Complete Hardware Guide for EX3200 and EX4200 Switches

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Table of Contents

About This Topic Collection

How To Use This Guide

Complete documentation for EX-series product family is provided on web pages at http://www.juniper.net/beta/junos/ex-series/. We have selected content from these web pages and created a number of EX-series guides that collect related topics into a book-like format so that the information is easy to print and easy to download to your local computer.

This guide, *Complete Hardware Guide for EX3200 and EX4200 Switches*, collects together information about the EX-series hardware. For release-specific information, see http://www.juniper.net/beta/junos/ex-series/ADD-URL.

List of EX-series Guides for JUNOS 9.0

Title	Description
Complete Hardware Guide for EX 3200 and EX 4200 Switches	Component descriptions, site preparation, installation, replacement, and safety and compliance
Complete Software Guide for JUNOS for EX-series Software, Release 9.0	Software feature descriptions, configuration examples and tasks, and reference pages for configuration statements and operational commands
J-Web User Interface Guide for JUNOS for EX-series Software	How to use the J-Web graphical user interface (GUI) with JUNOS for EX-series software
JUNOS for EX-series Software Release Notes, Release 9.0	Summary of hardware and software features and known problems with the software and hardware

Downloading Software

You can download the JUNOS for EX-series software from http://www.juniper.net/beta/junos/ex-series/.

Documentation Symbols Key

Notice Icons

Icon	Meaning	Description
	Informational note	Indicates important features or instructions.
	Caution	Indicates a situation that might result in loss of data or hardware damage.
	Warning	Alerts you to the risk of personal injury or death.
	Laser warning	Alerts you to the risk of personal injury from a laser.

Text and Syntax Conventions

Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the **configure** command: user@host> **configure**
`Fixed-width text like this`	Represents output that appears on the terminal screen.	`user@host> show chassis alarms` `No alarms currently active`
Italic text like this	■ Introduces important new terms. ■ Identifies book names. ■ Identifies RFC and Internet draft titles.	■ A policy *term* is a named structure that defines match conditions and actions. ■ *JUNOS System Basics Configuration Guide* ■ RFC 1997, *BGP Communities Attribute*
Italic text like this	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# **set system domain-name** *domain-name*

Plain text like this	Represents names of configuration statements, commands, files, and directories; IP addresses; configuration hierarchy levels; or labels on routing platform components.	■ To configure a stub area, include the **stub** statement at the **[edit protocols ospf area area-id]** hierarchy level. ■ The console port is labeled **CONSOLE**.
< > (angle brackets)	Enclose optional keywords or variables.	stub <default-metric *metric*>;
| (pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	broadcast | multicast (*string1* | *string2* | *string3*)
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	rsvp { # Required for dynamic MPLS only
[ ] (square brackets)	Enclose a variable for which you can substitute one or more values.	community name members [*community-ids*]

Indention and braces ({ })	Identify a level in the configuration hierarchy.	[edit]
		routing-options {
		static {
		route default {
		nexthop *address*;
		retain;
		}
		}
		}

; (semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
J-Web GUI Conventions		
Bold text like this	Represents J-Web graphical user interface (GUI) items you click or select.	■ In the Logical Interfaces box, select **All Interfaces**. ■ To cancel the configuration, click **Cancel**.
> (bold right angle bracket)	Separates levels in a hierarchy of J-Web selections.	In the configuration editor hierarchy, select **Protocols > Ospf**.

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- Page number if applicable
- Software version
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Part 1
Switch Overview

Chapter 1

Switch Overview

EX-Series Switch Hardware Overview

EX-series switches provide scalable connectivity for the enterprise market, including branch offices, campus locations, and data centers. The switches run under the JUNOS software, which provides Layer 2 and Layer 3 switching, routing, and security services. The same JUNOS code base runs on all Juniper Networks J-series, M-series, and T-series routing platforms.

EX-series Switch Types

EX-series switches are available in two product lines:

- **EX 3200 switches**—Typically, you deploy these switches in branch environments or wiring closets.
- **EX 4200 switches**—You can interconnect EX 4200 switches to form a virtual chassis that operates as a single network entity. You can deploy these switches wherever you need a higher density of Gigabit Ethernet ports (24 to 480 ports), redundancy, or the ability to span a single switch across several wiring closets. Typically, virtual-chassis switches are used in large branch offices and campus wiring closets, and top-of-rack locations in a data center.

Both lines have these features:

- Run under JUNOS for EX-series software
- Options of 24-port and 48-port models
- Options of full (all ports) or partial (8 ports) Power over Ethernet (PoE) capability
- Optional uplink modules provide connection to distribution switches.

EX 3200 Switches

EX 3200 switches provide connectivity for low-density environments. Typically, you deploy these switches in branch environments or wiring closets where only one switch is required.

EX 3200 switches are available in models with either 24 or 48 ports, and with either all ports equipped for power over Ethernet (PoE) or only 8 ports equipped for PoE. All ports have 10/100/1000 Base-T Gigabit Ethernet connectors.

EX 3200 switches include:

- Field-replaceable power supply and optional additional connection to external power source.
- Field-replaceable fan tray with single fan.
- JUNOS software with its modular design that enables failed system processes to gracefully restart.

EX4200 Switches

EX 4200 switches provide connectivity for medium- and high-density environments and scalability for growing networks. These switches can be deployed wherever you need a higher density of Gigabit Ethernet ports (24 to 480 ports), or redundancy. Typically, EX 4200 switches are used in large branch offices, campus wiring closets, and top-of-rack locations in data centers where they are positioned as the top device in a rack to provide connectivity for all the devices in the rack.

You can connect individual EX 4200 switches together to form one unit and manage the unit as a single chassis, called a virtual chassis. You can add more members to the virtual chassis as needed, up to a total of 10 members.

EX 4200 switches are available in models with 24 or 48 ports, and with either all ports equipped for power over Ethernet (PoE) or only 8 ports equipped for PoE. All of these models provide ports that have 10/100/1000 Base-T Gigabit Ethernet connectors.

Additionally, a 24–port model provides either small-form factor pluggable (SFP) or 10-Gigabit Small Form Factor Pluggable (XFP) transceivers for use with fiber connections. This model is typically used as a small distribution switch.

All of the virtual chassis EX-series switches have dedicated 80 Gbps virtual chassis ports that allow you to connect the switches to each other. You can use optional 10 Gbps uplink ports to connect members of a virtual chassis across multiple wiring closets.

To provide carrier-class reliability, virtual chassis EX-series switches include:

- Dual, load-sharing, redundant power-supplies that are field-replaceable and hot-swappable. An optional additional connection to an external power source is also available.
- Field-replaceable fan tray with three fans. The switch remains operational if a single fan fails.
- Redundant routing engines in a virtual chassis enable non-stop routing.
- JUNOS software with its modular design that enables failed system processes to gracefully restart.

Uplink Modules

A port on a network device that is used to connect to another network device rather than a client or server.

Optional uplink modules are available for all EX 3200 and EX 4200 models. Uplink modules provide either two 10-Gigabit Ethernet small-form factor pluggable (XFP) transceivers or four 1-Gigabit Ethernet small form factor pluggable (SFP) transceivers. You can use these ports to connect an access switch to a distribution switch, or to interconnect member switches of a virtual chassis across multiple wiring closets.

Power Over Ethernet

PoE ports provide electrical current to devices through the network cables so that separate power cords for devices, such as IP phones, wireless access points, and security cameras, are unnecessary. Both the EX 3200 and EX 4200 switch lines have options of full (all 24 or 48 ports) or partial (8 ports) Power over Ethernet (PoE) capability.

Full PoE models are primarily used in IP telephony environments. Partial PoE models are used in environments where, for example, only a few ports for wireless access points are required.

Related Topics

- EX 3200 Switch Models [topic ref to external file]
- EX 4200 Switch Models [topic ref to external file]
- Field-Replaceable Units in EX-series Switches [topic ref to external file]
- EX 3200 Switches—Front-Panel Description [topic ref to external file]
- EX 3200 Switches—Rear-Panel Description [topic ref to external file]
- EX 4200 Switches—Front-Panel Description [topic ref to external file]
- EX 4200 Switches—Rear-Panel Description [topic ref to external file]

EX 3200 Switch Models

Table 1 on page 6 lists the virtual chassis switch models. is available with 24 or 48 ports with partial or full Power over Ethernet (PoE)

Table 1: EX 3200 Switch Models

Model	Typical Deployment	Access Ports	PoE
EX 3200-24T	Access or Distribution switch	24 Gigabit Ethernet	8 ports
EX 3200-24P	Access switch	24 Gigabit Ethernet	All 24 ports
EX 3200-48T	Access or Distribution switch	48 Gigabit Ethernet	8 ports
EX 3200-48P	Access switch	48 Gigabit Ethernet	All 48 ports

Related Topics

- EX-Series Switch Hardware Overview [topic ref to external file]

- EX 4200 Switch Models [topic ref to external file]

EX 4200 Switch Models

Table 1 on page 6 lists the EX 4200 switch models. The EX 4200 switch is available with 24 or 48 ports, and with partial or full Power over Ethernet (PoE).

Table 2: EX 4200 Switch Models

Model	Ports	PoE
EX 4200-24T	24 Gigabit Ethernet	8 ports
EX 4200-24P	24 Gigabit Ethernet	All 24 ports
EX 4200-48T	48 Gigabit Ethernet	8 ports
EX 4200-48P	48 Gigabit Ethernet	All 48 ports
EX 4200-24F	24 single-form factor pluggable (SFP) transceivers	Not applicable

Related Topics

- EX-Series Switch Hardware Overview [topic ref to external file]
- EX 3200 Switch Models [topic ref to external file]

EX-series Switch Chassis Physical Specifications

The EX-series switch chassis is a rigid sheet-metal structure that houses the other hardware components. Table 3 on page 6 summarizes the physical specifications of the EX-series switch chassis.

Table 3: Physical Specifications of the EX-series Switch Chassis

Description	Value
Chassis height	1.75 inches (4.445 cm)
Chassis width	■ 17.25 inches (43.815 cm) ■ 19 inches (48.2 cm) with mounting brackets attached
Chassis depth	17 inches (43.18 cm), extended by 2.25 inches by power supply in models that have 600 W and 930 W power supply
Weight	22 lb (10 kg)

You can mount the EX-series switch chassis on standard 19-in. and 23-in. equipment racks or on cabinets by using rack mounting brackets. You can mount it on desks by using rubber feet.

Related Topics

- EX 3200 Switches—Front-Panel Description [topic ref to external file]
- EX 3200 Switches—Rear-Panel Description [topic ref to external file]
- EX 4200 Switches—Front-Panel Description [topic ref to external file]
- EX 4200 Switches—Rear-Panel Description [topic ref to external file]
- Mounting EX-series Switches [topic ref to external file]
- Rack Requirements and Specifications for EX-series Switches [topic ref to external file]
- Cabinet Requirements and Specifications for EX 3200 Switches [topic ref to external file]

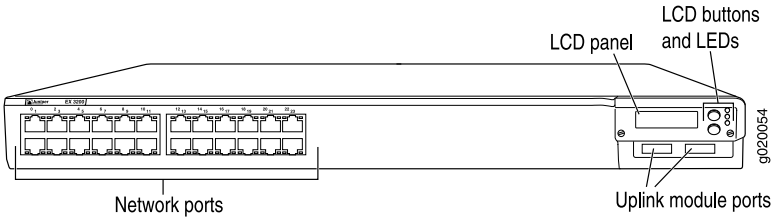
EX 3200 Switches—Front-Panel Description

The front panel of the EX 3200 switch consists of the following components:

- 10/100/1000 Ethernet ports or 10/100/1000 Power over Ethernet (PoE) ports
- Uplink module ports—SFP or XFP ports
- LCD and the LCD navigation buttons
- Front-panel LEDs

Figure 1 on page 7 shows the front panel of an EX 3200-24P, the 24-port PoE switch. All switches in the EX 3200 series have similar front panels. The number of ports on the front panel might vary for the different EX 3200 switch models.

Figure 1: EX 3200 Switch Front Panel



Related Topics

- Installing an Uplink Module in an EX-series Switch [topic ref to external file]
- Removing an Uplink Module from an EX-series Switch [topic ref to external file]
- EX 3200 Switches—Front-Panel LEDs [topic ref to external file]
- EX-series Switches—LCD [topic ref to external file]

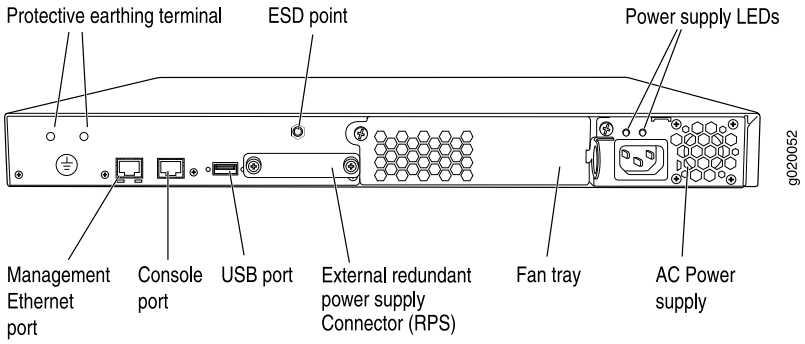
EX 3200 Switches—Rear-Panel Description

The rear panel of EX 3200 switch consists of the following components:

- Protective earthing terminal
- Management Ethernet port
- Console port
- USB port
- ESD point
- Fan tray
- External power system connector
- AC Power supply
- Power supply LEDs

Figure 2 on page 8 shows the rear panel of an EX 3200 switch with a 320 W power supply. All switches in the EX 3200 series have the same rear panel.

Figure 2: EX 3200 Switch Rear Panel



Related Topics

- Field-Replaceable Units in EX-series Switches [topic ref to external file]
- USB Port Specifications on EX-series Switches [topic ref to external file]
- Connecting Earth Ground to an EX-series Switch [topic ref to external file]
- Preventing Electrostatic Discharge Damage [topic ref to external file]
- Cooling System in EX 3200 Switches [topic ref to external file]
- Power Supply in EX-series Switches [topic ref to external file]

EX 4200 Switches—Front-Panel Description

The front panel of the EX 4200 switch consists of the following components:

- 10/100/1000 Ethernet ports or 10/100/1000 Power over Ethernet (PoE) ports
- Uplink module ports—SFP or XFP ports
- LCD and the LCD navigation buttons
- Front-panel LEDs

Figure 3 on page 9 and Figure 4 on page 9 show the front panel of an EX 4200-48P, the 48-port PoE switch. All switches in the EX 4200 series, except EX 4200-24F, have similar front panels. The number of ports on the front panel might vary for the different EX 4200 switch models.

Figure 3: EX 4200 Switch Front Panel

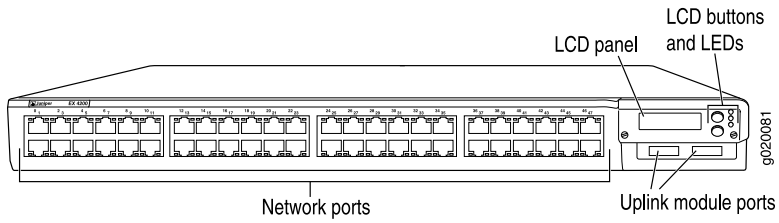
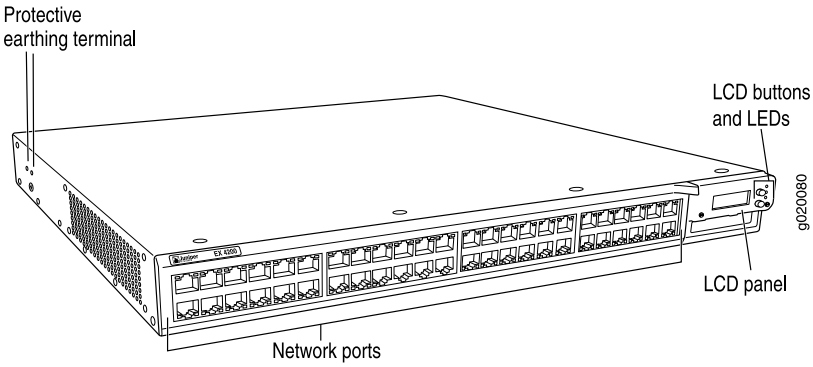


Figure 4: EX 4200 Switch Front Panel



Related Topics

- Installing an Uplink Module in an EX-series Switch [topic ref to external file]
- Removing an Uplink Module from an EX-series Switch [topic ref to external file]
- EX 4200 Switches—Front-Panel LEDs [topic ref to external file]
- EX-series Switches—LCD [topic ref to external file]

EX 4200 Switches—Rear-Panel Description

The rear panel of EX 4200 switch consists of the following components:

- Fan tray
- Virtual chassis ports (VCPs)
- USB port
- Management Ethernet port
- Console port
- ESD point
- AC Power supply
- Power supply LEDs
- External power system connector

Figure 5 on page 10 and Figure 6 on page 10 show the rear panel of an EX 4200 switch. All switches in the EX 4200 series have the same rear panel.

Figure 5: EX 4200 Switch Rear Panel

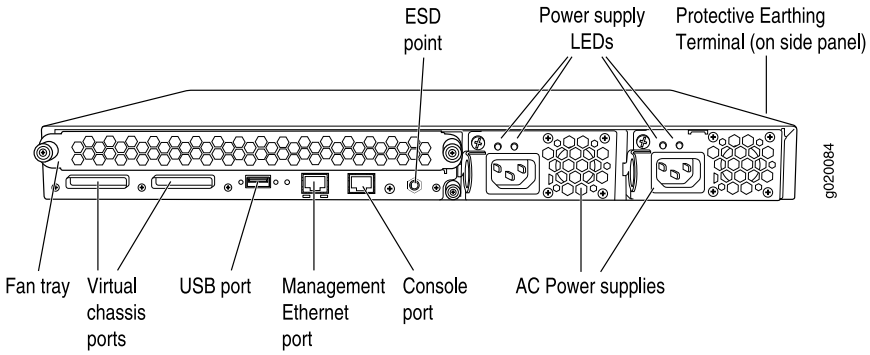
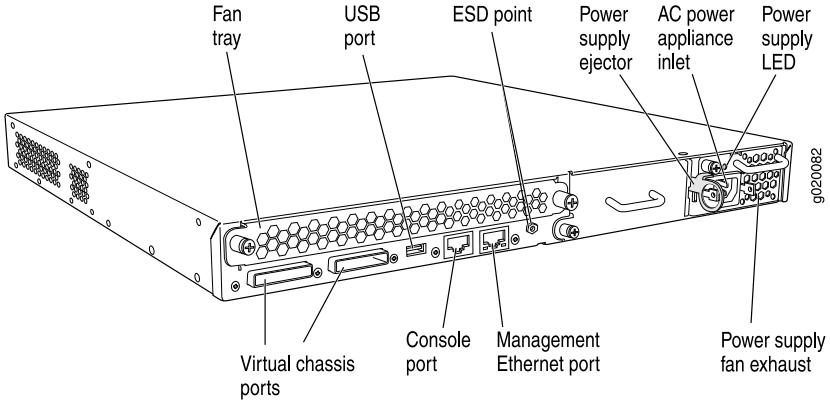


Figure 6: EX 4200 Switch Rear Panel



Related Topics

- Field-Replaceable Units in EX-series Switches [topic ref to external file]
- USB Port Specifications on EX-series Switches [topic ref to external file]
- Connecting Earth Ground to an EX-series Switch [topic ref to external file]
- Preventing Electrostatic Discharge Damage [topic ref to external file]
- Cooling System in EX 4200 Switches [topic ref to external file]
- Power Supply in EX-series Switches [topic ref to external file]

EX 3200 Switches—Front-Panel LEDs

The front panel of an EX 3200 switch has three LEDs on the far right side of the panel, next to the LCD. Table 4 on page 11 describes these LEDs, their colors and state, and the status they indicate.

Table 4: EX 3200 Series Switches—Front-Panel LEDs

LED Label	Color	State and Description
System	Unlit	System is powered off.
	Green	■ Blinking—System is booting. ■ On steadily—System is operating normally.
	Yellow	■ Blinking—System warning. ■ On steadily—System failure.
Power	Unlit	System is powered off.
	Green	■ On steadily—All internal power supplies are operating normally. ■ Blinking—Internal power supply has failed, and the system is operating on internal backup.
	Yellow	On steadily—All internal power supplies have failed, and the system is operating on external redundant power supply (RPS).
Fan	Green	■ On steadily—All fans are operating normally. ■ Blinking—Internal fans have failed, the system is operating in the cooling system redundancy mode, and operating temperature is normal.
	Yellow	■ Blinking—Internal fans have failed, the system is operating in the cooling system redundancy mode, and the system is in over temperature condition. ■ On steadily—Internal fans have failed, and the cooling system redundancy is not operational.

Related Topics

- EX 3200 Switches—Front-Panel Description [topic ref to external file]
- Power Supply in EX-series Switches [topic ref to external file]

EX-series Switches—Network Port LEDs

Each network port (RJ-45 connectors) on the rear panel of an EX-series switch has two LEDs. Figure 7 on page 12 shows the network ports and the locations of the LEDs on the port.

Graphic to come

The LEDs labeled LED 1 in Table 5 on page 12 indicate whether the ports are in full-duplex or half-duplex mode, and the link speed. LEDs labeled LED 2 indicate link activity and whether PoE is enabled on the ports. Table 5 on page 12 describes these LEDs, their colors and state, and the status they indicate.

Table 5: EX-series Switches—Network Port LEDs

LED	Color	State and Description
LED 1	Unlit	No link activity; PoE is not enabled.
	Green	■ On steadily—The port is up and the link is active, but there is no link activity. ■ Blinking—The port is up, with active links.
	Yellow	On steadily—PoE is enabled.
LED 2	Green	Indicates that port is operating in full-duplex mode. The link-speed indicators are: ■ One blink per second—10 Mbps ■ Two blinks per second—100 Mbps ■ Three blinks per second—1000 Mbps
	Yellow	Indicates that port is operating in half-duplex mode. The link-speed indicators are: ■ One blink per second—10 Mbps ■ Two blinks per second—100 Mbps ■ Three blinks per second—1000 Mbps

Related Topics

- EX 3200 Switches—Front-Panel Description [topic ref to external file]
- EX 4200 Switches—Front-Panel Description [topic ref to external file]

EX 4200 Switches—Front-Panel LEDs

The front panel of an EX 4200 switch has three LEDs on the far right side of the panel, next to the LCD. Table 6 on page 13 describes these LEDs, their colors and state, and the status they indicate.

Table 6: EX 4200 Series Switches—Front-Panel LEDs

LED Label	Color	State and Description
System	Unlit	System is powered off.
	Green	■ Blinking—System is booting. ■ On steadily—System is operating normally.
	Yellow	■ Blinking—System warning. ■ On steadily—System failure.
Power	Unlit	System is powered off.
	Green	■ On steadily—All internal power supplies are operating normally. ■ Blinking—Internal power supply has failed, and the system is operating on internal backup.
	Yellow	On steadily—All internal power supplies have failed, and the system is operating on external redundant power supply (RPS).
Fan	Green	■ On steadily—All fans are operating normally. ■ Blinking—Internal fans have failed, the system is operating in the cooling system redundancy mode, and operating temperature is normal.
	Yellow	■ Blinking—Internal fans have failed, the system is operating in the cooling system redundancy mode, and the system is in over temperature condition. ■ On steadily—Internal fans have failed, and the cooling system redundancy is not operational.

Related Topics

- EX 4200 Switches—Front-Panel Description [topic ref to external file]
- Power Supply in EX-series Switches [topic ref to external file]

EX-series Switches—SFP Uplink Module Port LEDs

The small-form factor pluggable tranceiver (SFP) uplink module ports on EX-series switches have two LEDs: the LEDs labeled LED 1 in Figure 8 on page 13 indicate link status, and the LEDs labeled LED 2 indicate link speed. Table 7 on page 14 describes these LEDs, their colors and state, and the status they indicate.

Graphic to come

Table 7: EX-series Switches—SFP Uplink Module Port LEDs

LED	Color	State and Description
LED 1	Green	■ Off—Link is not operational. ■ On steadily—The port is up and the link is active, but there is no link activity. ■ Blinking—The port is up, with active links.
LED 2	Green	Indicates that link speed is 1000 Mbps.
	Yellow	Indicates that link speed is 10/100 Mbps.

Related Topics
- EX 3200 Switches—Front-Panel Description [topic ref to external file]
- EX 4200 Switches—Front-Panel Description [topic ref to external file]

EX-series Switches—XFP Uplink Module Port LEDs

The 10-Gigabit small-form factor pluggable tranceiver (XFP) uplink module ports on EX-series switches have two LEDs: the LEDs labeled LED 1 in Figure 9 on page 14 indicate link activity, and the LEDs labeled LED 2 indicate whether the port is enabled. Table 8 on page 14 describes these LEDs, their colors and state, and the status they indicate.

Graphic to come

Table 8: EX-series Switches—XFP Uplink Module Port LEDs

LED	Color	State and Description
LED 1	Green	■ Off—Link is not operational. ■ On steadily—The port is up and the link is active, but there is no link activity. ■ Blinking—The port is up, with active links.
LED 2	Green	Indicates that the port is enabled.
	Yellow	Indicates that the port is disabled.

Related Topics
- EX 3200 Switches—Front-Panel Description [topic ref to external file]
- EX 4200 Switches—Front-Panel Description [topic ref to external file]

EX-series Switches—LCD

The LCD on the front panel of the EX-series switches is a character display that can show two lines of text, each 16 characters in length. The LCD displays a variety of information about the switch and also provides a menu to perform basic operations such as initial setup and reboot. You can use the two buttons next to the LCD to display the menu and select menu options. The LCD panel operates in three

modes—idle mode, navigation mode, and alarm mode. In all three modes the first line displays the device name and the virtual chassis ID (when the switch is a member of a virtual chassis). The text in the second line changes depending on the mode.

- Idle mode—The LCD is in this mode when the switch operates normally. The second line displays the status of the fans and power supply, and the system temperature.
- Navigation mode—The LCD switches to this mode from idle mode when you press the menu button next to the top right corner of the LCD; you use this same button to select menu options. Use the button next to the bottom right corner of the LCD to scroll through the menu. The following menu options are available through the LCD:
  - Restore to Factory Default
  - Reboot
  - Initial Setup
  - LED Mode
- Alarm mode—The LCD switches to this mode when alarms occur.

NOTE: The Chassis view in the J-Web interface also displays the LCD. From the J-Web interface, you can view real-time status information and alarms in the LCD.

Related Topics

- EX 3200 Switches—Front-Panel Description [topic ref to external file]
- EX 4200 Switches—Front-Panel Description [topic ref to external file]

USB Port Specifications on EX-series Switches

The USB port on the rear panel of an EX-series switch accepts a USB storage device or a USB storage device adapter with a compact flash disk installed, as defined in the *CompactFlash Specification* published by the CompactFlash Association. When the USB storage device is installed and configured, it automatically acts as a secondary boot device if the primary compact flash disk fails on startup.

Related Topics

- EX 3200 Switches—Rear-Panel Description [topic ref to external file]
- EX 4200 Switches—Rear-Panel Description [topic ref to external file]

Power Supply in EX-series Switches

EX-series switches use AC power that provides two voltage outputs: 12 V for system and logic power and 48-51 V (or higher, to compensate for voltage drops along the path from the power supplies to the RJ-45 connector) for PoE ports. The power supply in EX-series switches (see Figure 10 on page 65 and Figure 11 on page 65) supports the three PoE configurations: 8, 24, and 48 PoE ports. The power supply is a hot-removable and hot-insertable field-replaceable unit (FRU). EX 4200 switches have

an internal redundant power supply, making the power supply in EX 4200 switches fully redundant. The power supply in EX 3200 switches is not redundant.

Figure 10: Power Supply in EX 3200 Switches

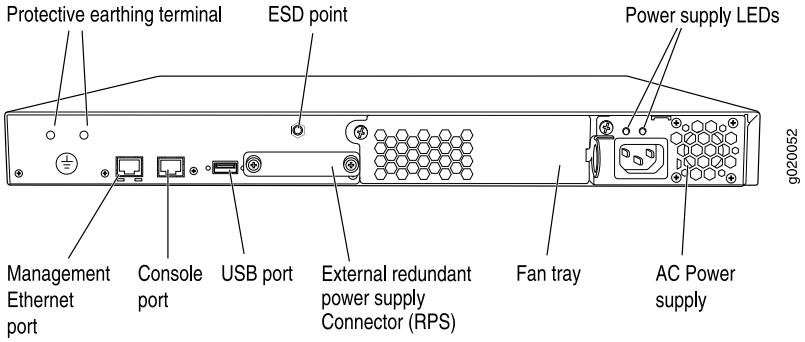


Figure 11: Power Supply in EX 4200 Switches

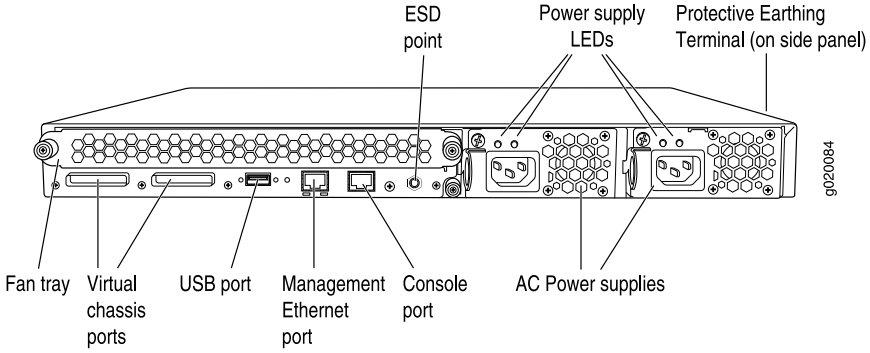


Table 9 on page 66 provides the power requirements for the various configurations of PoE ports in EX 3200 switches.

Table 9: Power Requirements for EX 3200 Switches

Model Number	Number of PoE-enabled Ports	Power Requirement
EX 3200-24T	8	320 W
EX 3200-48T	8	320 W
EX 3200-24P	24	600 W
EX 3200-48P	48	930 W

Table 10 on page 66 provides the power requirements for the various configurations of PoE ports in EX 4200 switches.

Table 10: Power Requirements for EX 4200 Switches

Model Number	Number of PoE-enabled Ports	Power Requirement
EX 4200-24T	8	320 W
EX 4200-48T	8	320 W
EX 4200-24P	24	600 W
EX 4200-48P	48	930 W
EX 4200-24F	–	320 W

To avoid electrical injury, follow instructions in Installing an AC Power Supply in an EX-series Switch [topic ref to external file] and Removing an AC Power Supply from an EX-series Switch [topic ref to external file] carefully.

NOTE: After turning off power, wait for at least 60 seconds before turning it back on. After turning on power, wait for at least 60 seconds before turning it off.

After turning on power, it can take up to 60 seconds for status indicators—such as LEDs on the power supply, show chassis command output, and messages on the craft interface LCD—to indicate that the power supply is functioning normally. Ignore error indicators that appear during the first 60 seconds.

Related Topics

- EX 3200 Switches—Rear-Panel Description [topic ref to external file]
- EX 4200 Switches—Rear-Panel Description [topic ref to external file]
- Field-Replaceable Units in EX-series Switches [topic ref to external file]

Cooling System in EX 3200 Switches

The cooling system in EX 3200 switches consists of a field-replaceable unit fan tray with one blower (see Figure 12 on page 17). The fan tray is located at the rear of the chassis and provides side-to-rear chassis cooling (see Figure 13 on page 18).

Figure 12: Fan Tray Used in EX 3200 Switches

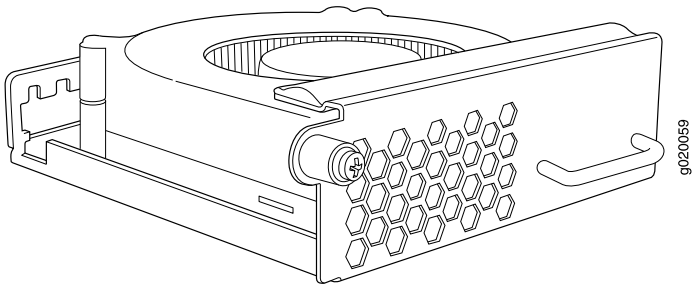
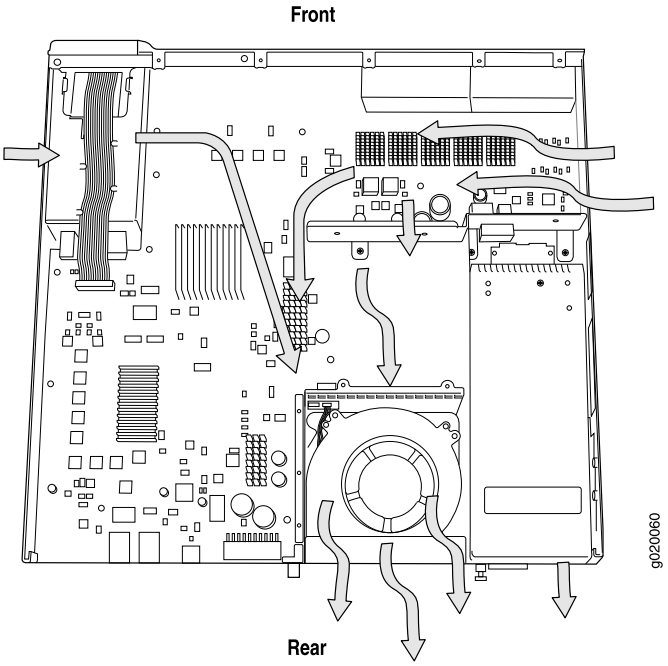


Figure 13: Airflow Through the EX 3200 Switch Chassis



Temperature sensors in the chassis monitor the temperature within the chassis. The system raises an alarm if the fan fails or if the temperature inside the chassis rises above permitted levels.

CAUTION: If you do not maintain the temperature inside the chassis at permitted levels, the system shuts down automatically.

Related Topics

- Field-Replaceable Units in EX-series Switches [topic ref to external file]
- EX 3200 Switches—Rear-Panel Description [topic ref to external file]
- Installing a Fan Tray in an EX-series Switch [topic ref to external file]
- Removing a Fan Tray from an EX-series Switch [topic ref to external file]

Cooling System in EX 4200 Switches

The cooling system in EX 4200 switches consists of a field-replaceable unit fan tray with three blowers (see Figure 14 on page 19). The fan tray is located at the rear of the chassis and provides side-to-rear chassis cooling (see Figure 15 on page 19).

Figure 14: Fan Tray Used in EX 4200 Switches

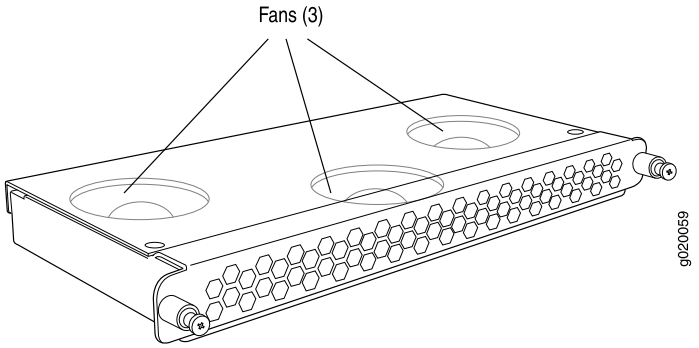
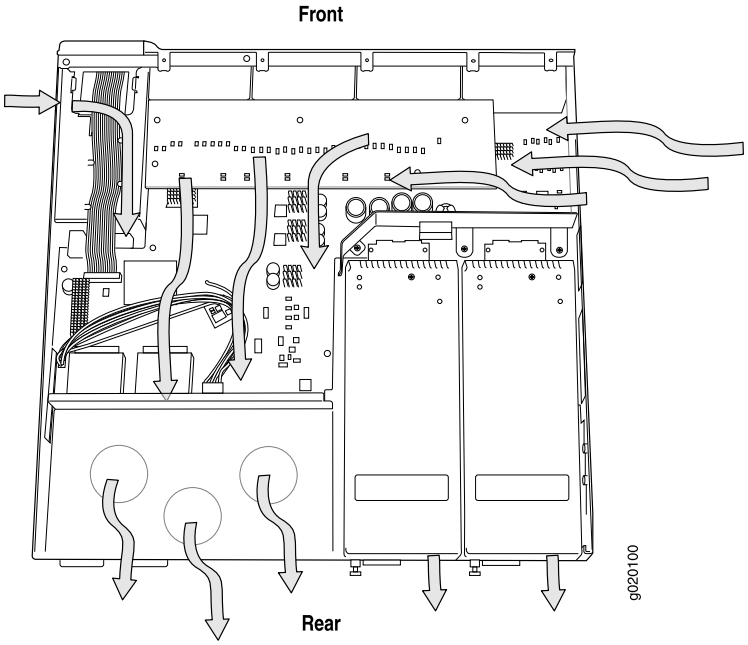


Figure 15: Airflow Through the EX 4200 Switch Chassis



The fan tray used in the EX 4200 switch comes with load-sharing redundancy that can tolerate a single fan failure at room temperature (below 40° C/104° F) to still provide sufficient cooling.

Temperature sensors in the chassis monitor the temperature within the chassis. If a fan fails or if the temperature inside the chassis rises above permitted levels, the speed of the functional fans increases to the maximum speed and the system raises an alarm.

CAUTION: If you do not maintain the temperature inside the chassis at permitted levels, the system shuts down automatically.

Related Topics

- Field-Replaceable Units in EX-series Switches [topic ref to external file]
- EX 4200 Switches—Rear-Panel Description [topic ref to external file]
- Installing a Fan Tray in an EX-series Switch [topic ref to external file]
- Removing a Fan Tray from an EX-series Switch [topic ref to external file]

Field-Replaceable Units in EX-series Switches

Field-replaceable units (FRUs) are components that you can replace at your site. EX-series switches have hot-removable and hot-insertable FRUs that you can remove and replace while the switch is functioning without turning off power to the switch or disrupting switch functions. The field-replaceable units (FRUs) in EX-series switches are:

- Power supply
- Fan tray
- Uplink module

Related Topics

- Installing an AC Power Supply in an EX-series Switch [topic ref to external file]
- Removing an AC Power Supply from an EX-series Switch [topic ref to external file]
- Installing a Fan Tray in an EX-series Switch [topic ref to external file]
- Removing a Fan Tray from an EX-series Switch [topic ref to external file]
- Installing an Uplink Module in an EX-series Switch [topic ref to external file]
- Removing an Uplink Module from an EX-series Switch [topic ref to external file]

Part 2
Setting Up the Switch

Chapter 2

Preparing the Site for Switch Installation

Site Preparation Checklist for EX-series Switches

The checklist in Table 11 on page 23 summarizes the tasks you need to perform when preparing a site for switch installation.

Table 11: Site Preparation Checklist

Item or Task	For More Information	Performed By	Date
Environment			
Verify that environmental factors such as temperature and humidity do not exceed switch tolerances.	Environmental Requirements and Specifications [topic ref to external file] .		
Power			
Measure distance between external power sources and switch installation site.			
Locate sites for connection of system grounding.			
Calculate the power consumption and requirements.			
Hardware Configuration			
Choose the configuration.			
Rack			
Verify that your rack meets the minimum requirements for the installation of the switch.			
Plan rack location, including required space clearances.			
Secure the rack to the floor and building structure.			
Cables			

Table 11: Site Preparation Checklist *(continued)*

Item or Task	For More Information	Performed By	Date
Acquire cables and connectors: ■ Determine the number of cables needed based on your planned configuration. ■ Review the maximum distance allowed for each cable. Choose the length of cable based on the distance between the hardware components being connected.			
Plan the cable routing and management.			

Related Topics
- Installing and Connecting EX-series Switches [topic ref to external file]
- Mounting EX-series Switches [topic ref to external file]
- Cabinet Requirements and Specifications for EX 3200 Switches [topic ref to external file]
- Clearance Requirements for Airflow and Hardware Maintenance [topic ref to external file]
- Environmental Requirements and Specifications [topic ref to external file]

Rack Requirements and Specifications for EX-series Switches

All EX-series switches can be installed in a rack. If you are installing multiple EX-series switches to function as a virtual chassis, you must install the switches in a rack. Table 12 on page 24 provides the rack requirements and specifications for EX-series switches.

Table 12: Rack Requirements and Specifications for EX-series Switches

Rack Requirement	Guidelines
Rack type	Use a front-mount rack, four-post (telco) rack, or a center-mount rack.

Rack size and strength	■ Ensure that the rack complies with one of these standards:
	  ■ A 19-in. rack as defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310–D) published by the Electronics Industry Association (http://www.eia.org).
	  ■ A 600-mm rack as defined in the four-part *Equipment Engineering (EE); European telecommunications standard for equipment practice* (document numbers ETS 300 119-1 through 119-4) published by the European Telecommunications Standards Institute (http://www.etsi.org).
	  The horizontal spacing between the rails in a rack that complies with this standard is usually wider than the switch's mounting brackets, which measure 19 in. (48.2 cm) from outer edge to outer edge. Use approved wing devices to narrow the opening between the rails as required.
	■ Ensure that the rack rails are spaced widely enough to accommodate the switch chassis' external dimensions. See Table 13 on page 25.
	■ Ensure that the spacing of rails and adjacent racks allows for the proper clearance around the switch and rack.

Table 12: Rack Requirements and Specifications for EX-series Switches *(continued)*

Rack Requirement	Guidelines
Rack connection to building structure	■ Secure the rack to the building structure. ■ If earthquakes are a possibility in your geographical area, secure the rack to the floor. ■ Secure the rack to the ceiling brackets as well as wall or floor brackets if maximum stability is required.

One pair of mounting brackets is supplied with the EX-series switch. The holes in the mounting brackets are spaced at 1 U (1.75 in. or 4.445 cm), so the switch can be mounted in any rack that provides holes spaced at that distance.

The outer edges of the mounting brackets extend the width of either chassis to 19 in. (48.2 cm), and the front of the chassis extends approximately 0.5 in. (1.27 cm) beyond the mounting brackets. The spacing of rails and adjacent racks must also allow for the clearances around the switch and rack.

Table 13: EX-series Switches—External Dimensions

Switch Model	Dimensions
EX 3200, EX 4200 (without mounting brackets)	1.75 in. (4.445 cm) high, 17.25 in. (43.815 cm), and 17 in. (43.18 cm) deep.
EX 3200, EX 4200 (with mounting brackets)	1.75 in. (4.445 cm) high, 17.25 in. (43.815 cm), and 19 in. (48.2 cm) deep.

Related Topics
- Rack-Mounting Requirements and Warnings [topic ref to external file]
- Clearance Requirements for Airflow and Hardware Maintenance [topic ref to external file]

Requirements for Mounting EX-series Switches on the Desktop or Wall

You can install an EX-series switch on a desktop or wall. When choosing a location, allow at least 6 in. (15.2 cm) of clearance between the front and back of the chassis and adjacent equipment or walls.

If you are mounting the EX-series switch on a wall, use the EX-series switch wall mount kit from Juniper Networks. The wall mount kit is not part of the standard package and needs to be ordered separately.

Related Topics
- Cabinet Requirements and Specifications for EX 3200 Switches [topic ref to external file]
- Clearance Requirements for Airflow and Hardware Maintenance [topic ref to external file]
- Mounting EX-series Switches on Desks or Other Level Surfaces [topic ref to external file]

Cabinet Requirements and Specifications for EX-series Switches

EX-series switches can be mounted on 19–in. cabinets as defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310–D) published by the Electronics Industry Association (http://www.eia.org).

Related Topics

- Clearance Requirements for Airflow and Hardware Maintenance [topic ref to external file]
- Rack Requirements and Specifications for EX-series Switches [topic ref to external file]
- Mounting EX-series Switches on Racks or Cabinets [topic ref to external file]

Clearance Requirements for Airflow and Hardware Maintenance

When planning the site, including planning the layout of a wiring closet or rack, for installing the EX-series switches, you must allow sufficient clearance around the rack.

Graphic to come

- Allow at least 6 in. (15.2 cm) of clearance between the devices that have the fans or blowers installed on the sides. Allow 2.8 in. (7 cm) between the side of the chassis and any non-heat-producing surface such as a wall. For the cooling system to function properly, the airflow around the chassis must be unrestricted. Figure 16 on page 27 shows the airflow through the EX 3200 switch chassis and Figure 17 on page 27 shows the airflow through the EX 4200 switch chassis.
- If you are mounting a switch in a rack with other equipment, or if you are placing it on the desktop or floor near other equipment, ensure that the exhaust from other equipment does not blow into the intake vents of the chassis.
- Leave at least 24 in. (61 cm) both in front of and behind the switch. For service personnel to remove and install hardware components, you must leave adequate space at the front and back of the switch. NEBS GR-63 recommends that you allow at least 30 in. (76.2 cm) in front of the rack and 24 in. (61 cm) behind the rack.

Figure 16: Airflow Through the EX 3200 Switch Chassis

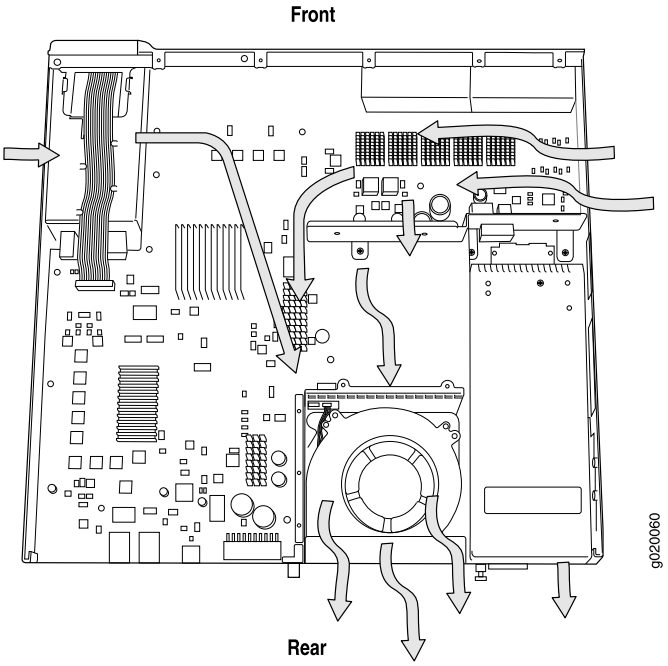
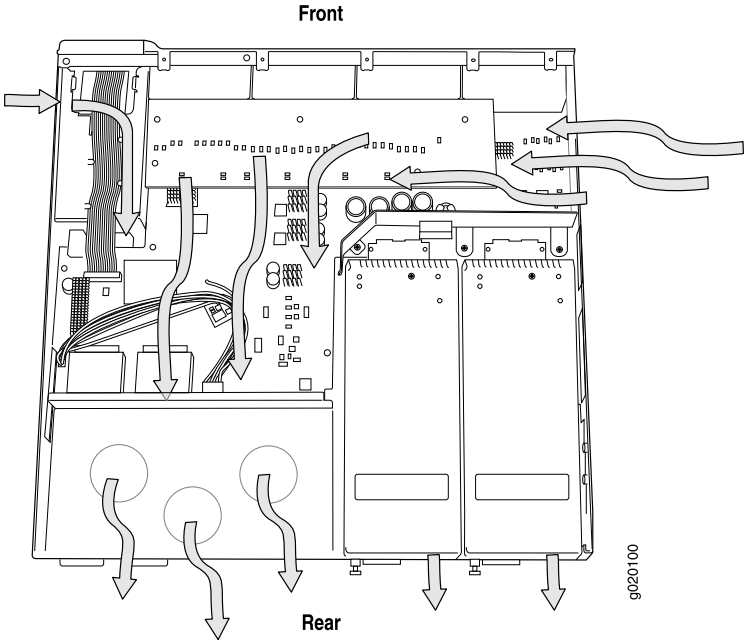


Figure 17: Airflow Through the EX 4200 Switch Chassis



Related Topics

- Rack-Mounting Requirements and Warnings [topic ref to external file]
- Cooling System in EX 3200 Switches [topic ref to external file]
- Cooling System in EX 4200 Switches [topic ref to external file]

Understanding Virtual Chassis Hardware Configuration

Virtual chassis is a feature in EX 4200 switches that allows you to interconnect two or more EX 4200 switches, enabling them to operate as a unified single high bandwidth switch. You can interconnect a maximum of 10 EX 4200 switches through the dedicated 64-Gbps virtual chassis ports (VCPs) or the uplink module ports configured as virtual chassis extender ports (VCEPs) to form a virtual chassis. All EX 4200 switch models support virtual chassis, and you can interconnect different models, offering a range of port configurations, within the same virtual chassis.

The virtual chassis configuration includes designation of a master switch and a backup switch, with all other switches in the configuration designated as candidate switches. Virtual chassis operation is managed through the master switch. Each switch in the virtual chassis is assigned a unique identifier that is displayed on the switch LCD.

Related Topics

- Understanding Virtual Chassis Components [topic ref to external file]
- Planning the Virtual Chassis [topic ref to external file]

Planning the Virtual Chassis

Before installing EX 4200 switches in a virtual chassis configuration, you must consider the following factors:

- The number of switches in the virtual chassis and location—You can interconnect two to ten EX 4200 switches to form a virtual chassis. You can stack the switches in a single rack or install them on multiple racks. For information on the size and strength of racks, see Rack Requirements and Specifications for EX-series Switches [topic ref to external file] . See EX-series Switch Chassis Physical Specifications [topic ref to external file] for the dimensions and weights of the switch models.
- Cabling requirements for virtual chassis—You can interconnect the EX 4200 switches in a virtual chassis configuration through virtual chassis ports (VCPs) using the 0.5 meter long VCP cable supplied in the package. Depending on the virtual chassis configurations you have, you might need cables of different lengths. If you need longer cables, you can purchase them separately. The maximum length allowed for a virtual chassis cable is 5 meters. To connect switches that are installed farther apart, you must configure the uplink module ports as virtual chassis extender ports (VCEPs) and use them to interconnect the switches.
- Clearance on the rear side of the switch—You must have access to the rear of the switch if you plan to interconnect switches to form a virtual chassis.
- Power supply—You must plan the installation site to meet the power requirements of the EX-series switches in a virtual chassis. The input power requirements vary depending on the number of power over Ethernet (PoE) ports in a switch. See Power Supply in EX-series Switches [topic ref to external file] for the power requirements for the various configurations of PoE ports in EX 4200 switches.

Related Topics

- Rack Requirements and Specifications for EX-series Switches [topic ref to external file]
- EX-series Switch Chassis Physical Specifications [topic ref to external file]
- Clearance Requirements for Airflow and Hardware Maintenance [topic ref to external file]
- Power Supply in EX-series Switches [topic ref to external file]

Chapter 3

Installing an EX 3200 Fixed-Configuration Switch

Unpacking the EX-series Switch

The EX-series switch is shipped in a cardboard carton and is secured with foam packing material. The carton also contains an accessory box and quick-start instructions.

NOTE: The EX-series switch is maximally protected inside the shipping carton. Do not unpack it until you are ready to begin installation.

To unpack the switch (see Figure 18 on page 35):

1. Move the shipping carton to a staging area as close to the installation site as possible, but where you have enough room to remove the system components.
2. Position the carton so that the arrows are pointing up.
3. Open the top flaps on the shipping carton.
4. Remove the accessory box and verify the contents against the parts inventory on the label attached to the carton.
5. Pull out the packing material holding the switch in place.
6. Verify the chassis components received against the packing list included with the switch. An inventory of parts provided with EX-series switches is provided in Table 14 on page 35.
7. Save the shipping carton, packing materials, and pallet in case you need to move or ship the switch later.

Graphic to come

Table 14: Inventory of Components Provided with EX-series Switches

Component	Quantity
Switch	1
Fan tray	1

Table 14: Inventory of Components Provided with EX-series Switches *(continued)*

Component	Quantity
Power supply	1
Mounting brackets	2
Mounting screws for securing mounting brackets to the chassis	8
Rubber feet	4
RJ-45 cable	1
RJ-45 to DB-9 serial port adapter	1

Related Topics
- Mounting EX-series Switches [topic ref to external file]
- Connecting Power to the EX-series Switch Chassis [topic ref to external file]
- Connecting and Configuring the EX-series Switch [topic ref to external file]

Mounting EX-series Switches

You can mount EX-series switches on 19-in. or 23-in. equipment racks or cabinets by using rack mounting brackets. You can mount them on desks or other level surfaces by using rubber feet. The switch is shipped with mounting brackets and screws to be used to secure the chassis to rack or cabinet rails. It is also shipped with rubber feet to be used to stabilize the chassis on desks or other level surfaces.

Related Topics
- Mounting EX-series Switches on Racks or Cabinets [topic ref to external file]
- Mounting EX-series Switches on Desks or Other Level Surfaces [topic ref to external file]
- Rack Requirements and Specifications for EX-series Switches [topic ref to external file]
- Cabinet Requirements and Specifications for EX 3200 Switches [topic ref to external file]
- Unpacking the EX-series Switch [topic ref to external file]

Connecting Earth Ground to an EX-series Switch

For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the EX-series Switch to connect to the earth ground. EX-series switch chassis gets additional grounding when you plug the power supply in the switch into a grounded AC power outlet by using an AC power cord appropriate for your geographical location.

Ensure you have the following tools and parts available to connect an EX-series switch to earth ground:

- Electrostatic discharge (ESD) grounding strap
- Grounding cable
- Phillips screwdriver number 2

Ensure you understand how to prevent ESD damage (see Preventing Electrostatic Discharge Damage [topic ref to external file]).

To connect EX-series switches to earth ground (see Figure 19 on page 64):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Connect earth ground to the chassis by using a grounding cable.
   a. Verify that a licensed electrician has attached an appropriate grounding cable lug to the grounding cable.
   b. Connect one end of the grounding cable to a proper earth ground, such as the rack in which the switch is installed.
   c. With a Phillips screwdriver number 2, remove the screw and washer from the PEM nut at the grounding point on the chassis.
   d. Place the grounding lug at the other end of the cable over the grounding point, as shown in Figure 19 on page 64.
   e. Secure the cable lug to the grounding point, first with the washer, then with the screw.

Figure 19: Connecting Earth Ground to an EX-series Switch

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Graphic to come

Related Topics

- Preventing Electrostatic Discharge Damage [topic ref to external file]
- Power Supply in EX-series Switches [topic ref to external file]
- AC Power, Connection, and Power Cord Specifications [topic ref to external file]

Chapter 4

Installing an EX 4200 Virtual Chassis Switch

Unpacking the EX-series Switch

The EX-series switch is shipped in a cardboard carton and is secured with foam packing material. The carton also contains an accessory box and quick-start instructions.

NOTE: The EX-series switch is maximally protected inside the shipping carton. Do not unpack it until you are ready to begin installation.

To unpack the switch (see Figure 18 on page 35):

1. Move the shipping carton to a staging area as close to the installation site as possible, but where you have enough room to remove the system components.
2. Position the carton so that the arrows are pointing up.
3. Open the top flaps on the shipping carton.
4. Remove the accessory box and verify the contents against the parts inventory on the label attached to the carton.
5. Pull out the packing material holding the switch in place.
6. Verify the chassis components received against the packing list included with the switch. An inventory of parts provided with EX-series switches is provided in Table 14 on page 35.
7. Save the shipping carton, packing materials, and pallet in case you need to move or ship the switch later.

Graphic to come

Table 15: Inventory of Components Provided with EX-series Switches

Component	Quantity
Switch	1
Fan tray	1

Table 15: Inventory of Components Provided with EX-series Switches *(continued)*

Component	Quantity
Power supply	1
Mounting brackets	2
Mounting screws for securing mounting brackets to the chassis	8
Rubber feet	4
RJ-45 cable	1
RJ-45 to DB-9 serial port adapter	1

Related Topics
- Mounting EX-series Switches [topic ref to external file]
- Connecting Power to the EX-series Switch Chassis [topic ref to external file]
- Connecting and Configuring the EX-series Switch [topic ref to external file]

Mounting EX-series Switches

You can mount EX-series switches on 19-in. or 23-in. equipment racks or cabinets by using rack mounting brackets. You can mount them on desks or other level surfaces by using rubber feet. The switch is shipped with mounting brackets and screws to be used to secure the chassis to rack or cabinet rails. It is also shipped with rubber feet to be used to stabilize the chassis on desks or other level surfaces.

Related Topics
- Mounting EX-series Switches on Racks or Cabinets [topic ref to external file]
- Mounting EX-series Switches on Desks or Other Level Surfaces [topic ref to external file]
- Rack Requirements and Specifications for EX-series Switches [topic ref to external file]
- Cabinet Requirements and Specifications for EX 3200 Switches [topic ref to external file]
- Unpacking the EX-series Switch [topic ref to external file]

Cabling EX 4200 Switches for Virtual Chassis Configuration

You can install EX 4200 switches in a single rack or multiple racks, or in different wiring closets, and interconnect them to form a virtual chassis. The physical location of the switches in a virtual chassis is restricted only by the maximum length supported for cables to connect virtual chassis ports (VCPs) or virtual chassis extender ports (VCEPs). The maximum cable length supported is 5 meters for VCPs and 10 km for VCEPs.

The following illustrations describe various cabling configuration examples.

Figure 21 on page 37 and Figure 22 on page 38 show five EX 4200 switches stacked vertically in a rack and interconnected in a ring topology using four short virtual chassis cables and one long virtual chassis cable.

Graphic to come

Graphic to come

Figure 23 on page 39 shows five EX 4200 switches stacked vertically in a rack and interconnected in a ring topology using short-length and medium-length virtual chassis cables.

Graphic to come

Figure 24 on page 40 shows five EX 4200 switches stacked vertically in a rack and interconnected in a chain topology using short cables.

Graphic to come

Figure 25 on page 41 and Figure 26 on page 42 show five EX 4200 switches mounted on the top rows of adjacent racks and interconnected in a ring topology using medium-length and long-length virtual chassis cables.

Graphic to come

Graphic to come

Figure 27 on page 43 shows five EX 4200 switches mounted on the top rows of adjacent racks and interconnected in a chain topology using medium-length virtual chassis cables.

Graphic to come

Figure 28 on page 44 shows nine devices distributed across wiring closets and interconnected in a chain topology through both VCPs and VCEPs.

Graphic to come

Related Topics

- Planning the Virtual Chassis [topic ref to external file]
- Virtual Chassis Ports Connector Pinout Information [topic ref to external file]

Connecting Earth Ground to an EX-series Switch

For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the EX-series Switch to connect to the earth ground. EX-series switch chassis gets additional grounding when you plug the power supply in the switch into a grounded AC power outlet by using an AC power cord appropriate for your geographical location.

Ensure you have the following tools and parts available to connect an EX-series switch to earth ground:

- Electrostatic discharge (ESD) grounding strap
- Grounding cable
- Phillips screwdriver number 2

Ensure you understand how to prevent ESD damage (see Preventing Electrostatic Discharge Damage [topic ref to external file]).

To connect EX-series switches to earth ground (see Figure 19 on page 64):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Connect earth ground to the chassis by using a grounding cable.
   a. Verify that a licensed electrician has attached an appropriate grounding cable lug to the grounding cable.
   b. Connect one end of the grounding cable to a proper earth ground, such as the rack in which the switch is installed.
   c. With a Phillips screwdriver number 2, remove the screw and washer from the PEM nut at the grounding point on the chassis.
   d. Place the grounding lug at the other end of the cable over the grounding point, as shown in Figure 19 on page 64.
   e. Secure the cable lug to the grounding point, first with the washer, then with the screw.

Figure 29: Connecting Earth Ground to an EX-series Switch

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Graphic to come

Related Topics

- Preventing Electrostatic Discharge Damage [topic ref to external file]
- Power Supply in EX-series Switches [topic ref to external file]
- AC Power, Connection, and Power Cord Specifications [topic ref to external file]

Connecting Power to the EX-series Switch

EX-series switches use AC power. The power supply in EX-series switches is a hot-removable and hot-insertable field-replaceable unit (FRU).

NOTE: For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the EX-series switch to connect to the earth ground. For instructions on connecting EX-series switches to ground using a separate grounding conductor, see Connecting Earth Ground to an EX-series Switch [topic ref to external file] . EX-series switches get additional grounding when you plug the power supply in the switch into a grounded AC power outlet by using the AC power cord appropriate for your geographical location (see AC Power, Connection, and Power Cord Specifications [topic ref to external file]).

Ensure you have the following tools and parts available:

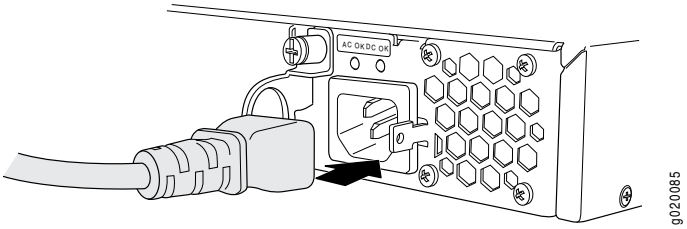
- Electrostatic discharge (ESD) grounding strap
- Power cord

Ensure you understand how to prevent ESD damage (see Preventing Electrostatic Discharge Damage [topic ref to external file]).

To connect power to an EX-series switch chassis (see Figure 30 on page 48):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Connect EX-series switches to earth ground by using a grounding cable. For instructions on connecting an EX-series switch to earth ground, see Connecting Earth Ground to an EX-series Switch [topic ref to external file] .
3. Locate the power cord or cords shipped with the switch, which has a plug appropriate for your geographical location. For power cord specifications, see AC Power, Connection, and Power Cord Specifications [topic ref to external file] .
4. Insert the appliance coupler end of a power cord into the appliance inlet on the power supply faceplate, as shown in Figure 30 on page 48.
5. Insert the power cord plug into an AC power source outlet.
6. Turn on the power.
7. Press the power switch on the EX-series switch chassis to the ON (|) position.

Figure 30: Connecting Power to an EX-series Switch Chassis



NOTE: Each power supply must be connected to a dedicated AC power feed.

WARNING: Ensure that the power cord does not block access to switch components or drape where people can trip on it.

Related Topics

- Field-Replaceable Units in EX-series Switches [topic ref to external file]
- Power Supply in EX-series Switches [topic ref to external file]
- AC Power, Connection, and Power Cord Specifications [topic ref to external file]

Chapter 5

Connecting the Switch and Performing Initial Configuration

Connecting Power to the EX-series Switch

EX-series switches use AC power. The power supply in EX-series switches is a hot-removable and hot-insertable field-replaceable unit (FRU).

NOTE: For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the EX-series switch to connect to the earth ground. For instructions on connecting EX-series switches to ground using a separate grounding conductor, see Connecting Earth Ground to an EX-series Switch [topic ref to external file] . EX-series switches get additional grounding when you plug the power supply in the switch into a grounded AC power outlet by using the AC power cord appropriate for your geographical location (see AC Power, Connection, and Power Cord Specifications [topic ref to external file]).

Ensure you have the following tools and parts available:

- Electrostatic discharge (ESD) grounding strap
- Power cord

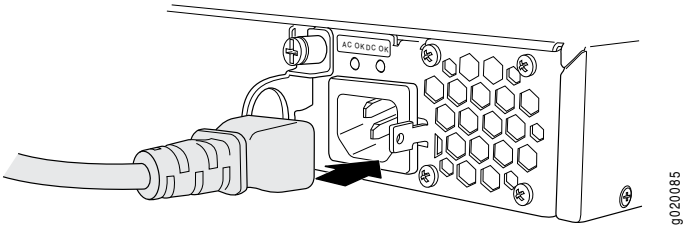
Ensure you understand how to prevent ESD damage (see Preventing Electrostatic Discharge Damage [topic ref to external file]).

To connect power to an EX-series switch chassis (see Figure 30 on page 48):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Connect EX-series switches to earth ground by using a grounding cable. For instructions on connecting an EX-series switch to earth ground, see Connecting Earth Ground to an EX-series Switch [topic ref to external file] .
3. Locate the power cord or cords shipped with the switch, which has a plug appropriate for your geographical location. For power cord specifications, see AC Power, Connection, and Power Cord Specifications [topic ref to external file] .
4. Insert the appliance coupler end of a power cord into the appliance inlet on the power supply faceplate, as shown in Figure 30 on page 48.
5. Insert the power cord plug into an AC power source outlet.

6. Turn on the power.
7. Press the power switch on the EX-series switch chassis to the ON (|) position.

Figure 31: Connecting Power to an EX-series Switch Chassis



NOTE: Each power supply must be connected to a dedicated AC power feed.

WARNING: Ensure that the power cord does not block access to switch components or drape where people can trip on it.

Related Topics

- Field-Replaceable Units in EX-series Switches [topic ref to external file]
- Power Supply in EX-series Switches [topic ref to external file]
- AC Power, Connection, and Power Cord Specifications [topic ref to external file]

Part 3
Hardware Maintenance, Replacement, and Troubleshooting

Chapter 6

Replacing Hardware Components

Removing a Fan Tray from an EX-series Switch

EX-series switches have a single field-replaceable unit (FRU) fan tray on the rear panel.

Ensure you have the following tools and parts available to remove a fan tray from an EX-series switch chassis:

- Electrostatic discharge (ESD) grounding strap
- Phillips screwdriver number 2

Ensure you understand how to prevent ESD damage (see Preventing Electrostatic Discharge Damage [topic ref to external file]).

To remove a fan tray from an EX-series switch (see Figure 32 on page 52 and Figure 33 on page 52):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Loosen the thumbscrew securing the fan tray by using a Phillips screwdriver number 2.
3. Grasp the handle on the fan tray and pull firmly to slide it halfway out of the chassis.

WARNING: To avoid injury, do not touch the fan with your hands or any tools as you slide the fan tray out of the chassis—the fan may still be running.

4. When the fan stop spinning, slide the fan tray completely out of the chassis.

Figure 32: Removing a Fan Tray from an EX 3200 Switch

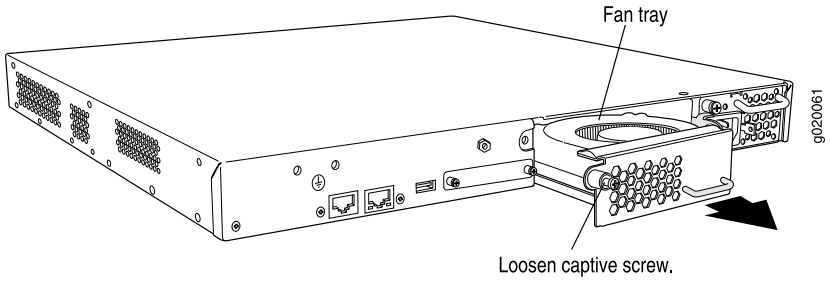
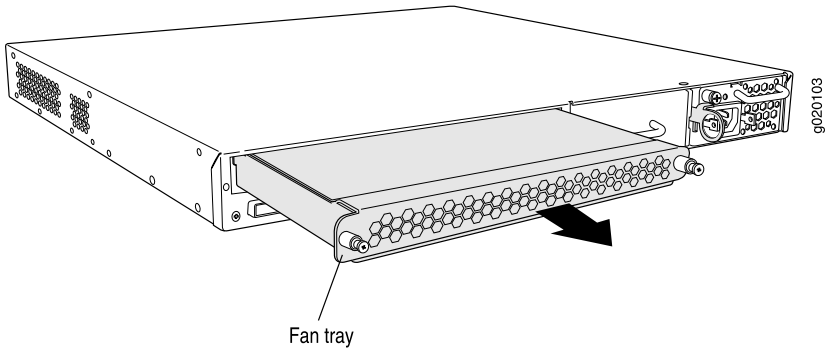


Figure 33: Removing a Fan Tray from an EX 4200 Switch



Related Topics

- Cooling System in EX 3200 Switches [topic ref to external file]
- Cooling System in EX 4200 Switches [topic ref to external file]
- Installing a Fan Tray in an EX-series Switch [topic ref to external file]
- Field-Replaceable Units in EX-series Switches [topic ref to external file]
- Preventing Electrostatic Discharge Damage [topic ref to external file]

Installing a Fan Tray in an EX-series Switch

EX-series switches have a single field-replaceable unit (FRU) fan tray on the rear panel.

Ensure you have the following tools and parts available to install a fan tray in an EX-series switch chassis:

- Electrostatic discharge (ESD) grounding strap
- Phillips screwdriver number 2

Ensure you understand how to prevent ESD damage (see Preventing Electrostatic Discharge Damage [topic ref to external file]).

To install a fan tray in an EX-series switch chassis (see Figure 34 on page 53 and Figure 35 on page 53):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Remove the fan tray from its bag. Using both hands, align the tray with the fan tray guides on the chassis and slide it in until it stops.
3. Tighten the thumbscrews on the fan tray by using a Phillips screwdriver number 2.

Figure 34: Installing a Fan Tray in an EX 3200 Switch

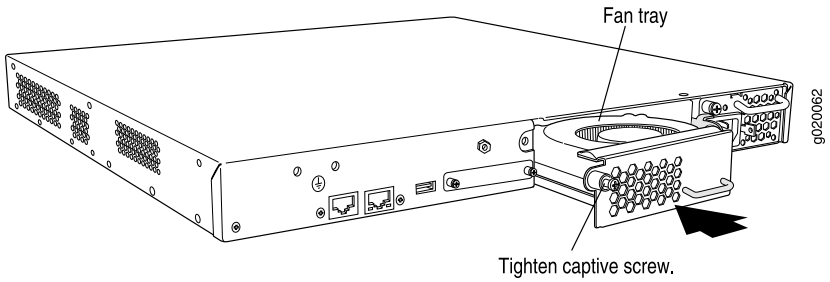
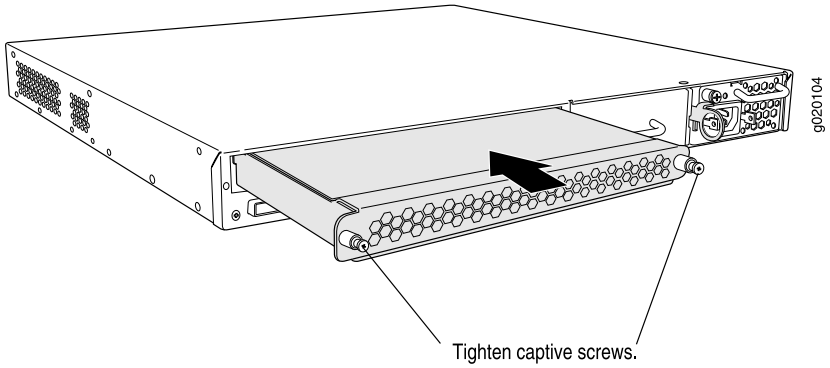


Figure 35: Installing a Fan Tray in an EX 4200 Switch



Related Topics

- Cooling System in EX 3200 Switches [topic ref to external file]
- Cooling System in EX 4200 Switches [topic ref to external file]
- Removing a Fan Tray from an EX-series Switch [topic ref to external file]
- Field-Replaceable Units in EX-series Switches [topic ref to external file]
- Preventing Electrostatic Discharge Damage [topic ref to external file]

Removing an Uplink Module from an EX-series Switch

EX-series switches have a field-replaceable unit (FRU) uplink module on the front panel.

Ensure you have the following tools and parts available to remove an uplink module from an EX-series switch chassis:

- Electrostatic discharge (ESD) grounding strap
- Slotted or flat tipped screwdriver (provided in the uplink module kit)

Ensure you understand how to prevent ESD damage (see Preventing Electrostatic Discharge Damage [topic ref to external file]).

To remove an uplink module from an EX-series switch (see Figure 36 on page 54):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Loosen the captive screws that secure the flip-up door covering the empty slot on the front panel of the chassis by using the screwdriver provided with the uplink module kit, flip the door upward, and remove the blanking panel.
3. Using both hands, pull the uplink module to slide it halfway out of the chassis.
4. Place one hand under the uplink module to support it and slide it completely out of the chassis.

Graphic to come

Related Topics

- Installing an Uplink Module in an EX-series Switch [topic ref to external file]
- Field-Replaceable Units in EX-series Switches [topic ref to external file]
- Preventing Electrostatic Discharge Damage [topic ref to external file]

Installing an Uplink Module in an EX-series Switch

EX-series switches have a field-replaceable unit (FRU) uplink module on the front panel.

Ensure you have the following tools and parts available to install an uplink module in an EX-series switch chassis:

- Electrostatic discharge (ESD) grounding strap
- Slotted or flat tipped screwdriver (provided in the uplink module kit)

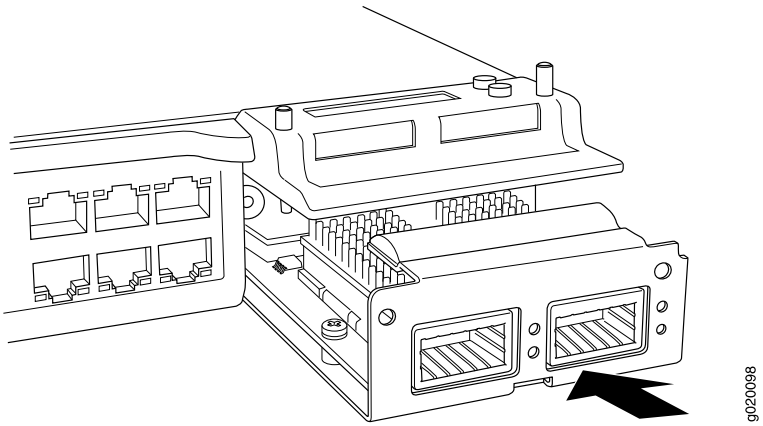
Ensure you understand how to prevent ESD damage (see Preventing Electrostatic Discharge Damage [topic ref to external file]).

To install an uplink module in an EX-series switch (see Figure 37 on page 55):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Loosen the captive screws that secure the flip-up door covering the empty slot on the front panel of the chassis by using the screwdriver provided with the uplink module kit, flip the door upward, and remove the blanking panel.
3. Remove the uplink module from its bag. Take care not to touch module components, pins, leads, or solder connections.

4. Using both hands, place the module between the guides of the selected slot and slide it in until it stops.
5. Flip the door down and tighten the screws by using the screwdriver provided with the uplink module kit.

Figure 37: Installing an Uplink Module in an EX-series Switch



Related Topics

- Removing an Uplink Module from an EX-series Switch [topic ref to external file]
- Field-Replaceable Units in EX-series Switches [topic ref to external file]
- Preventing Electrostatic Discharge Damage [topic ref to external file]

Removing an AC Power Supply from an EX-series Switch

The AC power supply in EX-series switches is a hot-removable and hot-insertable field-replaceable unit (FRU) located on the rear panel.

Ensure you have the following tools and parts available:

- Electrostatic discharge (ESD) grounding strap
- Phillips screwdriver number 2

Ensure you understand how to prevent ESD damage (see Preventing Electrostatic Discharge Damage [topic ref to external file]).

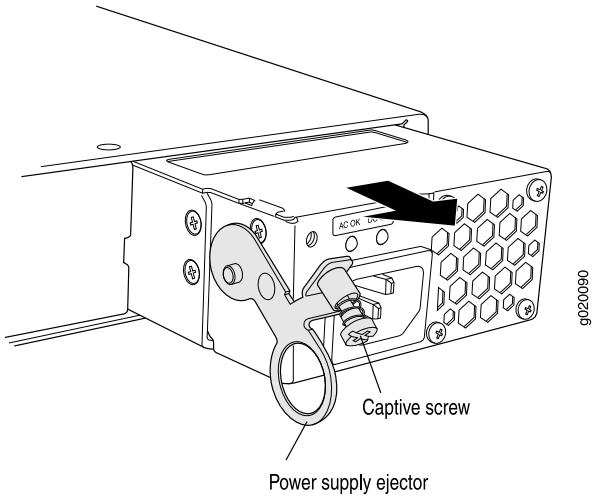
CAUTION: Do not leave the power supply slot empty for a long time while the switch is operational. The power supply must remain in the chassis for proper airflow.

To remove an AC power supply from an EX-series switch (see Figure 38 on page 56):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Press the power switch on the power supply faceplate to the OFF (O) position.

3. Press the power switch on the AC power source outlet to the OFF (O) position.
4. Unplug the power cord from the appliance inlet on the faceplate.
5. Loosen the thumbscrew at each corner of the power supply faceplate by using a Phillips screwdriver number 2.
6. Grasp the power supply ejector and pull firmly to slide it halfway out of the chassis.
7. Place one hand under the power supply to support it and slide it completely out of the chassis.

Figure 38: Removing an AC Power Supply from an EX-series Switch



Related Topics

- Power Supply in EX-series Switches [topic ref to external file]
- Installing an AC Power Supply in an EX-series Switch [topic ref to external file]
- Field-Replaceable Units in EX-series Switches [topic ref to external file]
- AC Power, Connection, and Power Cord Specifications [topic ref to external file]
- Preventing Electrostatic Discharge Damage [topic ref to external file]

Installing an AC Power Supply in an EX-series Switch

The power supply in EX-series switches is a hot-removable and hot-insertable field-replaceable unit (FRU) located on the rear panel.

Ensure you have the following tools and parts available to install an AC power supply in an EX-series switch chassis:

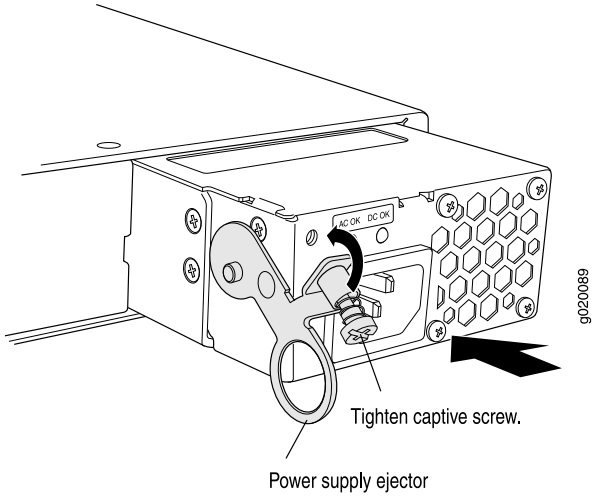
- Electrostatic discharge (ESD) grounding strap
- Phillips screwdriver number 2

Ensure you understand how to prevent ESD damage (see Preventing Electrostatic Discharge Damage [topic ref to external file]).

To install an AC power supply in an EX-series switch (see Figure 39 on page 57):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Remove the power supply from its bag. Take care not to touch power supply components, pins, leads, or solder connections.
3. Using both hands, place the power supply between the guides of the power supply slot on the chassis and slide it in until it stops. Make sure that the power supply faceplate is flush with any adjacent power supply faceplate.
4. Tighten the thumbscrews at each corner of the power supply faceplate by using a Phillips screwdriver number 2.
5. Insert the appliance coupler end of a power cord appropriate for your geographical location into the appliance inlet on the power supply faceplate.
6. Insert the power cord plug into an AC power source outlet.
7. Press and release the power button to power on the switch. Verify that the POWER LED lights steadily after you press the power button.

Figure 39: Installing an AC Power Supply in an EX-series Switch



NOTE: Each power supply must be connected to a dedicated AC power feed.

WARNING: Ensure that the power cord does not block access to switch components or drape where people can trip on it.

Related Topics

- Power Supply in EX-series Switches [topic ref to external file]
- Removing an AC Power Supply from an EX-series Switch [topic ref to external file]
- Field-Replaceable Units in EX-series Switches [topic ref to external file]
- AC Power, Connection, and Power Cord Specifications [topic ref to external file]
- Preventing Electrostatic Discharge Damage [topic ref to external file]

Part 4
Hardware Specifications, Safety, and Compliance

Chapter 7

Switch Environmental Specifications

Environmental Requirements and Specifications

The switch must be installed in a rack or cabinet housed in a dry, clean, well-ventilated, and temperature-controlled environment.

Ensure that these environmental guidelines are followed:

- The site must be as dust-free as possible, because dust can clog air intake vents and filters, reducing the efficiency of the switch cooling system.
- Maintain ambient airflow for normal switch operation. If the airflow is blocked or restricted, or if the intake air is too warm, the switch may overheat, leading to the switch temperature monitor shutting down the switch to protect the hardware components.

Table 16 on page 61 provides the required environmental conditions for normal switch operation.

Table 16: EX-series Switch Environmental Tolerances

Description	Tolerance
Altitude	No performance degradation to 10,000 feet (3048 meters)
Relative humidity	Normal operation ensured in relative humidity range of 5% to 90%, noncondensing
Temperature	Normal operation ensured in temperature range of 32° F to 104° F (0° C to 40° C)
Seismic	Designed to meet Telcordia Technologies Zone 4 earthquake requirements

Related Topics

- Clearance Requirements for Airflow and Hardware Maintenance [topic ref to external file]

Chapter 8

Power Guidelines, Requirements, and Specifications

Site Electrical Wiring Guidelines

Table 17 on page 63 describes the factors you must consider while planning the electrical wiring at your site.

Table 17: Site Electrical Wiring Guidelines

Site Wiring Factor	Guidelines
Signaling limitations	If your site has experienced any of the following problems, consult experts in electrical surge suppression and shielding: ■ Improperly installed wires can emit radio interference. ■ Damage from lightning strikes occurred when wires exceeded recommended distances or passed between buildings. ■ Damage to unshielded conductors and electronic devices was caused by the electromagnetic pulse (EMP) caused by lightning.
Radio frequency interference (RFI)	To reduce or eliminate the emission of radio frequency interference (RFI) from your site wiring, do the following: ■ Use twisted-pair cable with a good distribution of grounding conductors. ■ If you must exceed the recommended distances, use a high-quality twisted-pair cable with one ground conductor for each data signal when applicable.
Electromagnetic compatibility	If your site is susceptible to problems with electromagnetic compatibility (EMC), particularly from lightning or radio transmitters, you might want to seek expert advice. Some of the problems caused by strong sources of electromagnetic interference (EMI) are: ■ Destruction of the signal drivers and receivers in the switch. ■ Electrical hazards as a result of power surges conducted over the lines into the equipment. **CAUTION:** It is particularly important to provide a properly grounded and shielded environment and to use electrical surge-suppression devices. To comply with intrabuilding lightning/surge requirements, intrabuilding wiring must be shielded and the shield for the wiring must be grounded at both ends.

Related Topics

- General Safety Guidelines and Warnings [topic ref to external file]
- General Electrical Safety Guidelines [topic ref to external file]
- Preventing Electrostatic Discharge Damage [topic ref to external file]
- Power Supply in EX-series Switches [topic ref to external file]

Connecting Earth Ground to an EX-series Switch

For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the EX-series Switch to connect to the earth ground. EX-series switch chassis gets additional grounding when you plug the power supply in the switch into a grounded AC power outlet by using an AC power cord appropriate for your geographical location.

Ensure you have the following tools and parts available to connect an EX-series switch to earth ground:

- Electrostatic discharge (ESD) grounding strap
- Grounding cable
- Phillips screwdriver number 2

Ensure you understand how to prevent ESD damage (see Preventing Electrostatic Discharge Damage [topic ref to external file]).

To connect EX-series switches to earth ground (see Figure 19 on page 64):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Connect earth ground to the chassis by using a grounding cable.
   a. Verify that a licensed electrician has attached an appropriate grounding cable lug to the grounding cable.
   b. Connect one end of the grounding cable to a proper earth ground, such as the rack in which the switch is installed.
   c. With a Phillips screwdriver number 2, remove the screw and washer from the PEM nut at the grounding point on the chassis.
   d. Place the grounding lug at the other end of the cable over the grounding point, as shown in Figure 19 on page 64.
   e. Secure the cable lug to the grounding point, first with the washer, then with the screw.

Figure 40: Connecting Earth Ground to an EX-series Switch

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Graphic to come

Related Topics

- Preventing Electrostatic Discharge Damage [topic ref to external file]
- Power Supply in EX-series Switches [topic ref to external file]
- AC Power, Connection, and Power Cord Specifications [topic ref to external file]

Power Supply in EX-series Switches

EX-series switches use AC power that provides two voltage outputs: 12 V for system and logic power and 48-51 V (or higher, to compensate for voltage drops along the path from the power supplies to the RJ-45 connector) for PoE ports. The power supply in EX-series switches (see Figure 10 on page 65 and Figure 11 on page 65) supports the three PoE configurations: 8, 24, and 48 PoE ports. The power supply is a hot-removable and hot-insertable field-replaceable unit (FRU). EX 4200 switches have an internal redundant power supply, making the power supply in EX 4200 switches fully redundant. The power supply in EX 3200 switches is not redundant.

Figure 41: Power Supply in EX 3200 Switches

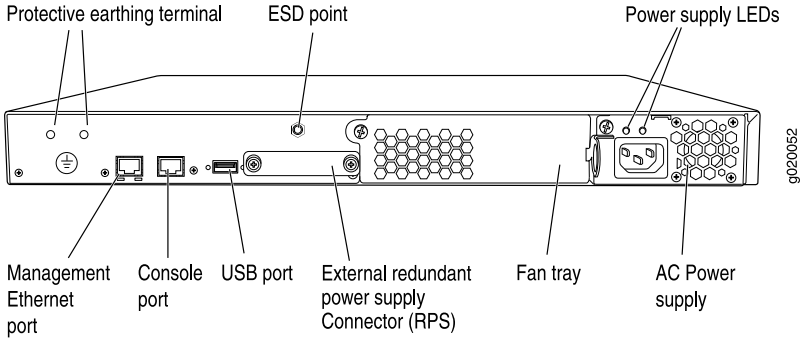


Figure 42: Power Supply in EX 4200 Switches

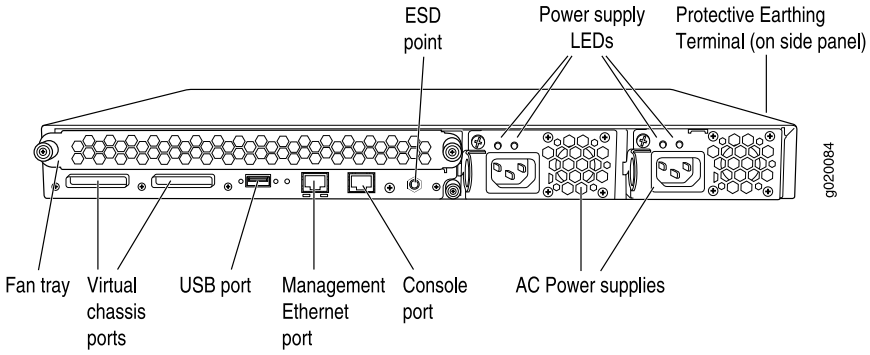


Table 9 on page 66 provides the power requirements for the various configurations of PoE ports in EX 3200 switches.

Table 18: Power Requirements for EX 3200 Switches

Model Number	Number of PoE-enabled Ports	Power Requirement
EX 3200-24T	8	320 W
EX 3200-48T	8	320 W
EX 3200-24P	24	600 W
EX 3200-48P	48	930 W

Table 10 on page 66 provides the power requirements for the various configurations of PoE ports in EX 4200 switches.

Table 19: Power Requirements for EX 4200 Switches

Model Number	Number of PoE-enabled Ports	Power Requirement
EX 4200-24T	8	320 W
EX 4200-48T	8	320 W
EX 4200-24P	24	600 W
EX 4200-48P	48	930 W
EX 4200-24F	–	320 W

To avoid electrical injury, follow instructions in Installing an AC Power Supply in an EX-series Switch [topic ref to external file] and Removing an AC Power Supply from an EX-series Switch [topic ref to external file] carefully.

NOTE: After turning off power, wait for at least 60 seconds before turning it back on. After turning on power, wait for at least 60 seconds before turning it off.

After turning on power, it can take up to 60 seconds for status indicators—such as LEDs on the power supply, show chassis command output, and messages on the craft interface LCD—to indicate that the power supply is functioning normally. Ignore error indicators that appear during the first 60 seconds.

Related Topics

- EX 3200 Switches—Rear-Panel Description [topic ref to external file]
- EX 4200 Switches—Rear-Panel Description [topic ref to external file]
- Field-Replaceable Units in EX-series Switches [topic ref to external file]

AC Power, Connection, and Power Cord Specifications

Detachable AC power cords are supplied with the switch. The appliance coupler at the female end of the cord inserts into the appliance inlet on the faceplate of the AC power supply. The coupler is type (C19) as described by International Electrotechnical Commission (IEC) standard 60320. The plug at the male end of the power cord fits into the power source receptacle that is standard for your geographical location.

NOTE: In North America, AC power cords must not exceed 4.5 meters (approximately 14.75 feet) in length, to comply with National Electrical Code (NEC) Sections 400-8 (NFPA 75, 5-2.2) and 210-52 and Canadian Electrical Code (CEC) Section 4-010(3). The cords supplied with the switch are in compliance.

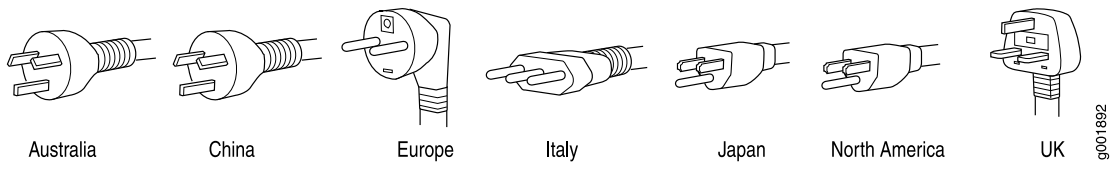
Table 20 on page 67 lists AC power cord specifications provided for each country or region.

Table 20: AC Power Cord Specifications

Country/Region	Electrical Specifications	Plug Standards
Australia	250 VAC, 10 A, 50 Hz	AS/NZ 3112–1993
China	250 VAC, 10 A, 50 Hz	GB2099.1 1996 and GB1002 1996 (CH1-10P)
Europe (except Italy and United Kingdom)	250 VAC, 10 A, 50 Hz	CEE (7) VII
Italy	250 VAC, 10 A, 50 Hz	CEI 23–16/VII
Japan	125 VAC, 12 A, 50 Hz or 60 Hz	JIS 8303
North America	125 VAC, 10 A, 60 Hz	NEMA 5-15
United Kingdom	250 VAC, 10 A, 50 Hz	BS 1363A

Figure 43 on page 67 illustrates the plug on the power cord for each country or region listed in Table 20 on page 67.

Figure 43: AC Plug Types



NOTE: The AC power cord for the EX-series switch is intended for use with the switch only and not for any other use.

Related Topics

- General Safety Guidelines and Warnings [topic ref to external file]
- General Electrical Safety Guidelines [topic ref to external file]
- Preventing Electrostatic Discharge Damage [topic ref to external file]
- Power Supply in EX-series Switches [topic ref to external file]

Chapter 9

Cable and Wire Guidelines and Specifications

Chapter 10

Cable Connector Pinouts

EX-series Switch—Chassis Console Port Pinouts

The console port on an EX-series switch chassis has an RJ-45 connector. Table 21 on page 71 provides the pinout information for the RJ-45 chassis console connector. To connect the console port to an external management device, you need an RJ-45 to DB-9 serial port adapter. An RJ-45 cable and an RJ-45 to DB-9 serial port adapter are supplied with the switch.

Table 21: RJ-45 Chassis Console Connector Pinout

Pin	Signal	Description
1	RTS Output	Request to send
2	DTR Output	Data terminal ready
3	TxD Output	Transmit data
4	GND	Chassis ground
5	GND	Chassis ground
6	RxD Input	Receive data
7	CD Input	Carrier detect
8	CTS Input	Clear to send

Related Topics

- EX 3200 Switches—Rear-Panel Description [topic ref to external file]
- EX 4200 Switches—Rear-Panel Description [topic ref to external file]

RJ-45 Connector Pinout Information

Table 22 on page 72 provides the RJ-45 connector pinout information.

Table 22: RJ-45 Connector Pinout Information

Pin	Signal	Description
1	RTS Output	Request to send
2	DTR Output	Data terminal ready
3	TxD Output	Transmit data
4, 5	Signal Ground	Signal ground
6	RxD Input	Receive data
7	CD Input	Data carrier detect
8	CTS Input	Clear to send

Chapter 11

Safety and Regulatory Compliance Information

Agency Approvals

The EX-series switch complies with the following standards:

- Safety
  - CAN/CSA-22.2 No. 60950–1–07/UL 60950–1. 2nd Ed. Safety of Information Technology Equipment
  - EN 60950–1:2005. Safety of Information Technology Equipment
  - EN 60825-1 Safety of Laser Products - Part 1: Equipment Classification, Requirements and User's Guide
- EMC

- FCC 47CFR Part 15 Class A (USA)
- EN 55022 Class A Emissions (Europe)
- ICES-003 Class A
- VCCI Class A (Japan)
- AS/NZS CISPR 22 Class A (Australia/New Zealand)
- CISPR 22 Class A
- EN 55024
- EN 300386
- EN 61000-3-2 Power Line Harmonics
- EN 61000-3-3 Voltage Fluctuations and Flicker
- EN 61000-4-2 ESD
- EN 61000-4-3 Radiated Immunity
- EN 61000-4-4 EFT
- EN 61000-4-5 Surge
- EN 61000-4-6 Low Frequency Common Immunity
- EN 61000-4-11 Voltage Dips and Sags

Related Topics ■ Compliance Statements for EMC Requirements [topic ref to external file]

Compliance Statements for EMC Requirements

Canada This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

The Industry Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational, and safety requirements. Industry Canada does not guarantee the equipment will operate to the users' satisfaction.

Before installing this equipment, users should ensure that it is permissible to connect the equipment to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the inside wiring associated with a single line individual service may be extended by means of a certified connector assembly. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by

the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

CAUTION: Users should not attempt to make electrical ground connections by themselves, but should contact the appropriate inspection authority or an electrician, as appropriate.

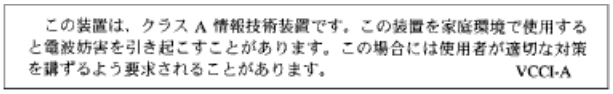
Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

European Community

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Graphic to come

Japan



The preceding translates as follows:

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

VCCI-A

United States

The EX-series switch has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Part 15 Statement

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio or TV technician for help.

Non-Regulatory Environmental Standards

NEBS

- SR-3580 NEBS Criteria Levels (Level 3 Compliance)
- GR-63-CORE: NEBS, Physical Protection
- GR-1089-CORE: EMC and Electrical Safety for Network Telecommunications Equipment

Related Topics

- Agency Approvals [topic ref to external file]

Definitions of Safety Warning Levels

The documentation for EX-series switches uses the following three levels of safety warnings:

NOTE: You might find this information helpful in a particular situation, or you might overlook this important information if it was not highlighted in a Note.

CAUTION: You need to observe the specified guidelines to avoid minor injury or discomfort to you or severe damage to the EX-series switch.

WARNING: This 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.

WARNING: 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.

WARNING: 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.

WARNING: 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.

WARNING: 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.

WARNING: 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.

WARNING: 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.

WARNING: 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.

WARNING: ¡Atención! 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.

WARNING: 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.

Related Topics

- Warning Statement for Norway and Sweden [topic ref to external file]
- General Safety Guidelines and Warnings [topic ref to external file]
- Installation Instructions Warning [topic ref to external file]
- Maintenance and Operational Safety Guidelines and Warnings [topic ref to external file]
- Grounded Equipment Warning [topic ref to external file]
- Laser and LED Safety Guidelines and Warnings [topic ref to external file]

General Safety Guidelines and Warnings

The following guidelines help ensure your safety and protect the EX-series switch from damage. The list of guidelines might not address all potentially hazardous situations in your working environment, so be alert and exercise good judgment at all times.

- Perform only the procedures explicitly described in the hardware documentation for this product. Make sure that only authorized service personnel perform other system services.
- Keep the area around the chassis clear and free from dust before, during, and after installation.
- Keep tools away from areas where people could trip over them while walking.
- Do not wear loose clothing or jewelry, such as rings, bracelets, or chains, which could become caught in the chassis.
- Wear safety glasses if you are working under any conditions that could be hazardous to your eyes.
- Do not perform any actions that create a potential hazard to people or make the equipment unsafe.
- Never attempt to lift an object that is too heavy for one person to handle.
- Never install or manipulate wiring during electrical storms.
- Never install electrical jacks in wet locations unless the jacks are specifically designed for wet environments.
- Operate the EX-series switch only when it is properly grounded.
- Ensure that the separate protective earthing terminal provided on this product is permanently connected to earth.
- Replace fuses only with fuses of the same type and rating.
- Do not open or remove chassis covers or sheet-metal parts unless instructions are provided in the hardware documentation for this product. Such an action could cause severe electrical shock.
- Do not push or force any objects through any opening in the chassis frame. Such an action could result in electrical shock or fire.
- Avoid spilling liquid onto the EX-series switch chassis or onto any switch component. Such an action could cause electrical shock or damage the switch.
- Avoid touching uninsulated electrical wires or terminals that have not been disconnected from their power source. Such an action could cause electrical shock.
- Always ensure that all modules, power supplies, and blanks are fully inserted and that the installation screws are fully tightened.

Related Topics

- AC Power Electrical Safety Guidelines [topic ref to external file]
- General Electrical Safety Guidelines [topic ref to external file]
- Maintenance and Operational Safety Guidelines and Warnings [topic ref to external file]
- Laser and LED Safety Guidelines and Warnings [topic ref to external file]
- Installation Instructions Warning [topic ref to external file]
- Grounded Equipment Warning [topic ref to external file]

Maintenance and Operational Safety Guidelines and Warnings

While performing the maintenance activities for EX-series switches, observe the following guidelines and warnings:

Battery Handling Warning

WARNING: Replacing the battery incorrectly might result in an explosion. Replace the battery only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

WARNING: Waarschuwing Er is ontploffingsgevaar als de batterij verkeerd vervangen wordt. Vervang de batterij slechts met hetzelfde of een equivalent type dat door de fabrikant aanbevolen is. Gebruikte batterijen dienen overeenkomstig fabrieksvoorschriften weggeworpen te worden.

WARNING: Varoitus Räjähdyksen vaara, jos akku on vaihdettu väärään akkuun. Käytä vaihtamiseen ainoastaan saman- tai vastaavantyyppistä akkua, joka on valmistajan suosittelema. Hävitä käytetyt akut valmistajan ohjeiden mukaan.

WARNING: Attention Danger d'explosion si la pile n'est pas remplacée correctement. Ne la remplacer que par une pile de type semblable ou équivalent, recommandée par le fabricant. Jeter les piles usagées conformément aux instructions du fabricant.

WARNING: Warnung Bei Einsetzen einer falschen Batterie besteht Explosionsgefahr. Ersetzen Sie die Batterie nur durch den gleichen oder vom Hersteller empfohlenen Batterietyp. Entsorgen Sie die benutzten Batterien nach den Anweisungen des Herstellers.

WARNING: Advarsel Det kan være fare for eksplosjon hvis batteriet skiftes på feil måte. Skift kun med samme eller tilsvarende type som er anbefalt av produsenten. Kasser brukte batterier i henhold til produsentens instruksjoner.

WARNING: Avvertenza Pericolo di esplosione se la batteria non è installata correttamente. Sostituire solo con una di tipo uguale o equivalente, consigliata dal produttore. Eliminare le batterie usate secondo le istruzioni del produttore.

WARNING: Aviso Existe perigo de explosão se a bateria for substituída incorrectamente. Substitua a bateria por uma bateria igual ou de um tipo equivalente recomendado pelo fabricante. Destrua as baterias usadas conforme as instruções do fabricante.

WARNING: ¡Atención! Existe peligro de explosión si la batería se reemplaza de manera incorrecta. Reemplazar la batería exclusivamente con el mismo tipo o el equivalente recomendado por el fabricante. Desechar las baterías gastadas según las instrucciones del fabricante.

WARNING: Varning! Explosionsfara vid felaktigt batteribyte. Ersätt endast batteriet med samma batterityp som rekommenderas av tillverkaren eller motsvarande. Följ tillverkarens anvisningar vid kassering av använda batterier.

Jewelry Removal Warning

WARNING: Before working on equipment that is connected to power lines, remove jewelry, including rings, necklaces, and watches. Metal objects heat up when connected to power and ground and can cause serious burns or can be welded to the terminals.

WARNING: 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.

WARNING: 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.

WARNING: 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.

WARNING: 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.

WARNING: 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.

WARNING: 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.

WARNING: 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.

WARNING: ¡Atención! 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.

WARNING: 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.

Lightning Activity Warning

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

WARNING: Waarschuwing Tijdens onweer dat gepaard gaat met bliksem, dient u niet aan het systeem te werken of kabels aan te sluiten of te ontkoppelen.

WARNING: Varoitus Älä työskentele järjestelmän parissa äläkä yhdistä tai irrota kaapeleita ukkosilmalla.

WARNING: Attention Ne pas travailler sur le système ni brancher ou débrancher les câbles pendant un orage.

WARNING: Warnung Arbeiten Sie nicht am System und schließen Sie keine Kabel an bzw. trennen Sie keine ab, wenn es gewittert.

WARNING: Avvertenza Non lavorare sul sistema o collegare oppure scollegare i cavi durante un temporale con fulmini.

WARNING: Advarsel Utfør aldri arbeid på systemet, eller koble kabler til eller fra systemet når det tordner eller lyner.

WARNING: Aviso Não trabalhe no sistema ou ligue e desligue cabos durante períodos de mau tempo (trovoada).

WARNING: ¡Atención! No operar el sistema ni conectar o desconectar cables durante el transcurso de descargas eléctricas en la atmósfera.

WARNING: Varning! Vid åska skall du aldrig utföra arbete på systemet eller ansluta eller koppla loss kablar.

Operating Temperature 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 6 inches (15.2 cm) of clearance around the ventilation openings.

WARNING: Waarschuwing Om te voorkomen dat welke switch van de Juniper Networks router dan ook oververhit raakt, dient u deze niet te bedienen op een plaats waar de maximale aanbevolen omgevingstemperatuur van 40° C wordt overschreden. Om te voorkomen dat de luchtstroom wordt beperkt, dient er minstens 15,2 cm speling rond de ventilatie-openingen te zijn.

WARNING: Varoitus Ettei Juniper Networks switch-sarjan reititin ylikuumentuisi, sitä ei saa käyttää tilassa, jonka lämpötila ylittää korkeimman suositellun ympäristölämpötilan 40° C. Ettei ilmanvaihto estyisi, tuuletusaukkojen ympärille on jätettävä ainakin 15,2 cm tilaa.

WARNING: Attention Pour éviter toute surchauffe des routeurs de la gamme Juniper Networks switch, ne l'utilisez pas dans une zone où la température ambiante est supérieure à 40° C. Pour permettre un flot d'air constant, dégagez un espace d'au moins 15,2 cm autour des ouvertures de ventilations.

WARNING: Warnung Um einen Router der switch vor Überhitzung zu schützen, darf dieser nicht in einer Gegend betrieben werden, in der die Umgebungstemperatur das empfohlene Maximum von 40° C überschreitet. Um Lüftungsverschluß zu verhindern, achten Sie darauf, daß mindestens 15,2 cm lichter Raum um die Lüftungsöffnungen herum frei bleibt.

WARNING: Avvertenza Per evitare il surriscaldamento dei switch, non adoperateli in un locale che ecceda la temperatura ambientale massima di 40° C. Per evitare che la circolazione dell'aria sia impedita, lasciate uno spazio di almeno 15.2 cm di fronte alle aperture delle ventole.

WARNING: Advarsel Unngå overoppheting av eventuelle rutere i Juniper Networks switch Disse skal ikke brukes på steder der den anbefalte maksimale omgivelsestemperaturen overstiger 40° C (104° F). Sørg for at klaringen rundt lufteåpningene er minst 15,2 cm (6 tommer) for å forhindre nedsatt luftsirkulasjon.

WARNING: Aviso Para evitar o sobreaquecimento do encaminhador Juniper Networks switch, não utilize este equipamento numa área que exceda a temperatura máxima recomendada de 40° C. Para evitar a restrição à circulação de ar, deixe pelo menos um espaço de 15,2 cm à volta das aberturas de ventilação.

WARNING: ¡Atención! Para impedir que un encaminador de la serie Juniper Networks switch se recaliente, no lo haga funcionar en un área en la que se supere la temperatura ambiente máxima recomendada de 40° C. Para impedir la restricción de la entrada de aire, deje un espacio mínimo de 15,2 cm alrededor de las aperturas para ventilación.

WARNING: Varning! Förhindra att en Juniper Networks switch överhettas genom att inte använda den i ett område där den maximalt rekommenderade omgivningstemperaturen på 40° C överskrids. Förhindra att luftcirkulationen inskränks genom att se till att det finns fritt utrymme på minst 15,2 cm omkring ventilationsöppningarna.

Product Disposal Warning

WARNING: Disposal of this product must be handled according to all national laws and regulations.

WARNING: Waarschuwing Dit produkt dient volgens alle landelijke wetten en voorschriften te worden afgedankt.

WARNING: Varoitus Tämän tuotteen lopullisesta hävittämisestä tulee huolehtia kaikkia valtakunnallisia lakeja ja säännöksiä noudattaen.

WARNING: Attention La mise au rebut définitive de ce produit doit être effectuée conformément à toutes les lois et réglementations en vigueur.

WARNING: Warnung Dieses Produkt muß den geltenden Gesetzen und Vorschriften entsprechend entsorgt werden.

WARNING: Avvertenza L'eliminazione finale di questo prodotto deve essere eseguita osservando le normative italiane vigenti in materia

WARNING: Advarsel Endelig disponering av dette produktet må skje i henhold til nasjonale lover og forskrifter.

WARNING: Aviso A descartagem final deste produto deverá ser efectuada de acordo com os regulamentos e a legislação nacional.

WARNING: ¡Atención! El desecho final de este producto debe realizarse según todas las leyes y regulaciones nacionales

WARNING: Varning! Slutlig kassering av denna produkt bör skötas i enlighet med landets alla lagar och föreskrifter.

Related Topics

- General Safety Guidelines and Warnings [topic ref to external file]
- AC Power Electrical Safety Guidelines [topic ref to external file]
- General Electrical Safety Guidelines [topic ref to external file]
- Laser and LED Safety Guidelines and Warnings [topic ref to external file]
- Installation Instructions Warning [topic ref to external file]
- Grounded Equipment Warning [topic ref to external file]

Radiation from Open Port Apertures Warning

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

WARNING: Waarschuwing Aangezien onzichtbare straling vanuit de opening van de poort kan komen als er geen fiberkabel aangesloten is, dient blootstelling aan straling en het kijken in open openingen vermeden te worden.

WARNING: Varoitus Koska portin aukosta voi emittoitua näkymätöntä säteilyä, kun kuitukaapelia ei ole kytkettynä, vältä säteilylle altistumista äläkä katso avoimiin aukkoihin.

WARNING: Attention Des radiations invisibles à l'il nu pouvant traverser l'ouverture du port lorsqu'aucun câble en fibre optique n'y est connecté, il est recommandé de ne pas regarder fixement l'intérieur de ces ouvertures.

WARNING: Warnung Aus der Port-Öffnung können unsichtbare Strahlen emittieren, wenn kein Glasfaserkabel angeschlossen ist. Vermeiden Sie es, sich den Strahlungen auszusetzen, und starren Sie nicht in die Öffnungen!

WARNING: Avvertenza Quando i cavi in fibra non sono inseriti, radiazioni invisibili possono essere emesse attraverso l'apertura della porta. Evitate di esporvi alle radiazioni e non guardate direttamente nelle aperture.

WARNING: Advarsel Unngå utsettelse for stråling, og stirr ikke inn i åpninger som er åpne, fordi usynlig stråling kan emiteres fra portens åpning når det ikke er tilkoblet en fiberkabel.

WARNING: Aviso Dada a possibilidade de emissão de radiação invisível através do orifício da via de acesso, quando esta não tiver nenhum cabo de fibra conectado, deverá evitar a exposição à radiação e não deverá olhar fixamente para orifícios que se encontrarem a descoberto.

WARNING: ¡Atención! Debido a que la apertura del puerto puede emitir radiación invisible cuando no existe un cable de fibra conectado, evite mirar directamente a las aperturas para no exponerse a la radiación.

WARNING: Varning! Osynlig strålning kan avges från en portöppning utan ansluten fiberkabel och du bör därför undvika att bli utsatt för strålning genom att inte stirra in i oskyddade öppningar.

Related Topics

- General Safety Guidelines and Warnings [topic ref to external file]
- AC Power Electrical Safety Guidelines [topic ref to external file]
- General Electrical Safety Guidelines [topic ref to external file]
- Laser and LED Safety Guidelines and Warnings [topic ref to external file]
- Installation Instructions Warning [topic ref to external file]
- Grounded Equipment Warning [topic ref to external file]

Laser and LED Safety Guidelines and Warnings

EX-series switches are equipped with laser transmitters, which are considered a Class 1 Laser Product by the U.S. Food and Drug Administration and are evaluated as a Class 1 Laser Product per EN 60825–1 requirements.

Observe the following guidelines and warnings:

General Laser Safety Guidelines

When working around PIMs, observe the following safety guidelines to prevent eye injury:

- Do not look into unterminated ports or at fibers that connect to unknown sources.
- Do not examine unterminated optical ports with optical instruments.
- Avoid direct exposure to the beam.

WARNING: Unterminated optical connectors can emit invisible laser radiation. The lens in the human eye focuses all the laser power on the retina, so focusing the eye directly on a laser source—even a low-power laser—could permanently damage the eye.

Class 1 Laser Product Warning

WARNING: Class 1 laser product.

Waarschuwing Klasse-1 laser produkt.

Varoitus Luokan 1 lasertuote.

Attention Produit laser de classe I.

Warnung Laserprodukt der Klasse 1.

WARNING: Avvertenza Prodotto laser di Classe 1.

Advarsel Laserprodukt av klasse 1.

Aviso Produto laser de classe 1.

¡Atención! Producto láser Clase I.

Varning! Laserprodukt av klass 1.

Class 1 LED Product Warning

WARNING: Class 1 LED product.

Waarschuwing Klasse 1 LED-product.

Varoitus Luokan 1 valodiodituote.

Attention Alarme de produit LED Class I.

Warnung Class 1 LED-Produktwarnung.

WARNING: Avvertenza Avvertenza prodotto LED di Classe 1.

Advarsel LED-produkt i klasse 1.

Aviso Produto de classe 1 com LED.

¡Atención! Aviso sobre producto LED de Clase 1.

Varning! Lysdiodprodukt av klass 1.

Laser Beam Warning

WARNING: Do not stare into the laser beam or view it directly with optical instruments.

WARNING: Waarschuwing Niet in de straal staren of hem rechtstreeks bekijken met optische instrumenten.

WARNING: Varoitus Älä katso säteeseen äläkä tarkastele sitä suoraan optisen laitteen avulla.

WARNING: Attention Ne pas fixer le faisceau des yeux, ni l'observer directement à l'aide d'instruments optiques.

WARNING: Warnung Nicht direkt in den Strahl blicken und ihn nicht direkt mit optischen Geräten prüfen.

WARNING: Avvertenza Non fissare il raggio con gli occhi né usare strumenti ottici per osservarlo direttamente.

WARNING: Advarsel Stirr eller se ikke direkte p strlen med optiske instrumenter.

WARNING: Aviso Não olhe fixamente para o raio, nem olhe para ele directamente com instrumentos ópticos.

WARNING: ¡Atención! No mirar fijamente el haz ni observarlo directamente con instrumentos ópticos.

WARNING: Varning! Rikta inte blicken in mot strålen och titta inte direkt på den genom optiska instrument.

Related Topics

- General Safety Guidelines and Warnings [topic ref to external file]
- AC Power Electrical Safety Guidelines [topic ref to external file]
- General Electrical Safety Guidelines [topic ref to external file]
- Radiation from Open Port Apertures Warning [topic ref to external file]
- Installation Instructions Warning [topic ref to external file]
- Grounded Equipment Warning [topic ref to external file]

Ramp Warning

WARNING: When installing the switch, do not use a ramp inclined at more than 10 degrees.

Waarschuwing Gebruik een oprijplaat niet onder een hoek van meer dan 10 graden.

Varoitus Älä käytä sellaista kaltevaa pintaa, jonka kaltevuus ylittää 10 astetta.

Attention Ne pas utiliser une rampe dont l'inclinaison est supérieure à 10 degrés.

Warnung Keine Rampen mit einer Neigung von mehr als 10 Grad verwenden.

Avvertenza Non usare una rampa con pendenza superiore a 10 gradi.

Advarsel Bruk aldri en rampe som heller mer enn 10 grader.

Aviso Não utilize uma rampa com uma inclinação superior a 10 graus.

¡Atención! No usar una rampa inclinada más de 10 grados

Varning! Använd inte ramp med en lutning på mer än 10 grader.

Related Topics

- General Safety Guidelines and Warnings [topic ref to external file]
- AC Power Electrical Safety Guidelines [topic ref to external file]
- General Electrical Safety Guidelines [topic ref to external file]
- Laser and LED Safety Guidelines and Warnings [topic ref to external file]
- Installation Instructions Warning [topic ref to external file]
- Grounded Equipment Warning [topic ref to external file]

Rack-Mounting Requirements and Warnings

Ensure that the equipment rack into which the EX-series switch is installed is evenly and securely supported, to avoid the hazardous condition that could result from uneven mechanical loading.

WARNING: To prevent bodily injury when mounting or servicing the switch in a rack, take the following precautions to ensure that the system remains stable. The following directives help maintain your safety:

- The switch must be installed into a rack that is secured to the building structure.
- The switch should be mounted at the bottom of the rack if it is the only unit in the rack.
- When mounting the switch 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 switch in the rack.

WARNING: 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:

- De Juniper Networks switch moet in een stellage worden geïnstalleerd die aan een bouwsel is verankerd.
- 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.

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

- Juniper Networks switch on asennettava telineeseen, joka on kiinnitetty rakennukseen.
- 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.

WARNING: 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:

- Le rack sur lequel est monté le Juniper Networks switch doit être fixé à la structure du bâtiment.
- 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.

WARNING: 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:

- Der Juniper Networks switch muß in einem Gestell installiert werden, das in der Gebäudestruktur verankert ist.
- 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.

WARNING: 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:

- Il Juniper Networks switch deve essere installato in un telaio, il quale deve essere fissato alla struttura dell'edificio.
- 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.

WARNING: 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:

- Juniper Networks switch må installeres i et stativ som er forankret til bygningsstrukturen.
- 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.

WARNING: 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:

- O Juniper Networks switch deverá ser instalado numa prateleira fixa à estrutura do edificio.
- 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.

WARNING: ¡Atención! 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:

- El Juniper Networks switch debe instalarse en un bastidor fijado a la estructura del edificio.
- 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.

WARNING: 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:

- Juniper Networks switch måste installeras i en ställning som är förankrad i byggnadens struktur.
- 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.

Related Topics

- General Safety Guidelines and Warnings [topic ref to external file]
- AC Power Electrical Safety Guidelines [topic ref to external file]
- General Electrical Safety Guidelines [topic ref to external file]
- Laser and LED Safety Guidelines and Warnings [topic ref to external file]
- Installation Instructions Warning [topic ref to external file]
- Grounded Equipment Warning [topic ref to external file]

Installation Instructions Warning

WARNING: Read the installation instructions before you connect the switch to a 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.

¡Atención! 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.

Related Topics

- General Safety Guidelines and Warnings [topic ref to external file]
- AC Power Electrical Safety Guidelines [topic ref to external file]
- General Electrical Safety Guidelines [topic ref to external file]
- Laser and LED Safety Guidelines and Warnings [topic ref to external file]
- Grounded Equipment Warning [topic ref to external file]

Chassis Lifting Guidelines

The weight of a fully loaded EX–series switch chassis is approximately 22 lb (10 kg). Observe the following guidelines for lifting and moving an EX-series switch:

- Before installing the EX-series switch, read the guidelines in Site Preparation Checklist for EX-series Switches [topic ref to external file] to verify that the intended site meets the specified power, environmental, and clearance requirements.
- Before lifting or moving the EX-series switch, disconnect all external cables.
- As when lifting any heavy object, lift most of the weight with your legs rather than your back. Keep your knees bent and your back relatively straight and avoid

twisting your body as you lift. Balance the load evenly and be sure that your footing is solid.

Related Topics

- General Safety Guidelines and Warnings [topic ref to external file]
- Mounting EX-series Switches [topic ref to external file]
- Installation Instructions Warning [topic ref to external file]

Telecommunication Line Cord Warning

WARNING: To reduce the risk of fire, use only No. 26 AWG or larger UL-listed or CSA-certified telecommunication line cord.

Waarschuwing Om brandgevaar te reduceren, dient slechts telecommunicatielijnsnoer nr. 26 AWG of groter gebruikt te worden.

Varoitus Tulipalovaaran vähentämiseksi käytä ainoastaan nro 26 AWG- tai paksumpaa tietoliikennejohdinta.

Attention Pour réduire les risques d'incendie, n'utiliser que des cordons de lignes de télécommunications de type AWG n° 26 ou plus larges.

Warnung Zur Reduzierung der Feuergefahr eine Fernmeldeleitungsschnur der Größe 26 AWG oder größer verwenden.

Avvertenza Per ridurre il rischio di incendio, usare solo un cavo per linea di telecomunicazioni di sezione 0,12 mm2 (26 AWG) o maggiore.

Advarsel Bruk kun AWG nr. 26 eller telekommunikasjonsledninger med større dimensjon for å redusere faren for brann.

Aviso Para reduzir o risco de incêndio, utilize apenas terminais de fio de telecomunicações Nº. 26 AWG ou superiores.

¡Atención! Para reducir el riesgo de incendios, usar sólo líneas de telecomunicaciones de calibre No. 26 AWG o más gruesas.

Varning! För att minska brandrisken skall endast Nr. 26 AWG eller större telekommunikationsledning användas.

Related Topics

- General Safety Guidelines and Warnings [topic ref to external file]

TN Power Warning

WARNING: The switch is designed to work with a TN power system.

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.

¡Atención! El equipo está diseñado para trabajar con sistemas de alimentación tipo TN.

Varning! Enheten är konstruerad för användning tillsammans med elkraftssystem av TN-typ.

Related Topics

- General Safety Guidelines and Warnings [topic ref to external file]
- General Electrical Safety Guidelines [topic ref to external file]
- AC Power Electrical Safety Guidelines [topic ref to external file]

Power Disconnection Warning

WARNING: Before working on the switch or near power supplies, unplug the power cord from an AC switch.

Waarschuwing Voordat u aan een frame of in de nabijheid van voedingen werkt, dient u bij wisselstroom toestellen de stekker van het netsnoer uit het stopcontact te halen.

Varoitus Kytke irti vaihtovirtalaitteiden virtajohto, ennen kuin teet mitään asennuspohjalle tai työskentelet virtalähteiden läheisyydessä.

Attention Avant de travailler sur un châssis ou à proximité d'une alimentation électrique, débrancher le cordon d'alimentation des unités en courant alternatif.

Warnung Bevor Sie an einem Chassis oder in der Nähe von Netzgeräten arbeiten, ziehen Sie bei Wechselstromeinheiten das Netzkabel ab bzw.

Avvertenza Prima di lavorare su un telaio o intorno ad alimentatori, scollegare il cavo di alimentazione sulle unità CA.

Advarsel Før det utføres arbeid på kabinettet eller det arbeides i nærheten av strømforsyningsenheter, skal strømledningen trekkes ut på vekselstrømsenheter.

Aviso Antes de trabalhar num chassis, ou antes de trabalhar perto de unidades de fornecimento de energia, desligue o cabo de alimentação nas unidades de corrente alternada.

¡Atención! Antes de manipular el chasis de un equipo o trabajar cerca de una fuente de alimentación, desenchufar el cable de alimentación en los equipos de corriente alterna (CA).

Varning! Innan du arbetar med ett chassi eller nära strömförsörjningsenheter skall du för växelströmsenheter dra ur nätsladden.

Related Topics

- General Safety Guidelines and Warnings [topic ref to external file]
- General Electrical Safety Guidelines [topic ref to external file]
- AC Power Electrical Safety Guidelines [topic ref to external file]

Multiple Power Supplies Disconnection Warning

WARNING: EX 4200 series switches have more than one power supply connection. All connections must be removed completely to remove power from the unit completely.

Related Topics

- General Safety Guidelines and Warnings [topic ref to external file]
- General Electrical Safety Guidelines [topic ref to external file]
- AC Power Electrical Safety Guidelines [topic ref to external file]

In Case of Electrical Accident

If an electrical accident results in an injury, take the following actions in this order:

1. Use caution. Be aware of potentially hazardous conditions that could cause further injury.
2. Disconnect power from the switch.
3. If possible, send another person to get medical aid. Otherwise, assess the condition of the victim, then call for help.

Related Topics

- General Safety Guidelines and Warnings [topic ref to external file]
- General Electrical Safety Guidelines [topic ref to external file]
- AC Power Electrical Safety Guidelines [topic ref to external file]

Warning Statement for Norway and Sweden

WARNING: The equipment must be connected to an earthed mains socket-outlet.

Advarsel Apparatet skal kobles til en jordet stikkontakt.

Varning! Apparaten skall anslutas till jordat nätuttag.

Related Topics ■ General Safety Guidelines and Warnings [topic ref to external file]

Grounded Equipment Warning

WARNING: The switch is intended to be grounded. During normal use, ensure that you have connected earth ground to the switch chassis.

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.

¡Atención! 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.

Related Topics

- General Safety Guidelines and Warnings [topic ref to external file]

Power Sources for Redundant Power Supplies

EX 4200 switches have a redundant power supply. When you have redundant power supplies in a switch, you must connect each power supply to a different input power source. Failure to do so makes the switch susceptible to total power failure if one of the power supplies fails.

冗余电源

如果 Juniper Networks 设备包含一个可选的冗余电源　请将两个电源连接到不同的输入电源。不这样做的结果是 Juniper Networks 设备一路供电出问题时导致全部的电源故障

Related Topics

- General Safety Guidelines and Warnings [topic ref to external file]
- General Electrical Safety Guidelines [topic ref to external file]
- AC Power Electrical Safety Guidelines [topic ref to external file]

AC Power Electrical Safety Guidelines

The following electrical safety guidelines apply to AC-powered switches:

- AC-powered switches are shipped with a three-wire electrical cord with a grounding-type plug that fits only a grounding-type power outlet. Do not circumvent this safety feature. Equipment grounding should comply with local and national electrical codes.
- You must provide an external Listed circuit breaker rated minimum 15 A in the building installation.
- The power cord serves as the main disconnecting device. The socket outlet must be near the switch and be easily accessible.
- The cores in the mains lead are colored in accordance with the following code:
  - Green and yellow—Earth
  - Blue—Neutral
  - Brown—Live
- When a switch is equipped with two AC power supplies, both power cords (one for each power supply) must be unplugged to completely disconnect power to the switch.
- Note the following warnings printed on the AC power supply faceplate:
  - To completely de-energize the system disconnect maximum of 2 power cordsets.

- Apparaten skall anslutas till jordat uttag när den ansluts till ett nätverk. [Swedish]

Power Cable Warning (Japanese)

WARNING: The attached power cable is only for this product. Do not use the cable for another product.

注意

附属の電源コードセットはこの製品専用です。
他の電気機器には使用しないでください。

Related Topics

- General Safety Guidelines and Warnings [topic ref to external file]
- General Electrical Safety Guidelines [topic ref to external file]

General Electrical Safety Guidelines

WARNING: Certain ports on the switch are designed for use as intrabuilding (within-the-building) interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE, Issue 4) and require isolation from the exposed outside plant (OSP) cabling. To comply with NEBS requirements and protect against lightning surges and commercial power disturbances, the intrabuilding ports *must not* be metallically connected to interfaces that connect to the OSP or its wiring. The intrabuilding ports on the switch are suitable for connection to intrabuilding or unexposed wiring or cabling only. The addition of primary protectors is not sufficient protection for connecting these interfaces metallically to OSP wiring.

CAUTION: To comply with intrabuilding lightning and surge requirements, intrabuilding wiring must be shielded, and the shield for the wiring must be grounded at both ends.

CAUTION: Before removing or installing components of a switch, attach an ESD strap to an ESD point and place the other end of the strap around your bare wrist. Failure to use an ESD strap could result in damage to the switch.

- Install the EX-series switch in compliance with the following local, national, and international electrical codes:

  - United States—National Fire Protection Association (NFPA 70), United States National Electrical Code.
  - Other countries—International Electromechanical Commission (IEC) 60364, Part 1 through Part 7.
  - Evaluated to the TN power system.
  - Canada—Canadian Electrical Code, Part 1, CSA C22.1.
- Locate the emergency power-off switch for the room in which you are working so that if an electrical accident occurs, you can quickly turn off the power.
- Make sure that grounding surfaces are cleaned and brought to a bright finish before grounding connections are made.
- Do not work alone if potentially hazardous conditions exist anywhere in your workspace.
- Never assume that power is disconnected from a circuit. Always check the circuit before starting to work.
- Carefully look for possible hazards in your work area, such as moist floors, ungrounded power extension cords, and missing safety grounds.
- Operate the EX-series switch within marked electrical ratings and product usage instructions.
- To ensure that the EX-series switch and peripheral equipment function safely and correctly, use the cables and connectors specified for the attached peripheral equipment, and make certain they are in good condition.

You can remove and replace many switch components without powering off or disconnecting power to the switch, as detailed elsewhere in the hardware documentation for this product. Never install equipment if it appears damaged.

Related Topics

- General Safety Guidelines and Warnings [topic ref to external file]
- AC Power Electrical Safety Guidelines [topic ref to external file]

Preventing Electrostatic Discharge Damage

Many switch hardware components are sensitive to damage from static electricity. Some components can be impaired by voltages as low as 30 V. You can easily generate potentially damaging static voltages whenever you handle plastic or foam packing material or if you move components across plastic or carpets. Observe the following guidelines to minimize the potential for electrostatic discharge (ESD) damage, which can cause intermittent or complete component failures:

- Always use an ESD wrist strap or ankle strap, and make sure that it is in direct contact with your skin.

CAUTION: For safety, periodically check the resistance value of the ESD strap. The measurement must be in the range of 1 through 10 Mohm.

- When handling any component that is removed from the chassis, make sure the equipment end of your ESD strap is attached to the electrostatic discharge points on the chassis (see Figure 44 on page 104 and Figure 45 on page 104).
- Avoid contact between the component and your clothing. ESD voltages emitted from clothing can damage components.
- When removing or installing a component, always place it component-side up on an antistatic surface, in an antistatic card rack, or in an electrostatic bag (see Figure 46 on page 105). If you are returning a component, place it in an electrostatic bag before packing it.

Figure 44: EX 3200 Switch Rear Panel

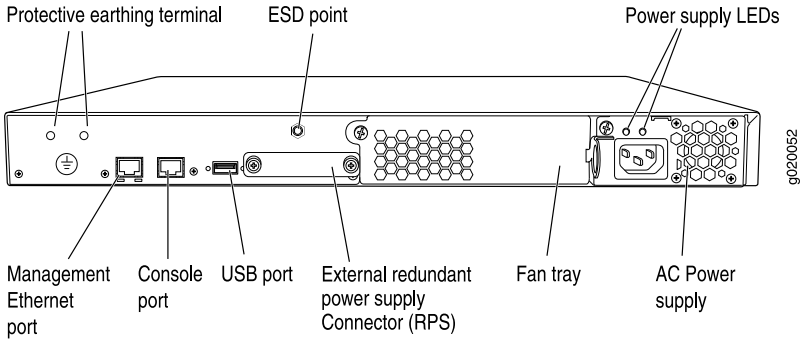


Figure 45: EX 4200 Switch Rear Panel

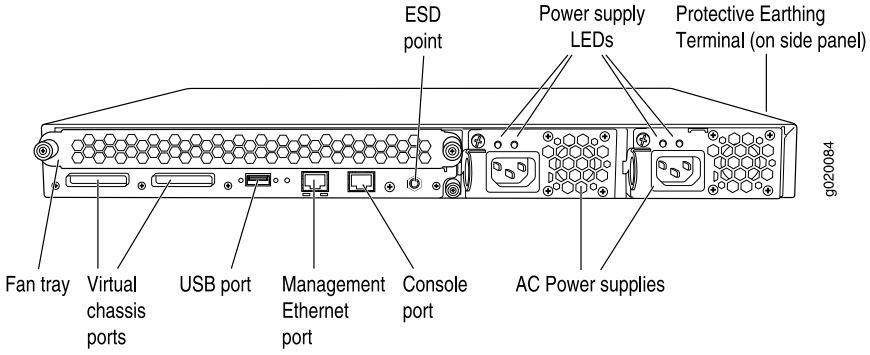
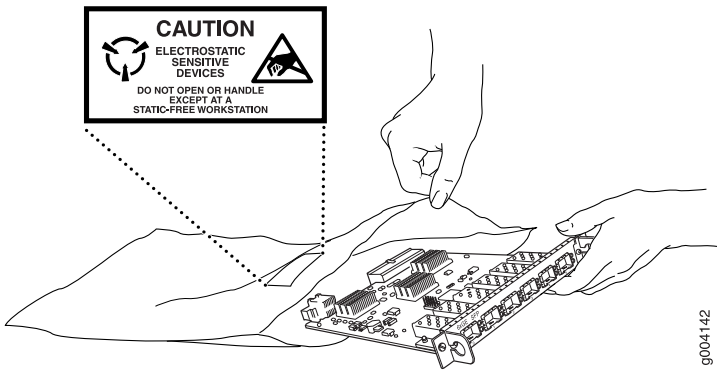


Figure 46: Place a Component into an Electrostatic Bag



NOTE: ANSI/TIA/EIA-568 cables such as category 5e and category 6 can get electrostatically charged. In order to dissipate this charge, always ground the cables to a suitable and safe earth ground before connecting them to the system.

Related Topics
- General Safety Guidelines and Warnings [topic ref to external file]

Qualified Personnel Warning

WARNING: Only trained and qualified personnel should install or replace the EX-series switch.

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.

Attention Tout installation ou remplacement de l'appareil doit être réalisé par du personnel qualifié et compétent.

Warnung 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.

Related Topics

- General Safety Guidelines and Warnings [topic ref to external file]
- General Electrical Safety Guidelines [topic ref to external file]
- AC Power Electrical Safety Guidelines [topic ref to external file]

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