x W x D) | 1.75 x 16 x 17.5 in.<br>(4.45 x 40.46 x 44.45 cm) |

*Table A-2 Technical Specifications for the Catalyst 3512, 3524, and 3548 XL Switches*

| | Catalyst 3512 XL | Catalyst 3524 XL | Catalyst 3548 XL |
|---|---|---|---|
| **Environmental Ranges** | | | |
| Operating temperature | 32 to 113°F (0 to 45°C) | 32 to 113°F (0 to 45°C) | 32 to 113°F (0 to 45°C) |
| Storage temperature | –4 to 149°F (–10 to 65°C) | –4 to 149°F (–10 to 65°C) | –4 to 149°F (–10 to 65°C) |
| Relative humidity | 10 to 85% (noncondensing) | 10 to 85% (noncondensing) | 10 to 85% (noncondensing) |
| Operating altitude | Up to 10,000 ft (3000 m) | Up to 10,000 ft (3000 m) | Up to 10,000 ft (3000 m) |
| Storage altitude | 15,000 ft (4570 m) | 15,000 ft (4570 m) | 15,000 ft (4570 m) |
| **Power Requirements** | | | |
| AC input voltage | 100 to 127/200 to 240 VAC (autoranging) 50 to 60 Hz | 100 to 127/200 to 240 VAC (autoranging) 50 to 60 Hz | 100 to 127/200 to 240 VAC (autoranging) 50 to 60 Hz |
| DC input voltages | +5V ⎓ @8.0A, +12V ⎓ @0.5A | +5V ⎓ @10A, +12V ⎓ @0.5A | +3.3V ⎓ @17A +12V ⎓ @1.1A |
| Power consumption | 50W 171 Btus per hour | 75W 256 Btus per hour | 100W 600 Btus per hour |
| **Physical Dimensions** | | | |
| Weight | 10.25 lb (4.65 kg) | 8.5 lb (3.86 kg) | 12 lb (5.45 kg) |
| Dimensions (H x D x W) | 1.75 x 11.82 x 17.5 in. (4.45 x 30.02 x 44.45 cm) | 1.75 x 11.82 x 17.5 in. (4.45 x 30.02 x 44.45 cm) | 1.73 x 15.34 x 17.5 in (4.39 x 39.0 x 44.45 cm) |

*Table A-3 Technical Specifications for the Catalyst 3524-PWR XL Switch*

| | |
|---|---|
| **Environmental Ranges** | |
| Operating temperature | 32 to 113°F (0 to 45°C) |
| Storage temperature | –4 to 149°F (–10 to 65°C) |
| Operating humidity | 10 to 85% (noncondensing) |
| Operating altitude | Up to 10,000 ft (3000 m) |
| Storage altitude | Up to 15,000 ft (4570 m) |
| **Power Requirements** | |
| AC input voltage | 100 to 127/200 to 240 VAC (autoranging) 50 to 60 Hz |
| DC input voltages | –48V ⎓ @3A,<br>+12V ⎓ @6A |
| Power consumption | 325W[1]<br>1100 Btus per hour |
| **Physical Dimensions** | |
| Weight | 10.25 lb (4.65 kg) |
| Dimensions (H x W x D) | 1.75 x 11.82 x 17.5 in.<br>(4.45 x 30.02 x 44.45 cm) |

1. The actual power consumption depends on the number of IP phones connected. 325W represents 24 IP phones connected.

*Table A-4 Catalyst 3500 Series XL Agency Approvals*

| Safety | EMC |
|---|---|
| UL to UL 1950, Third Edition | FCC Part 15 Class A |
| c-UL to CAN/CSA 22.2 No. 950-95, Third Edition | EN 55022 Class A (CISPR 22 Class A) |
| TUV/GS to EN 60950 with Amendment A1-A4 and A11 | VCCI Class A |
| ACA/A2LA to AS/NZS 3260 and TS001-1997 | AS/NZS 3548 Class A |
| CB to IEC 60950 with all country deviations | BSMI |
| NOM to NOM-019-SCFI | CE Marking |
| CE Marking | |


# Connector and Cable Specifications

This appendix describes the Catalyst 3500 XL switch ports and the cables and adapters that you use to connect the switch to other devices.

## Connector Specifications

### 10/100 Ports

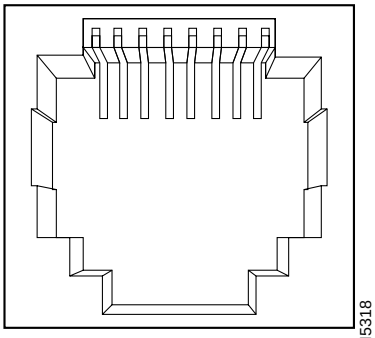
The 10/100 Ethernet ports use standard RJ-45 connectors and Ethernet pinouts with internal crossovers, as indicated by an X in the port name. These ports have their transmit (TD) and receive (RD) signals internally crossed so that a straight-through cable and adapter can be attached to the port. Figure B-1 shows the pinout.

When connecting the 10/100 ports to compatible workstations, servers, routers, and Cisco IP Phones, you must use a straight-through cable wired for 10BaseT and 100BaseTX (Figure B-5 illustrates the straight-through cable schematics). When connecting to other switches or repeaters, ensure that you use a crossover cable. (Figure B-4 illustrates the crossover cable schematics.)

**Note** Use a straight-through cable to connect two ports when one of the ports is designated with an **X**. Use a crossover cable to connect two ports when both ports are designated with an **X** or when both ports do not have an **X**.

*Figure B-1 10/100 Port Pinouts*

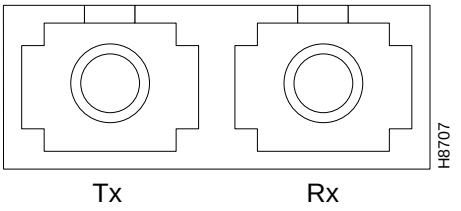
| Pin | Label | 1 2 3 4 5 6 7 8 |
|---|---|---|
| 1 | RD+ | |
| 2 | RD- | |
| 3 | TD+ | |
| 4 | NC | |
| 5 | NC | |
| 6 | TD- | |
| 7 | NC | |
| 8 | NC | |




# 1000BaseX Ports

1000BaseX ports use duplex SC connectors, as shown in Figure B-2.

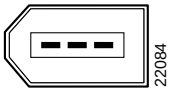
*Figure B-2 1000BaseX SC Connector*



# Gigastack Port

The GigaStack Gigabit Interface Converter (GBIC) uses proprietary connectors, as shown in Figure B-3.

***Figure B-3 GigaStack Connector***




The GigaStack GBIC cables are proprietary, high-data-rate cables with enhanced signal integrity and EMI performance.

**Caution** Do not use standard IEEE 1394 cables with the GigaStack GBIC.

# Console Port

The console port uses an 8-pin RJ-45 connector, described in Table B-1 and Table B-2. The supplied RJ-45-to-RJ-45 rollover cable and DB-9 adapter are used to connect the console port of the switch to a console PC. You need to provide a RJ-45-to-DB-25 female DTE adapter if you want to connect the switch console port to a terminal. You can order a kit (part number ACS-DSBUASYN=) containing that adapter from Cisco. For console port and adapter pinout information, see Table B-1 and Table B-2.

# Cable and Adapter Specifications

## Crossover and Straight-Through Cable Pinouts

The schematics of crossover and straight-through cables are shown in Figure B-4 and Figure B-5.

***Figure B-4 Crossover Cable Schematic***

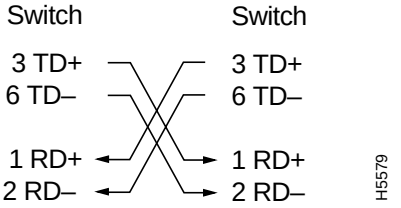
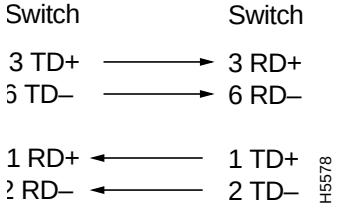



***Figure B-5 Straight-Through Cable Schematic***

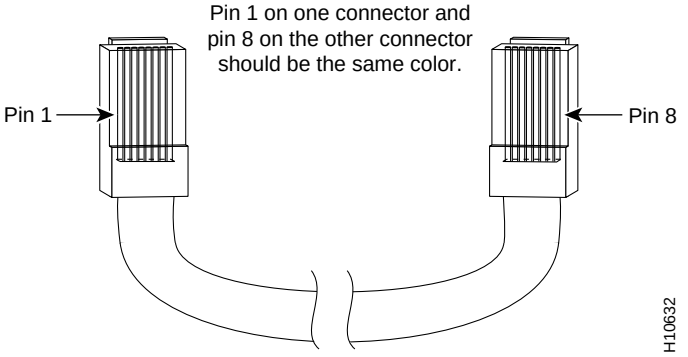


# Rollover Cable and Adapter Pinouts

## Identifying a Rollover Cable

To identify a rollover cable, compare the two modular ends of the cable. Hold the cable ends side-by-side, with the tab at the back. The wire connected to the pin on the outside of the left plug should be the same color as the wire connected to the pin on the outside of the right plug (see Figure B-6).

***Figure B-6 Identifying a Rollover Cable***



## Connecting to a PC

Use the supplied thin, flat, RJ-45-to-RJ-45 rollover cable and RJ-45-to-DB-9 female DTE adapter to connect the console port to a PC running terminal-emulation software. Figure B-7 shows how to connect the console port to a PC. Table B-1 lists the pinouts for the console port, the RJ-45-to-RJ-45 rollover cable, and the RJ-45-to-DB-9 female DTE adapter.

***Figure B-7 Connecting the Console Port to a PC***

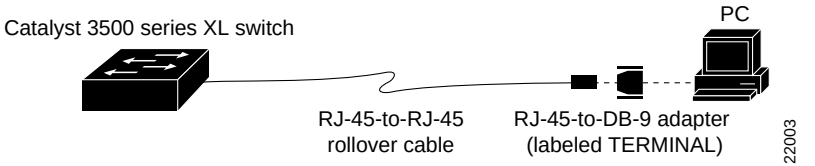



***Table B-1 Console Port Signaling and Cabling Using a DB-9 Adapter***

| Console Port (DTE) | RJ-45-to-RJ-45 Rollover Cable | | RJ-45-to-DB-9 Terminal Adapter | Console Device |
|---|---|---|---|---|
| **Signal** | **RJ-45 Pin** | **RJ-45 Pin** | **DB-9 Pin** | **Signal** |
| RTS | 1 | 8 | 8 | CTS |
| Not connected | 2 | 7 | 6 | DSR |
| TxD | 3 | 6 | 2 | RxD |
| GND | 4 | 5 | 5 | GND |
| GND | 5 | 4 | 5 | GND |
| RxD | 6 | 3 | 3 | TxD |
| Not connected | 7 | 2 | 4 | DTR |
| CTS | 8 | 1 | 7 | RTS |

## Connecting to a Terminal

Use the thin, flat, RJ-45-to-RJ-45 rollover cable and RJ-45-to-DB-25 female DTE adapter to connect the console port to a terminal. Table B-2 lists the pinouts for the console port, the RJ-45-to-RJ-45 rollover cable, and the RJ-45-to-DB-25 female DTE adapter.

**Note** The RJ-45-to-DB-25 female DTE adapter is not supplied with the switch. You can order a kit (part number ACS-DSBUASYN=) containing this adapter from Cisco.

*Table B-2 Console Port Signaling and Cabling Using a DB-25 Adapter*

| Console Port (DTE) | RJ-45-to-RJ-45 Rollover Cable | | RJ-45-to-DB-25 Terminal Adapter | Console Device |
|---|---|---|---|---|
| **Signal** | **RJ-45 Pin** | **RJ-45 Pin** | **DB-25 Pin** | **Signal** |
| RTS | 1 | 8 | 5 | CTS |
| Not connected | 2 | 7 | 6 | DSR |
| TxD | 3 | 6 | 3 | RxD |
| GND | 4 | 5 | 7 | GND |
| GND | 5 | 4 | 7 | GND |
| RxD | 6 | 3 | 2 | TxD |
| Not connected | 7 | 2 | 20 | DTR |
| CTS | 8 | 1 | 4 | RTS |


# Translated Safety Warnings

This appendix repeats in multiple languages the warnings in this guide. These translated warnings can be used with other documents related to this guide.

# Attaching the Cisco RPS (model PWR600-AC-RPS)

This warning applies to the Catalyst 3508, 3512, 3524, and 3548 XL switches.

| | |
|---|---|
| **Warning** | **Attach only the Cisco RPS (model PWR600-AC-RPS) to the RPS receptacle.** |
| **Waarschuwing:** | **Slechts de Cisco RPS (model PWR600-AC-RPS) aan de RPS contactdoos verbinden.** |
| **Varoitus** | **Kiinnitä RPS-vastakappaleeseen vain Cisco RPS (malli PWR600-AC-RPS).** |
| **Avertissement :** | **Raccordez le bloc d'alimentation Cisco RPS (modèle PWR600-AC-RPS) uniquement au connecteur RPS.** |
| **Warnung:** | **An die RPS-Steckhülse darf nur das Cisco RPS (Modell PWR600-AC-RPS) angeschlossen werden.** |
| **Avvertenza.** | **Collegare soltanto il Cisco RPS (modello PWR600-AC-RPS) alla presa RPS.** |
| **Advarsel!** | **Koble bare Cisco RPS (modell PWR600-AC-RPS) til RPS-stikkontakten.** |
| **Aviso** | **Anexe o RPS Cisco (modelo PWR600-AC-RPS) apenas ao receptáculo RPS.** |
| **Aviso:** | **Sólo conecte el Cisco RPS (modelo PWR600-AC-RPS) al receptáculo RPS.** |
| **Varning!** | **Koppla endast Ciscos RPS (modell PWR600-AC-RPS) till RPS-uttaget.** |

# Attaching the Cisco RPS (model PWR300-AC-RPS)

This warning applies to the Catalyst 3524-PWR XL switch.

| | |
|---|---|
| **Warning** | **Attach only the Cisco RPS (model PWR300-AC-RPS) to the RPS receptacle.** |
| **Waarschuwing:** | **Slechts de Cisco RPS (model PWR300-AC-RPS) aan de RPS contactdoos verbinden.** |
| **Varoitus** | **Kiinnitä RPS-vastakappaleeseen vain Cisco RPS (malli PWR300-AC-RPS).** |
| **Avertissement :** | **Raccordez le bloc d'alimentation Cisco RPS (modèle PWR300-AC-RPS) uniquement au connecteur RPS.** |
| **Warnung:** | **An die RPS-Steckhülse darf nur das Cisco RPS (Modell PWR300-AC-RPS) angeschlossen werden.** |
| **Avvertenza.** | **Collegare soltanto il Cisco RPS (modello PWR300-AC-RPS) alla presa RPS.** |
| **Advarsel!** | **Koble bare Cisco RPS (modell PWR300-AC-RPS) til RPS-stikkontakten.** |
| **Aviso** | **Anexe o RPS Cisco (modelo PWR300-AC-RPS) apenas ao receptáculo RPS.** |
| **Aviso:** | **Sólo conecte el Cisco RPS (modelo PWR300-AC-RPS) al receptáculo RPS.** |
| **Varning!** | **Koppla endast Ciscos RPS (modell PWR300-AC-RPS) till RPS-uttaget.** |

# Service Personnel Warning

**Warning** **This equipment is to be installed and maintained by service personnel only as defined by AS/NZS 3260 Clause 1.2.14.3 Service Personnel.**

**Waarschuwing** **Deze apparatuur mag slechts geïnstalleerd en onderhouden worden door servicepersoneel conform de definitie van AS/NZS 3260 Clausule 1.2.14.3 Service Personnel.**

**Varoitus** **Tämän laitteen saa asentaa tai huoltaa ainoastaan Australiassa ja Uudessa Seelannissa sovellettavan AS/NZS 3260 -standardin kohdan 1.2.14.3 Service Personnel määrittelemä huoltohenkilöstö.**

**Attention** **Cet équipement ne doit être installé et entretenu que par du personnel d'entretien comme défini par la réglementation AS/NZS 3260 Clause 1.2.14.3 Service Personnel.**

**Warnung** **Dieses Gerät darf nur von Wartungspersonal gemäß AS/NZS-Definition 3260, Paragraph 1.2.14.3, "Service Personnel", installiert und gewartet werden.**

**Avvertenza** **Questo apparecchio deve essere installato e mantenuto in efficienza esclusivamente da personale tecnico che soddisfi i requisiti specificati nella sezione 1.2.14.3 sul 'Service Personnel' contenuta nelle norme AS/NZS 3260.**

**Advarsel** **Installasjon og vedlikehold av dette utstyret skal kun foretas av vedlikeholdspersonell som definert i AS/NZS 3260, klausul 1.2.14.3 Service Personnel.**

**Aviso** **Este equipamento deverá ser instalado e reparado apenas por pessoal de manutenção qualificado, conforme estipulado em AS/NZS 3260 Cláusula 1.2.14.3 Service Personnel.**

**Advertencia** **Este equipo se debe instalar y mantener solamente por personal de servicio, según definido por AS/NZS 3260 Cláusula 1.2.14.3 Service Personnel.**

**Varning!** **Installation och underhåll av denna utrustning får endast utföras av servicepersonal enligt definition i AS/NZS 3260 klausul 1.2.14.3 Service Personnel.**

# Qualified Personnel Warning

| | |
|---|---|
| **Warning** | **Only trained and qualified personnel should be allowed to install or replace this equipment** |
| **Waarschuwing** | **Installatie en reparaties mogen uitsluitend door getraind en bevoegd personeel uitgevoerd worden.** |
| **Varoitus** | **Ainoastaan koulutettu ja pätevä henkilökunta saa asentaa tai vaihtaa tämän laitteen.** |
| **Avertissement** | **Tout installation ou remplacement de l'appareil doit être réalisé par du personnel qualifié et compétent.** |
| **Achtung** | **Gerät nur von geschultem, qualifiziertem Personal installieren oder auswechseln lassen.** |
| **Avvertenza** | **Solo personale addestrato e qualificato deve essere autorizzato ad installare o sostituire questo apparecchio.** |
| **Advarsel** | **Kun kvalifisert personell med riktig opplæring bør montere eller bytte ut dette utstyret.** |
| **Aviso** | **Este equipamento deverá ser instalado ou substituído apenas por pessoal devidamente treinado e qualificado.** |
| **¡Atención!** | **Estos equipos deben ser instalados y reemplazados exclusivamente por personal técnico adecuadamente preparado y capacitado.** |
| **Varning** | **Denna utrustning ska endast installeras och bytas ut av utbildad och kvalificerad personal.** |

# Installation Warning

| | |
|---|---|
| **Warning** | **Read the installation instructions before you connect the system to its power source.** |
| **Waarschuwing** | **Raadpleeg de installatie-aanwijzingen voordat u het systeem met de voeding verbindt.** |
| **Varoitus** | **Lue asennusohjeet ennen järjestelmän yhdistämistä virtalähteeseen.** |
| **Attention** | **Avant de brancher le système sur la source d'alimentation, consulter les directives d'installation.** |
| **Warnung** | **Lesen Sie die Installationsanweisungen, bevor Sie das System an die Stromquelle anschließen.** |
| **Avvertenza** | **Consultare le istruzioni di installazione prima di collegare il sistema all'alimentatore.** |
| **Advarsel** | **Les installasjonsinstruksjonene før systemet kobles til strømkilden.** |
| **Aviso** | **Leia as instruções de instalação antes de ligar o sistema à sua fonte de energia.** |
| **¡Advertencia!** | **Ver las instrucciones de instalación antes de conectar el sistema a la red de alimentación.** |
| **Varning!** | **Läs installationsanvisningarna innan du kopplar systemet till dess strömförsörjningsenhet.** |

**警告**　システムを電源に接続する前に、インストレーションについての説明書を必ずお読みください。

# Jewelry Removal Warning

**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.**

**Waarschuwing** **Alvorens aan apparatuur te werken die met elektrische leidingen is verbonden, sieraden (inclusief ringen, kettingen en horloges) verwijderen. Metalen voorwerpen worden warm wanneer ze met stroom en aarde zijn verbonden, en kunnen ernstige brandwonden veroorzaken of het metalen voorwerp aan de aansluitklemmen lassen.**

**Varoitus** **Ennen kuin työskentelet voimavirtajohtoihin kytkettyjen laitteiden parissa, ota pois kaikki korut (sormukset, kaulakorut ja kellot mukaan lukien). Metalliesineet kuumenevat, kun ne ovat yhteydessä sähkövirran ja maan kanssa, ja ne voivat aiheuttaa vakavia palovammoja tai hitsata metalliesineet kiinni liitäntänapoihin.**

**Attention** **Avant d'accéder à cet équipement connecté aux lignes électriques, ôter tout bijou (anneaux, colliers et montres compris). Lorsqu'ils sont branchés à l'alimentation et reliés à la terre, les objets métalliques chauffent, ce qui peut provoquer des blessures graves ou souder l'objet métallique aux bornes.**

**Warnung** **Vor der Arbeit an Geräten, die an das Netz angeschlossen sind, jeglichen Schmuck (einschließlich Ringe, Ketten und Uhren) abnehmen. Metallgegenstände erhitzen sich, wenn sie an das Netz und die Erde angeschlossen werden, und können schwere Verbrennungen verursachen oder an die Anschlußklemmen angeschweißt werden.**

**Avvertenza** **Prima di intervenire su apparecchiature collegate alle linee di alimentazione, togliersi qualsiasi monile (inclusi anelli, collane, braccialetti ed orologi). Gli oggetti metallici si riscaldano quando sono collegati tra punti di alimentazione e massa: possono causare ustioni gravi oppure il metallo può saldarsi ai terminali.**

**Advarsel** **Fjern alle smykker (inkludert ringer, halskjeder og klokker) før du skal arbeide på utstyr som er koblet til kraftledninger. Metallgjenstander som er koblet til kraftledninger og jord blir svært varme og kan forårsake alvorlige brannskader eller smelte fast til polene.**

**Aviso** **Antes de trabalhar em equipamento que esteja ligado a linhas de corrente, retire todas as jóias que estiver a usar (incluindo anéis, fios e relógios). Os objectos metálicos aquecerão em contacto com a corrente e em contacto com a ligação à terra, podendo causar queimaduras graves ou ficarem soldados aos terminais.**

**¡Advertencia!** **Antes de operar sobre equipos conectados a líneas de alimentación, quitarse las joyas (incluidos anillos, collares y relojes). Los objetos de metal se calientan cuando se conectan a la alimentación y a tierra, lo que puede ocasionar quemaduras graves o que los objetos metálicos queden soldados a los bornes.**

**Varning!** **Tag av alla smycken (inklusive ringar, halsband och armbandsur) innan du arbetar på utrustning som är kopplad till kraftledningar. Metallobjekt hettas upp när de kopplas ihop med ström och jord och kan förorsaka allvarliga brännskador; metallobjekt kan också sammansvetsas med kontakterna.**

# Stacking the Chassis Warning

**Warning** **Do not stack the chassis on any other equipment. If the chassis falls, it can cause severe bodily injury and equipment damage.**

**Waarschuwing** **Het chassis mag niet op andere apparatuur gestapeld te worden. Als het chassis mocht vallen, kan dit ernstig lichamelijk letsel en beschadiging van de apparatuur veroorzaken.**

**Varoitus** **Älä aseta asennuspohjaa minkään muun laitteen päälle. Asennuspohja voi pudotessaan aiheuttaa vaikean ruumiinvamman tai laitevaurion.**

**Avertissement** **Ne placez pas ce châssis sur un autre appareil. En cas de chute, il pourrait provoquer de graves blessures corporelles et d'importants dommages.**

**Achtung** **Das Gehäuse nicht auf andere Geräte stellen. Wenn das Gehäuse herunterfällt, besteht Gefahr schwerer Personenverletzungen und Geräteschäden.**

**Avvertenza** **Non collocare lo chassis su nessun altro apparecchio. Se lo chassis cade, può causare lesioni gravi e danni alle apparecchiature.**

**Advarsel** **Stable ikke kabinettet oppå annet utstyr. Hvis kabinettet faller, kan det forårsake alvorlig skade på mennesker og utstyr.**

**Aviso** **Não coloque o chassis em cima de qualquer outro equipamento. Se o chassis cair, poderá causar ferimentos graves e danos no equipamento.**

**¡Atención!** **No apilar los chasis sobre ningún otro equipo. Si el chasis se cae al suelo puede causar graves lesiones físicas y daños al equipo.**

**Varning** **Placera inte chassit ovanpå annan utrustning. Om chassit faller kan allvarlig kroppsskada såväl som skada på utrustningen uppstå.**

# Main Disconnecting Device

| | |
|---|---|
| Warning | The plug-socket combination must be accessible at all times because it serves as the main disconnecting device. |
| Waarschuwing | De combinatie van de stekker en het elektrisch contactpunt moet te allen tijde toegankelijk zijn omdat deze het hoofdmechanisme vormt voor verbreking van de aansluiting. |
| Varoitus | Pistoke/liitinkohta toimii pääkatkaisumekanismina. Pääsy siihen on pidettävä aina esteettömänä. |
| Attention | La combinaison de prise de courant doit être accessible à tout moment parce qu'elle fait office de système principal de déconnexion. |
| Warnung | Der Netzkabelanschluß am Gerät muß jederzeit zugänglich sein, weil er als primäre Ausschaltvorrichtung dient. |
| Avvertenza | Il gruppo spina-presa deve essere sempre accessibile, poiché viene utilizzato come dispositivo di scollegamento principale. |
| Advarsel | Kombinasjonen støpsel/uttak må alltid være tilgjengelig ettersom den fungerer som hovedfrakoplingsenhet. |
| Aviso | A combinação ficha-tomada deverá ser sempre acessível, porque funciona como interruptor principal. |
| ¡Advertencia! | El conjunto de clavija y toma ha de encontrarse siempre accesible ya que hace las veces de dispositivo de desconexión principal. |
| Varning! | Man måste alltid kunna komma åt stickproppen i uttaget, eftersom denna koppling utgör den huvudsakliga frånkopplingsanordningen. |

# Overtemperature Warning

**Warning** To prevent the switch from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature of 104°F (40°C). To prevent airflow restriction, allow at least 3 inches (7.6 cm) of clearance around the ventilation openings.

**Waarschuwing** Om oververhitting van de schakelaar te voorkomen, mag u die niet bedienen in een ruimte die de maximale aanbevolen omgevingstemperatuur van 104 F (40°C) overschrijdt. Om beperking van de luchtstroom te voorkomen, dient u ten minste 3 inch (7,6 cm) speling te laten rondom de ventilatie-openingen.

**Varoitus** Estääksesi kytkimen ylikuumenemisen älä käytä sitä sellaisissa paikoissa, joiden lämpötila ylittää ympäristön enimmäislämpötilaksi suositellun 40°C. Jätä vähintään 7,6 cm:n vapaa tila tuuletusaukkojen ympärille, jotta ilma pääsee vapaasti virtaamaan.

**Attention** Pour éviter une surchauffe du commutateur, ne pas le faire fonctionner dans un local dont la température ambiante dépasse le maximum recommandé de 40°C (104 F). Pour faciliter la circulation d'air, aménager un dégagement d'au moins 7,6 cm (3 pouces) autour des bouches d'aération.

**Warnung** Um eine Überhitzung des Schalters zu vermeiden, ist das System nicht in einem Bereich zu betreiben, in dem die empfohlene Höchsttemperatur von 40°C überschritten wird. Damit der Luftfluß nicht behindert wird, ist ein Freiraum von mindestens 7,6 cm um die Belüftungsöffnungen herum einzuhalten.

**Avvertenza** **Per evitare il surriscaldamento dell'interruttore, non usare l'apparecchiatura in un'area che supera la temperatura ambientale minima consigliata di 40°C. Per evitare una limitazione del flusso dell'aria, lasciare come minimo uno spazio libero di 7,6 cm intorno alle aperture di ventilazione.**

**Advarsel** **For å unngå at bryteren overopphetes skal utstyret ikke brukes på steder hvor anbefalt maks omgivelsestemperatur overstiger 104 grader Farenheit (40°C). La det være minst 3 tommer (7,6 cm) klaring rundt ventilasjonsåpningene for at luftsirkulasjonen skal være uhindret.**

**Aviso** **Para evitar sobreaquecimento do interruptor, não utilize o equipamento numa àrea que exceda uma temperatura máxima de 40°C. Para evitar o bloqueamento da circulação de ar, deixe pelo menos um espaço de 7.6 cm em volta das aberturas de ventilação.**

**¡Advertencia!** **Para evitar que el interruptor se recaliente, no se debe usar en áreas cuya temperatura ambiente exceda la máxima recomendada, esto es, 40°C (104°F). Para no entorpecer la corriente de aire, dejar por lo menos 7,6 cm (3 pulgadas) de espacio muerto alrededor de la rejilla de ventilación.**

**Varning!** **För att undvika överhettning av strömbrytaren skall den inte användas i utrymme vars temperatur överskrider den maximalt rekommenderade omgivningstemperaturen 40°C. Kontrollera att det finns minst 7,6 cm fritt utrymme runt ventilationsöppningarna så att luftflödet inte begränsas.**

# TN Power Warning

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|---|---|
| **Warning** | **The device is designed to work with TN power systems.** |
| **Waarschuwing** | **Het apparaat is ontworpen om te functioneren met TN energiesystemen.** |
| **Varoitus** | **Koje on suunniteltu toimimaan TN-sähkövoimajärjestelmien yhteydessä.** |
| **Attention** | **Ce dispositif a été conçu pour fonctionner avec des systèmes d'alimentation TN.** |
| **Warnung** | **Das Gerät ist für die Verwendung mit TN-Stromsystemen ausgelegt.** |
| **Avvertenza** | **Il dispositivo è stato progettato per l'uso con sistemi di alimentazione TN.** |
| **Advarsel** | **Utstyret er utfomet til bruk med TN-strømsystemer.** |
| **Aviso** | **O dispositivo foi criado para operar com sistemas de corrente TN.** |
| **¡Advertencia!** | **El equipo está diseñado para trabajar con sistemas de alimentación tipo TN.** |
| **Varning!** | **Enheten är konstruerad för användning tillsammans med elkraftssystem av TN-typ.** |

# Ground Connection Warning

| | |
|---|---|
| **Warning** | **When installing the unit, the ground connection must always be made first and disconnected last.** |
| **Waarschuwing** | **Bij de installatie van het toestel moet de aardverbinding altijd het eerste worden gemaakt en het laatste worden losgemaakt.** |
| **Varoitus** | **Laitetta asennettaessa on maahan yhdistäminen aina tehtävä ensiksi ja maadoituksen irti kytkeminen viimeiseksi.** |
| **Attention** | **Lors de l'installation de l'appareil, la mise à la terre doit toujours être connectée en premier et déconnectée en dernier.** |
| **Warnung** | **Der Erdanschluß muß bei der Installation der Einheit immer zuerst hergestellt und zuletzt abgetrennt werden.** |
| **Avvertenza** | **In fase di installazione dell'unità, eseguire sempre per primo il collegamento a massa e disconnetterlo per ultimo.** |
| **Advarsel** | **Når enheten installeres, må jordledningen alltid tilkobles først og frakobles sist.** |
| **Aviso** | **Ao instalar a unidade, a ligação à terra deverá ser sempre a primeira a ser ligada, e a última a ser desligada.** |
| **¡Advertencia!** | **Al instalar el equipo, conectar la tierra la primera y desconectarla la última.** |
| **Varning!** | **Vid installation av enheten måste jordledningen alltid anslutas först och kopplas bort sist.** |

# Circuit Breaker (15A) Warning

**Warning** **This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that a fuse or circuit breaker no larger than 120 VAC, 15A U.S. (240 VAC, 16A international) is used on the phase conductors (all current-carrying conductors).**

**Waarschuwing** **Dit produkt is afhankelijk van de installatie van het gebouw voor kortsluit- (overstroom)beveiliging. Controleer of er een zekering of stroomverbreker van niet meer dan 120 Volt wisselstroom, 15 A voor de V.S. (240 Volt wisselstroom, 16 A internationaal) gebruikt wordt op de fasegeleiders (alle geleiders die stroom voeren).**

**Varoitus** **Tämä tuote on riippuvainen rakennukseen asennetusta oikosulkusuojauksesta (ylivirtasuojauksesta). Varmista, että vaihevirtajohtimissa (kaikissa virroitetuissa johtimissa) käytetään Yhdysvalloissa alle 120 voltin, 15 ampeerin ja monissa muissa maissa 240 voltin, 16 ampeerin sulaketta tai suojakytkintä.**

**Attention** **Pour ce qui est de la protection contre les courts-circuits (surtension), ce produit dépend de l'installation électrique du local. Vérifier qu'un fusible ou qu'un disjoncteur de 120 V alt., 15 A U.S. maximum (240 V alt., 16 A international) est utilisé sur les conducteurs de phase (conducteurs de charge).**

**Warnung** **Dieses Produkt ist darauf angewiesen, daß im Gebäude ein Kurzschluß- bzw. Überstromschutz installiert ist. Stellen Sie sicher, daß eine Sicherung oder ein Unterbrecher von nicht mehr als 240 V Wechselstrom, 16 A (bzw. in den USA 120 V Wechselstrom, 15 A) an den Phasenleitern (allen stromführenden Leitern) verwendet wird.**

**Avvertenza** **Questo prodotto dipende dall'installazione dell'edificio per quanto riguarda la protezione contro cortocircuiti (sovracorrente). Verificare che un fusibile o interruttore automatico, non superiore a 120 VCA, 15 A U.S. (240 VCA, 16 A internazionale) sia stato usato nei fili di fase (tutti i conduttori portatori di corrente).**

**Advarsel** **Dette produktet er avhengig av bygningens installasjoner av kortslutningsbeskyttelse (overstrøm). Kontroller at det brukes en sikring eller strømbryter som ikke er større enn 120 VAC, 15 A (USA) (240 VAC, 16 A internasjonalt) på faselederne (alle strømførende ledere).**

**Aviso** **Este produto depende das instalações existentes para protecção contra curto-circuito (sobrecarga). Assegure-se de que um fusível ou disjuntor não superior a 240 VAC, 16A é utilizado nos condutores de fase (todos os condutores de transporte de corrente).**

**¡Advertencia!** **Este equipo utiliza el sistema de protección contra cortocircuitos (o sobrecorrientes) deló propio edificio. Asegurarse de que se utiliza un fusible o interruptor automático de no más de 240 voltios en corriente alterna (VAC), 16 amperios del estándar internacional (120 VAC, 15 amperios del estándar USA) en los hilos de fase (todos aquéllos portadores de corriente).**

**Varning!** **Denna produkt är beroende av i byggnaden installerat kortslutningsskydd (överströmsskydd). Kontrollera att säkring eller överspänningsskydd används på fasledarna (samtliga strömförande ledare) för internationellt bruk max. 240 V växelström, 16 A (i USA max. 120 V växelström, 15 A).**

# Grounded Equipment Warning

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|---|---|
| **Warning** | **This equipment is intended to be grounded. Ensure that the host is connected to earth ground during normal use.** |
| **Waarschuwing** | **Deze apparatuur hoort geaard te worden Zorg dat de host-computer tijdens normaal gebruik met aarde is verbonden.** |
| **Varoitus** | **Tämä laitteisto on tarkoitettu maadoitettavaksi. Varmista, että isäntälaite on yhdistetty maahan normaalikäytön aikana.** |
| **Attention** | **Cet équipement doit être relié à la terre. S'assurer que l'appareil hôte est relié à la terre lors de l'utilisation normale.** |
| **Warnung** | **Dieses Gerät muß geerdet werden. Stellen Sie sicher, daß das Host-Gerät während des normalen Betriebs an Erde gelegt ist.** |
| **Avvertenza** | **Questa apparecchiatura deve essere collegata a massa. Accertarsi che il dispositivo host sia collegato alla massa di terra durante il normale utilizzo.** |
| **Advarsel** | **Dette utstyret skal jordes. Forviss deg om vertsterminalen er jordet ved normalt bruk.** |
| **Aviso** | **Este equipamento deverá estar ligado à terra. Certifique-se que o host se encontra ligado à terra durante a sua utilização normal.** |
| **¡Advertencia!** | **Este equipo debe conectarse a tierra. Asegurarse de que el equipo principal esté conectado a tierra durante el uso normal.** |
| **Varning!** | **Denna utrustning är avsedd att jordas. Se till att värdenheten är jordad vid normal användning.** |

**警告**　この装置はアースを必要とするものです。通常動作時は、ホストがアースされていることを確認してください。

# Supply Circuit Warning

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|---|---|
| **Warning** | **Care must be given to connecting units to the supply circuit so that wiring is not overloaded.** |
| **Waarschuwing** | **Let erop dat de toestellen op voedingscircuits worden aangesloten zonder het vermogen van de bedrading te overschrijden.** |
| **Varoitus** | **Laiteyksiköt on yhdistettävä huolellisesti syöttöpiiriin niin, että johdot eivät ole ylikuormitettuja.** |
| **Avertissement** | **Veillez à bien connecter les unités au circuit d'alimentation afin de ne pas surcharger les connections.** |
| **Achtung** | **Beim Anschließen der Geräte an das Stromnetz ist darauf zu achten, daß die Schaltverbindungen nicht überlastet werden.** |
| **Avvertenza** | **Fare attenzione quando si collegano le unità al circuito di alimentazione, per non sovraccaricare i cablaggi.** |
| **Advarsel** | **Vær nøye med å koble enheter til strømforsyningskretsen slik at ledningene ikke overbelastes.** |
| **Aviso** | **Deverá ter precaução ao ligar unidades ao circuito de fornecimento de energia, para não sobrecarregar a instalação.** |
| **¡Atención!** | **Poner mucho cuidado al conectar los equipos al circuito de alimentación a fin de no sobrecargar el cableado.** |
| **Varning** | **Var noga vid anslutning av enheter till matarströmkretsen så att ledningarna inte överbelastas.** |

# No On/Off Switch Warning

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|---|---|
| **Warning** | **Unplug the power cord before you work on a system that does not have an on/off switch.** |
| **Waarschuwing** | **Voordat u aan een systeem werkt dat geen aan/uit schakelaar heeft, dient u de stekker van het netsnoer uit het stopcontact te halen.** |
| **Varoitus** | **Ennen kuin teet mitään sellaiselle järjestelmälle, jossa ei ole kaksiasentokytkintä, kytke irti virtajohto.** |
| **Attention** | **Avant de travailler sur un système non équipé d'un commutateur marche-arrêt, débrancher le cordon d'alimentation.** |
| **Warnung** | **Bevor Sie an einem System ohne Ein/Aus-Schalter arbeiten, ziehen Sie das Netzkabel heraus.** |
| **Avvertenza** | **Prima di lavorare su un sistema che non è dotato di un interruttore on/off, scollegare il cavo di alimentazione.** |
| **Advarsel** | **Før det skal utføres arbeid på et system som ikke har en av/på-bryter, skal strømledningen trekkes ut.** |
| **Aviso** | **Antes de começar a trabalhar num sistema que não possua um interruptor ON/OFF, desligue o cabo de alimentação.** |
| **¡Advertencia!** | **Antes de trabajar sobre cualquier sistema que carezca de interruptor de Encendido/Apagado (ON/OFF), desenchufar el cable de alimentación.** |
| **Varning!** | **Dra ur nätsladden innan du utför arbete på ett system utan strömbrytare.** |

**警告**　オン/オフスイッチのない装置を扱う前には、必ず電源コードを抜いてください。

# Power Supply Warning

**Warning** **Do not touch the power supply when the power cord is connected. For systems with a power switch, line voltages are present within the power supply even when the power switch is off and the power cord is connected. For systems without a power switch, line voltages are present within the power supply when the power cord is connected.**

**Waarschuwing** **U dient de voeding niet aan te raken zolang het netsnoer aangesloten is. Bij systemen met een stroomschakelaar zijn er lijnspanningen aanwezig in de voeding, zelfs wanneer de stroomschakelaar uitgeschakeld is en het netsnoer aangesloten is. Bij systemen zonder een stroomschakelaar zijn er lijnspanningen aanwezig in de voeding wanneer het netsnoer aangesloten is.**

**Varoitus** **Älä kosketa virtalähdettä virtajohdon ollessa kytkettynä. Virrankatkaisimella varustetuissa järjestelmissä on virtalähteen sisällä jäljellä verkkojännite, vaikka virrankatkaisin on katkaistu-asennossa virtajohdon ollessa kytkettynä. Järjestelmissä, joissa ei ole virrankatkaisinta, on virtalähteen sisällä verkkojännite, kun virtajohto on kytkettynä.**

**Attention** **Ne pas toucher le bloc d'alimentation quand le cordon d'alimentation est branché. Avec les systèmes munis d'un commutateur marche-arrêt, des tensions de ligne sont présentes dans l'alimentation quand le cordon est branché, même si le commutateur est à l'arrêt. Avec les systèmes sans commutateur marche-arrêt, l'alimentation est sous tension quand le cordon d'alimentation est branché.**

**Warnung** **Berühren Sie das Netzgerät nicht, wenn das Netzkabel angeschlossen ist. Bei Systemen mit Netzschalter liegen Leitungsspannungen im Netzgerät vor, wenn das Netzkabel angeschlossen ist, auch wenn das System ausgeschaltet ist. Bei Systemen ohne Netzschalter liegen Leitungsspannungen im Netzgerät vor, wenn das Netzkabel angeschlossen ist.**

**Avvertenza** **Non toccare l'alimentatore se il cavo dell'alimentazione è collegato. Per i sistemi con un interruttore di alimentazione, tensioni di linea sono presenti all'interno dell'alimentatore anche quando l'interruttore di alimentazione è en posizione di disattivazione (off), se il cavo dell'alimentazione è collegato. Per i sistemi senza un interruttore, tensioni di linea sono presenti all'interno dell'alimentatore quando il cavo di alimentazione è collegato.**

**Advarsel** **Berør ikke strømforsyningsenheten når strømledningen er tilkoblet. I systemer som har en strømbryter, er det spenning i strømforsyningsenheten selv om strømbryteren er slått av og strømledningen er tilkoblet. Når det gjelder systemer uten en strømbryter, er det spenning i strømforsyningsenheten når strømledingen er tilkoblet.**

**Aviso** **Não toque na unidade abastecedora de energia quando o cabo de alimentação estiver ligado. Em sistemas com interruptor, a corrente eléctrica estará presente na unidade abastecedora, sempre que o cabo de alimentação de energia estiver ligado, mesmo quando o interruptor se encontrar desligado. Para sistemas sem interruptor, a tensão eléctrica dentro da unidade abastecedora só estará presente quando o cabo de alimentação estiver ligado.**

**¡Advertencia!** **No tocar la fuente de alimentación mientras el cable esté enchufado. En sistemas con interruptor de alimentación, hay voltajes de línea dentro de la fuente, incluso cuando el interruptor esté en Apagado (OFF) y el cable de alimentación enchufado. En sistemas sin interruptor de alimentación, hay voltajes de línea en la fuente cuando el cable está enchufado.**

**Varning!** **Vidrör inte strömförsörjningsenheten när nätsladden är ansluten. För system med strömbrytare finns det nätspänning i strömförsörjningsenheten även när strömmen har slagits av men nätsladden är ansluten. För system utan strömbrytare finns det nätspänning i strömförsörjningsenheten när nätsladden är ansluten.**

**警告** 電源コードが接続されているときは電源に触れないでください。電源スイッチの付いた装置で電源コードが接続されているときは、電源スイッチがオフでもライン電圧が電源内に存在します。電源スイッチのないシステムで電源コードが接続されているときは、ライン電圧が電源内に存在します。

# Lightning Activity Warning

| | |
|---|---|
| **Warning** | **Do not work on the system or connect or disconnect cables during periods of lightning activity.** |
| **Waarschuwing** | **Tijdens onweer dat gepaard gaat met bliksem, dient u niet aan het systeem te werken of kabels aan te sluiten of te ontkoppelen.** |
| **Varoitus** | **Älä työskentele järjestelmän parissa äläkä yhdistä tai irrota kaapeleita ukkosilmalla.** |
| **Attention** | **Ne pas travailler sur le système ni brancher ou débrancher les câbles pendant un orage.** |
| **Warnung** | **Arbeiten Sie nicht am System und schließen Sie keine Kabel an bzw. trennen Sie keine ab, wenn es gewittert.** |
| **Avvertenza** | **Non lavorare sul sistema o collegare oppure scollegare i cavi durante un temporale con fulmini.** |
| **Advarsel** | **Utfør aldri arbeid på systemet, eller koble kabler til eller fra systemet når det tordner eller lyner.** |
| **Aviso** | **Não trabalhe no sistema ou ligue e desligue cabos durante períodos de mau tempo (trovoada).** |
| **¡Advertencia!** | **No operar el sistema ni conectar o desconectar cables durante el transcurso de descargas eléctricas en la atmósfera.** |
| **Varning!** | **Vid åska skall du aldrig utföra arbete på systemet eller ansluta eller koppla loss kablar.** |

**警告**　雷電時には装置の取り扱い、またはケーブルの接続/切り離しを行わないでください。

# Product Disposal Warning

| | |
|---|---|
| Warning | **Ultimate disposal of this product should be handled according to all national laws and regulations.** |
| Waarschuwing | **Het uiteindelijke wegruimen van dit product dient te geschieden in overeenstemming met alle nationale wetten en reglementen.** |
| Varoitus | **Tämä tuote on hävitettävä kansallisten lakien ja määräysten mukaisesti.** |
| Attention | **La mise au rebut ou le recyclage de ce produit sont généralement soumis à des lois et/ou directives de respect de l'environnement. Renseignez-vous auprès de l'organisme compétent.** |
| Warnung | **Die Entsorgung dieses Produkts sollte gemäß allen Bestimmungen und Gesetzen des Landes erfolgen.** |
| Avvertenza | **Lo smaltimento di questo prodotto deve essere eseguito secondo le leggi e regolazioni locali.** |
| Advarsel | **Endelig kassering av dette produktet skal være i henhold til alle relevante nasjonale lover og bestemmelser.** |
| Aviso | **Deitar fora este produto em conformidade com todas as leis e regulamentos nacionais.** |
| ¡Advertencia! | **Al deshacerse por completo de este producto debe seguir todas las leyes y reglamentos nacionales.** |
| Varning! | **Vid deponering hanteras produkten enligt gällande lagar och bestämmelser.** |

# Chassis Warning—Rack-Mounting and Servicing

**Warning** **To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety:**

- This unit should be mounted at the bottom of the rack if it is the only unit in the rack.
- When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.
- If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.

**Waarschuwing** **Om lichamelijk letsel te voorkomen wanneer u dit toestel in een rek monteert of het daar een servicebeurt geeft, moet u speciale voorzorgsmaatregelen nemen om ervoor te zorgen dat het toestel stabiel blijft. De onderstaande richtlijnen worden verstrekt om uw veiligheid te verzekeren:**

- Dit toestel dient onderaan in het rek gemonteerd te worden als het toestel het enige in het rek is.
- Wanneer u dit toestel in een gedeeltelijk gevuld rek monteert, dient u het rek van onderen naar boven te laden met het zwaarste onderdeel onderaan in het rek.
- Als het rek voorzien is van stabiliseringshulpmiddelen, dient u de stabilisatoren te monteren voordat u het toestel in het rek monteert of het daar een servicebeurt geeft.

**Varoitus** **Kun laite asetetaan telineeseen tai huolletaan sen ollessa telineessä, on noudatettava erityisiä varotoimia järjestelmän vakavuuden säilyttämiseksi, jotta vältytään loukkaantumiselta. Noudata seuraavia turvallisuusohjeita:**

- Jos telineessä ei ole muita laitteita, aseta laite telineen alaosaan.
- Jos laite asetetaan osaksi täytettyyn telineeseen, aloita kuormittaminen sen alaosasta kaikkein raskaimmalla esineellä ja siirry sitten sen yläosaan.
- Jos telinettä varten on vakaimet, asenna ne ennen laitteen asettamista telineeseen tai sen huoltamista siinä.

**Attention** **Pour éviter toute blessure corporelle pendant les opérations de montage ou de réparation de cette unité en casier, il convient de prendre des précautions spéciales afin de maintenir la stabilité du système. Les directives ci-dessous sont destinées à assurer la protection du personnel :**

- Si cette unité constitue la seule unité montée en casier, elle doit être placée dans le bas.
- Si cette unité est montée dans un casier partiellement rempli, charger le casier de bas en haut en plaçant l'élément le plus lourd dans le bas.
- Si le casier est équipé de dispositifs stabilisateurs, installer les stabilisateurs avant de monter ou de réparer l'unité en casier.

**Warnung** **Zur Vermeidung von Körperverletzung beim Anbringen oder Warten dieser Einheit in einem Gestell müssen Sie besondere Vorkehrungen treffen, um sicherzustellen, daß das System stabil bleibt. Die folgenden Richtlinien sollen zur Gewährleistung Ihrer Sicherheit dienen:**

- Wenn diese Einheit die einzige im Gestell ist, sollte sie unten im Gestell angebracht werden.
- Bei Anbringung dieser Einheit in einem zum Teil gefüllten Gestell ist das Gestell von unten nach oben zu laden, wobei das schwerste Bauteil unten im Gestell anzubringen ist.
- Wird das Gestell mit Stabilisierungszubehör geliefert, sind zuerst die Stabilisatoren zu installieren, bevor Sie die Einheit im Gestell anbringen oder sie warten.

**Avvertenza** **Per evitare infortuni fisici durante il montaggio o la manutenzione di questa unità in un supporto, occorre osservare speciali precauzioni per garantire che il sistema rimanga stabile. Le seguenti direttive vengono fornite per garantire la sicurezza personale:**

- Questa unità deve venire montata sul fondo del supporto, se si tratta dell'unica unità da montare nel supporto.
- Quando questa unità viene montata in un supporto parzialmente pieno, caricare il supporto dal basso all'alto, con il componente più pesante sistemato sul fondo del supporto.
- Se il supporto è dotato di dispositivi stabilizzanti, installare tali dispositivi prima di montare o di procedere alla manutenzione dell'unità nel supporto.

**Advarsel** **Unngå fysiske skader under montering eller reparasjonsarbeid på denne enheten når den befinner seg i et kabinett. Vær nøye med at systemet er stabilt. Følgende retningslinjer er gitt for å verne om sikkerheten:**

- Denne enheten bør monteres nederst i kabinettet hvis dette er den eneste enheten i kabinettet.
- Ved montering av denne enheten i et kabinett som er delvis fylt, skal kabinettet lastes fra bunnen og opp med den tyngste komponenten nederst i kabinettet.
- Hvis kabinettet er utstyrt med stabiliseringsutstyr, skal stabilisatorene installeres før montering eller utføring av reparasjonsarbeid på enheten i kabinettet.

**Aviso** **Para se prevenir contra danos corporais ao montar ou reparar esta unidade numa estante, deverá tomar precauções especiais para se certificar de que o sistema possui um suporte estável. As seguintes directrizes ajudá-lo-ão a efectuar o seu trabalho com segurança:**

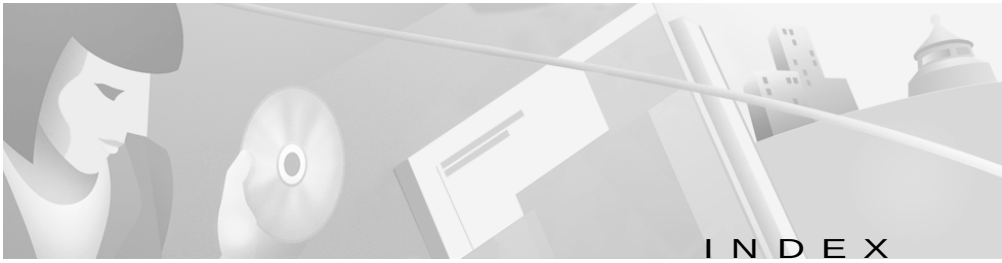
- Esta unidade deverá ser montada na parte inferior da estante, caso seja esta a única unidade a ser montada.
- Ao montar esta unidade numa estante parcialmente ocupada, coloque os itens mais pesados na parte inferior da estante, arrumando-os de baixo para cima.
- Se a estante possuir um dispositivo de estabilização, instale-o antes de montar ou reparar a unidade.

**¡Advertencia!** **Para evitar lesiones durante el montaje de este equipo sobre un bastidor, o posteriormente durante su mantenimiento, se debe poner mucho cuidado en que el sistema quede bien estable. Para garantizar su seguridad, proceda según las siguientes instrucciones:**

- Colocar el equipo en la parte inferior del bastidor, cuando sea la única unidad en el mismo.
- Cuando este equipo se vaya a instalar en un bastidor parcialmente ocupado, comenzar la instalación desde la parte inferior hacia la superior colocando el equipo más pesado en la parte inferior.
- Si el bastidor dispone de dispositivos estabilizadores, instalar éstos antes de montar o proceder al mantenimiento del equipo instalado en el bastidor.

**Varning!** **För att undvika kroppsskada när du installerar eller utför underhållsarbete på denna enhet på en ställning måste du vidta särskilda försiktighetsåtgärder för att försäkra dig om att systemet står stadigt. Följande riktlinjer ges för att trygga din säkerhet:**

- Om denna enhet är den enda enheten på ställningen skall den installeras längst ned på ställningen.
- Om denna enhet installeras på en delvis fylld ställning skall ställningen fyllas nedifrån och upp, med de tyngsta enheterna längst ned på ställningen.
- Om ställningen är försedd med stabiliseringsdon skall dessa monteras fast innan enheten installeras eller underhålls på ställningen.




## Numerics



## A



## B



## C

## D

## E



## F



## G



## H



## I

## J



## L



## M



## N

## O



## P



## Q

## R



## S



## T

## U



## V



## W