Complete Hardware Guide for EX4500 Ethernet Switches

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The information in this document is current as of the date on the title page.

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Table of Contents

List of Figures

List of Tables

About the Documentation

Junos OS Documentation and Release Notes

For a list of related Junos OS documentation, see http://www.juniper.net/techpubs/software/junos/.

If the information in the latest release notes differs from the information in the documentation, follow the *Junos OS Release Notes.*

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Documentation Conventions

Table 1 on page xvi defines the notice icons used in this guide.

Table 1: 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.
	Tip	Indicates helpful information.
	Best practice	Alerts you to a recommended use or implementation.

Table 2 on page xvi defines the text and syntax conventions used in this guide.

Table 2: 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 or emphasizes important new terms. • Identifies guide names. • Identifies RFC and Internet draft titles.	• A policy *term* is a named structure that defines match conditions and actions. • *Junos OS CLI User 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*

Table 2: Text and Syntax Conventions *(continued)*

Convention	Description	Examples
Text like this	Represents names of configuration statements, commands, files, and directories; 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)	Encloses 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)	Encloses a variable for which you can substitute one or more values.	**community name members [*community-ids*]**

Indention and braces ({ })	Identifies 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.	
GUI Conventions		
Bold text like this	Represents 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 menu selections.	In the configuration editor hierarchy, select **Protocols>Ospf**.

Documentation Feedback

We encourage you to provide feedback, comments, and suggestions so that we can improve the documentation. You can provide feedback by using either of the following methods:

Requesting Technical Support

Technical product support is available through the Juniper Networks Technical Assistance Center (JTAC). If you are a customer with an active J-Care or Partner Support Service

support contract, or are covered under warranty, and need post-sales technical support, you can access our tools and resources online or open a case with JTAC.

- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the *JTAC User Guide* located at http://www.juniper.net/us/en/local/pdf/resource-guides/7100059-en.pdf.
- Product warranties—For product warranty information, visit http://www.juniper.net/support/warranty/.
- JTAC hours of operation—The JTAC centers have resources available 24 hours a day, 7 days a week, 365 days a year.

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For quick and easy problem resolution, Juniper Networks has designed an online self-service portal called the Customer Support Center (CSC) that provides you with the following features:

- Find CSC offerings: http://www.juniper.net/customers/support/
- Search for known bugs: http://www2.juniper.net/kb/
- Find product documentation: http://www.juniper.net/techpubs/
- Find solutions and answer questions using our Knowledge Base: http://kb.juniper.net/
- Download the latest versions of software and review release notes: http://www.juniper.net/customers/csc/software/
- Search technical bulletins for relevant hardware and software notifications: http://kb.juniper.net/InfoCenter/
- Join and participate in the Juniper Networks Community Forum: http://www.juniper.net/company/communities/
- Open a case online in the CSC Case Management tool: http://www.juniper.net/cm/

To verify service entitlement by product serial number, use our Serial Number Entitlement (SNE) Tool: https://tools.juniper.net/SerialNumberEntitlementSearch/

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You can open a case with JTAC on the Web or by telephone.

- Use the Case Management tool in the CSC at http://www.juniper.net/cm/.
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

For international or direct-dial options in countries without toll-free numbers, see http://www.juniper.net/support/requesting-support.html.

PART 1

Switch and Components Overview and Specifications

CHAPTER 1

EX4500 Switch Overview

EX4500 Switches Hardware Overview

Juniper Networks EX4500 Ethernet Switches provide high-density 10-gigabit ports for aggregation layer and data center top-of-rack deployments, and provide options for data center optimized airflow (hot aisle/cold aisle). You can configure EX4500 switches in a Virtual Chassis, or in a mixed Virtual Chassis with EX4200 switches or EX4550 switches or both, in a total of up to 10 members.

You can manage EX4500 switches using the same interfaces that you use for managing other devices running Juniper Networks Junos operating system (Junos OS)—the command-line interface (CLI) and the J-Web graphical interface.

Software

Juniper Networks EX Series Ethernet Switches run Junos OS, which provides Layer 2 and Layer 3 switching, routing, and security services. The same Junos OS code base that runs on EX Series switches also runs on all Juniper Networks M Series, MX Series, and T Series routers, and SRX Series Services Gateways. For information about installing software on your switch, see *Software Installation on EX Series Switches*.

EX4500 Switches First View

EX4500 switches provide connectivity for high-density 10-Gigabit Ethernet data center top-of-rack and aggregation deployments. Typically, EX4500 switches are used in data centers where they can be positioned as the top device in a rack to provide connectivity for all devices in the rack.

The EX4500 switch is 2 rack units (2 U) in size. Each EX4500 switch is designed to optimize rack space utilization and cabling. See Figure 1 on page 4, Figure 2 on page 4, and Figure 3 on page 5.

NOTE: The side of the switch where the network ports are located is the front of the switch.

Figure 1: EX4500 Switch Front

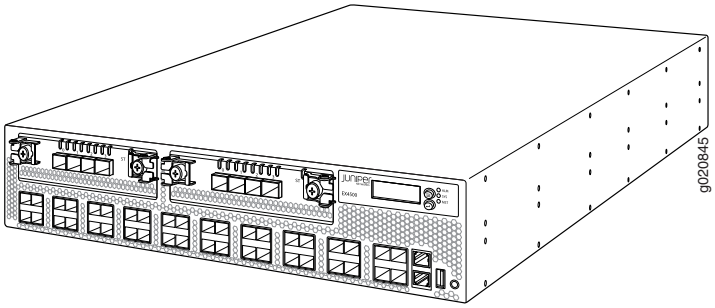


Figure 2: EX4500 Switch Rear with Intraconnect Module Installed

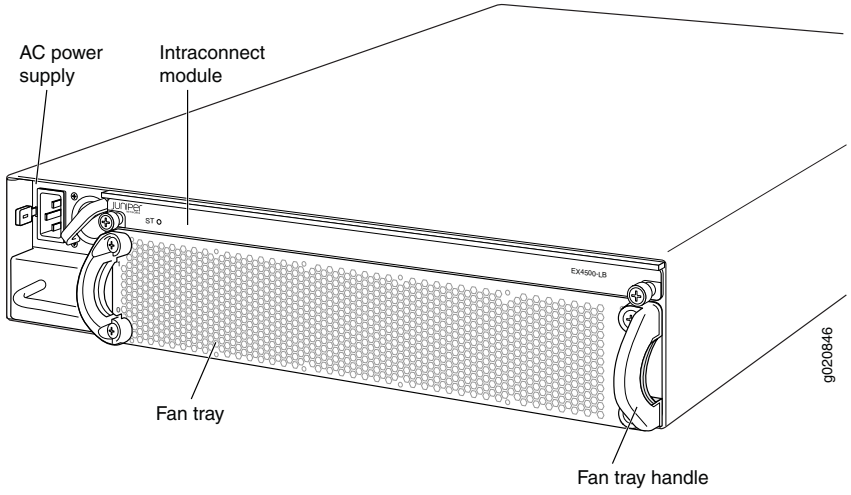
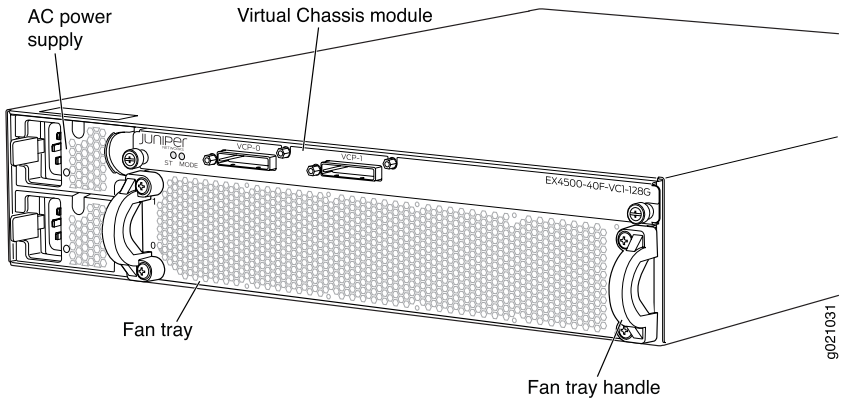


Figure 3: EX4500 Switch Rear with Virtual Chassis Module Installed



EX4500 switches are available in models with either front-to back airflow or back-to-front airflow and hardware that either supports or does not support Data Center Bridging (DCB), also known as Converged Enhanced Ethernet (CEE). See "EX4500 Switch Models" on page 7. All eight models provide 40 wire-speed 10-gigabit small form-factor pluggable (SFP+) network ports that can house either 1-Gigabit Ethernet transceivers or 10-Gigabit Ethernet transceivers. All models support two optional high-speed uplink modules.

To provide carrier-class reliability, EX4500 switches include:

- Dual redundant, load-sharing power supplies that are hot-insertable and hot-removable field-replaceable units.
- An FRU fan tray with five fans. The switch remains operational if a single fan fails.
- Redundant Routing Engines in a Virtual Chassis configuration. This redundancy enables graceful Routing Engine switchover (GRES).
- Junos OS with its modular design that enables failed system processes to gracefully restart.

Intraconnect Module and Virtual Chassis Module

EX4500 switches ship with either the intraconnect module or the Virtual Chassis module preinstalled in the switch. Only one of the modules can be installed on the rear side of the switch chassis at a time. Both modules are offline FRUs.

- Intraconnect module—The intraconnect module helps the switch achieve line rate on all its ports. See "Intraconnect Module in EX4500 Switches" on page 38.
- Virtual Chassis module—The Virtual Chassis module has two dedicated Virtual Chassis ports (VCPs) that can be used to interconnect the EX4500 switch with EX4200 switches, EX4500 switches, or EX4550 switches to form a Virtual Chassis. See "Virtual Chassis Module in EX4500 Switches" on page 39.

NOTE: Operating an EX4500 switch without the intraconnect module or the Virtual Chassis module is not supported.
EX4500 switches running Junos OS Release 10.4R2 or later 10.4 releases will not boot if you do not install the intraconnect module in the switch.
EX4500 switches running Junos OS Release 11.1R1 or later releases will not boot if you install neither the intraconnect module nor the Virtual Chassis module in the switch.

NOTE: The Virtual Chassis module is supported on EX4500 switches in Junos OS Releases 11.1 and later.

Virtual Chassis

The number of EX4500 switches that can be interconnected into a Virtual Chassis composed exclusively of EX4500 switches depends on the Junos OS release running on the switches. See "Understanding EX4200, EX4500, and EX4550 Virtual Chassis Hardware Configurations" on page 103.

EX4200, EX4500, and EX4550 switches can be connected together into the same Virtual Chassis to form a mixed Virtual Chassis. The number of EX4200, EX4500, and EX4550 switches that can be interconnected into a mixed Virtual Chassis depends on the Junos OS release running on the switches. See "Understanding EX4200, EX4500, and EX4550 Virtual Chassis Hardware Configurations" on page 103.

You can use the following ports to configure an EX4500 switch in a Virtual Chassis composed exclusively of EX4500 switches or in a mixed Virtual Chassis:

- Dedicated VCPs on the Virtual Chassis module installed in the switch
- SFP+ uplink module ports configured as VCPs
- SFP+ fixed network ports configured as VCPs

For information about understanding and configuring Virtual Chassis, see *EX2200, EX3300, EX4200, EX4500 and EX4550 Virtual Chassis*.

Uplink Modules

Optional uplink modules are available for EX4500 switches. You can install up to two uplink modules in an EX4500 switch. Each uplink module provides four SFP+ ports for connecting to core devices in a data center. You can install SFP or SFP+ transceivers in these ports. You can also configure the uplink module ports as VCPs to form a Virtual Chassis. For more information, see "Uplink Modules in EX4500 Switches" on page 36.

Power Supplies

EX4500 switches support both AC and DC power supplies. Each AC power supply is available in two different airflow models, front-to-back and back-to-front. DC power supplies are available only in the front-to-back airflow model.

EX4500 switches ship with one AC or DC power supply installed. You can install a second AC or DC power supply in your EX4500 switch. See "AC Power Supply in EX4500 Switches" on page 27 and "DC Power Supply in EX4500 Switches" on page 30.

CAUTION: **Mixing different types (AC and DC) of power supplies or power supplies with front-to-back and back-to-front airflow in the same chassis is not supported.**

Related Documentation

- EX4500 Switch Models on page 7
- Field-Replaceable Units in EX4500 Switches on page 23
- *EX Series Virtual Chassis Overview*

EX4500 Switch Models

The EX4500 switch is available in eight models. Table 3 on page 7 lists the models for an EX4500 switch and their port configurations, the airflow direction in each model, the components included in each model, and the Junos OS release in which the models were introduced.

NOTE: **The side of the switch where the network ports are located is the front of the switch.**

Table 3: EX4500 Switch Models, Components, and Supported Junos OS Release

Model	Port Configuration	Direction of Airflow	Switch Components	First Junos OS Release
EX4500-40F-FB	40-port GbE/10GbE SFP/SFP+	Front-to-back	• Chassis • One fan tray (with green exhaust label visible) • One AC power supply (with green ejector lever) • One power cord • One power supply cover panel • Two uplink module cover panels • One intraconnect module	10.2R1

Table 3: EX4500 Switch Models, Components, and Supported Junos OS Release *(continued)*

Model	Port Configuration	Direction of Airflow	Switch Components	First Junos OS Release
EX4500-40F-BF	40-port GbE/10GbE SFP/SFP+	Back-to-front	• Chassis • One fan tray (with orange intake label visible) • One AC power supply (with orange ejector lever) • One power cord • One power supply cover panel • Two uplink module cover panels • One intraconnect module	10.2R1
EX4500-40F-FB-C (supports Data Center Bridging (DCB), also known as Converged Enhanced Ethernet (CEE))	40-port GbE/10GbE SFP/SFP+	Front-to-back	• Chassis • One fan tray (with green exhaust label visible) • One AC power supply (with green ejector lever) • One power cord • One power supply cover panel • Two uplink module cover panels • One intraconnect module	10.3R1
EX4500-40F-BF-C (supports DCB)	40-port GbE/10GbE SFP/SFP+	Back-to-front	• Chassis • One fan tray (with orange intake label visible) • One AC power supply (with orange ejector lever) • One power cord • One power supply cover panel • Two uplink module cover panels • One intraconnect module	10.3R1
EX4500-40F-DC-C (supports DCB)	40-port GbE/10GbE SFP/SFP+	Front-to-back	• Chassis • One fan tray (with green exhaust label visible) • One DC power supply (with green ejector lever) • One power supply cover panel • Two uplink module cover panels • One intraconnect module	10.3R2

Table 3: EX4500 Switch Models, Components, and Supported Junos OS Release *(continued)*

Model	Port Configuration	Direction of Airflow	Switch Components	First Junos OS Release
EX4500-40F-VC1-FB (supports DCB)	40-port GbE/10GbE SFP/SFP+	Front-to-back	• Chassis • One fan tray (with green exhaust label visible) • One AC power supply (with green ejector lever) • One power cord • One power supply cover panel • Two uplink module cover panels • One Virtual Chassis module	11.1R1
EX4500-40F-VC1-BF (supports DCB)	40-port GbE/10GbE SFP/SFP+	Back-to-front	• Chassis • One fan tray (with orange intake label visible) • One AC power supply (with orange ejector lever) • One power cord • One power supply cover panel • Two uplink module cover panels • One Virtual Chassis module	11.1R1
EX4500-40F-VC1-DC (supports DCB)	40-port GbE/10GbE SFP/SFP+	Front-to-back	• Chassis • One fan tray (with green exhaust label visible) • One DC power supply (with green ejector lever) • One power supply cover panel • Two uplink module cover panels • One Virtual Chassis module	11.1R1

NOTE: EX4500 switches that have the label **VIRTUAL CHASSIS** on the front panel support DCB (also known as CEE).

NOTE: Uplink modules, transceivers, Virtual Chassis cables, and Virtual Chassis cable connector retainers are not part of the EX4500 switch's shipping configuration. If you want to purchase any of these, or additional power supplies for your switch, you must order them separately.

CAUTION: Mixing different types (AC and DC) of power supplies or power supplies with front-to-back and back-to-front airflow in the same chassis is not supported.

Related Documentation

- Chassis Physical Specifications for EX4500 Switches on page 11
- Front Panel of an EX4500 Switch on page 12
- Rear Panel of an EX4500 Switch on page 13
- EX4500 Switches Hardware Overview on page 3

Identifying EX4500 Switch Models

Purpose Identify the model number of your EX4500 switch.

Action Check the value of the **Routing Engine (FRU Model Number)** field in the output of the **show chassis hardware extensive** CLI command.

user@switch> **show chassis hardware extensive**

```
....
Routing Engine 0 REV 00D  750-026816   DE0210022651      EX4500-40F
 Jedec Code:   0x7fb0            EEPROM Version:    0x02
 P/N:          750-026816        S/N:               DE0210022651
 Assembly ID:  0x095a            Assembly Version:  05.00
 Date:         01-21-2010        Assembly Flags:    0x00
 Version:      REV 00D           CLEI Code:         COMUX00CRA
 ID: EX4500-40F                  FRU Model Number:  EX4500-40F-FB
....
```

The model number of your switch is one of the following:

- EX4500-40F-FB
- EX4500-40F-BF
- EX4500-40F-FB-C
- EX4500-40F-BF-C
- EX4500-40F-DC-C
- EX4500-40F-VC1-FB
- EX4500-40F-VC1-BF
- EX4500-40F-VC1-DC

Meaning

- The FB or the BF in the model number indicates the direction of airflow in the chassis:
  - FB—Front-to-back airflow

- BF—Back-to-front airflow

- The C in the model number indicates that the switch supports Data Center Bridging (DCB), also known as Converged Enhanced Ethernet (CEE). The absence of C in the model number of switches that do not support Virtual Chassis indicates that the switch does not support DCB.

NOTE: All models of EX4500 switches that support Virtual Chassis (switches that have the label VIRTUAL CHASSIS on the front panel) support DCB even though their model numbers do not have a C appended.

- The DC in the model number indicates that the switch model supports DC power supply.
- The VC in the model number indicates that the switch model can be used in a Virtual Chassis configuration.

NOTE: All EX4500 switch models can be used in a Virtual Chassis configuration if you have installed the Virtual Chassis module.

Related Documentation

- EX4500 Switch Models on page 7

Chassis Physical Specifications for EX4500 Switches

The EX4500 switch chassis is a rigid sheet-metal structure that houses the other switch components. Table 4 on page 11 summarizes the physical specifications of the EX4500 switch chassis.

Table 4: Physical Specifications of the EX4500 Switch Chassis

Description	Value
Chassis height	3.5 in. (8.9 cm)
Chassis width	• 17.25 in. (43.82 cm) • The outer edges of the front-mounting brackets extend the width to 19 in. (48.3 cm).
Chassis depth	• 21.1 in. (53.6 cm)
Weight	• EX4500 switch with 1 AC power supply: 37 lb (17 kg) • AC power supply: 3 lb (1.3 kg) • DC power supply: 3 lb (1.3 kg)

You can mount an EX4500 switch on a standard 19-in. two-post rack. You can also mount an EX4500 switch on a standard 19-in. four-post rack or in a standard 19-in. enclosed cabinet.

Related Documentation

- Rack Requirements for EX4500 Switches on page 85
- Cabinet Requirements for EX4500 Switches on page 86
- Mounting an EX4500 Switch on page 114
- Installing and Connecting an EX4500 Switch on page 111
- Installing and Removing EX4500 Switch Hardware Components on page 121

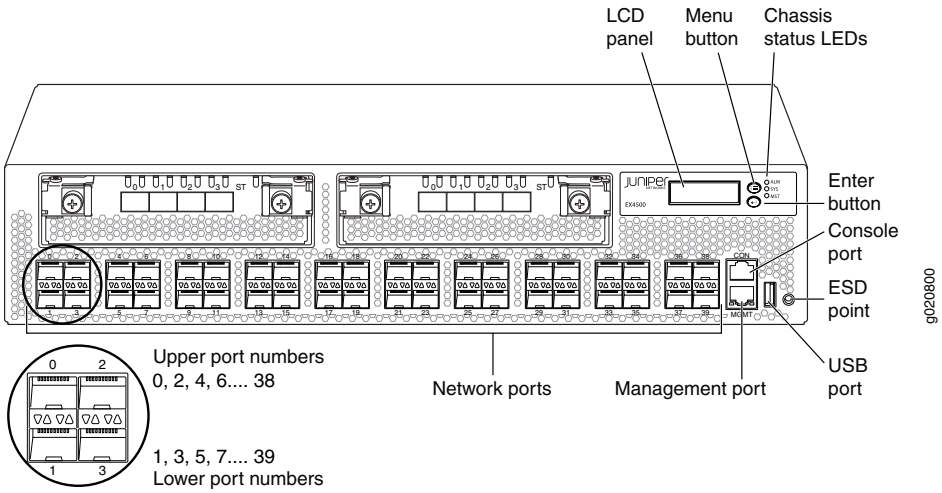
Front Panel of an EX4500 Switch

The front panel of an EX4500 switch consists of the following components:

- 40 SFP+ network ports
- Network port LEDs
- Two slots for installing uplink modules—Installing uplink modules is optional.
- LCD panel and the LCD navigation buttons
- Chassis status LEDs
- Console port
- Management port
- Management port LEDs
- USB port
- ESD point

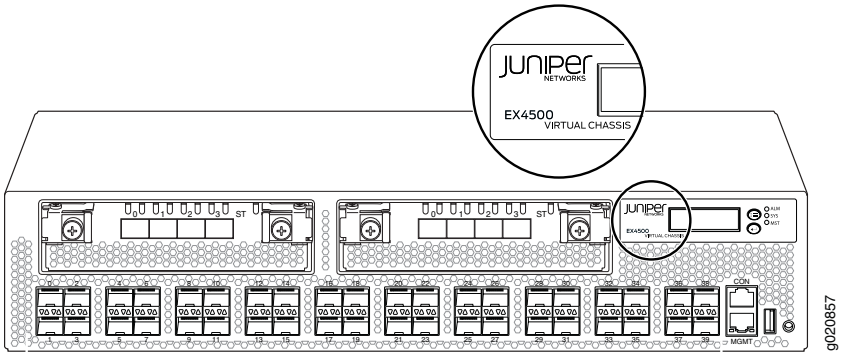
Figure 4 on page 12 shows the front panel of an EX4500 switch.

Figure 4: EX4500 Switch Front Panel



EX4500 switches that have the label **VIRTUAL CHASSIS** on the front panel support Data Center Bridging (DCB), also known as Converged Enhanced Ethernet (CEE). See Figure 5 on page 13.

Figure 5: Label Identifying EX4500 Switches that Support DCB



Related Documentation

- Rear Panel of an EX4500 Switch on page 13
- LCD Panel in EX4500 Switches on page 17
- Chassis Status LEDs in EX4500 Switches on page 22
- Network Port and Uplink Module Port LEDs in EX4500 Switches on page 24
- Uplink Modules in EX4500 Switches on page 36
- Pluggable Transceivers Supported on EX4500 Switches on page 49
- Installing and Removing EX4500 Switch Hardware Components on page 121

Rear Panel of an EX4500 Switch

The rear panel of the EX4500 switch consists of the following components:

- Power supply or power supplies
- One of the following:
  - AC appliance inlet and AC power supply LED
  - DC terminal block and DC power supply LED
- Fan tray
- One of the following:
  - Intraconnect module
  - Virtual Chassis module

NOTE: Operating an EX4500 switch without the Intraconnect module or the Virtual Chassis module installed is not supported. EX4500 switches running Junos OS Release 10.4R2 or later will not boot if either the Intraconnect or the Virtual Chassis module is not installed in the switch chassis.

NOTE: The protective earthing terminal is located on the left side of the chassis. See "Connecting Earth Ground to an EX Series Switch" on page 137.

Figure 6 on page 14 shows the rear panel of an EX4500 switch with AC power supplies and Intraconnect module installed.

Figure 6: EX4500 Switch Rear Panel with an Intraconnect Module Installed

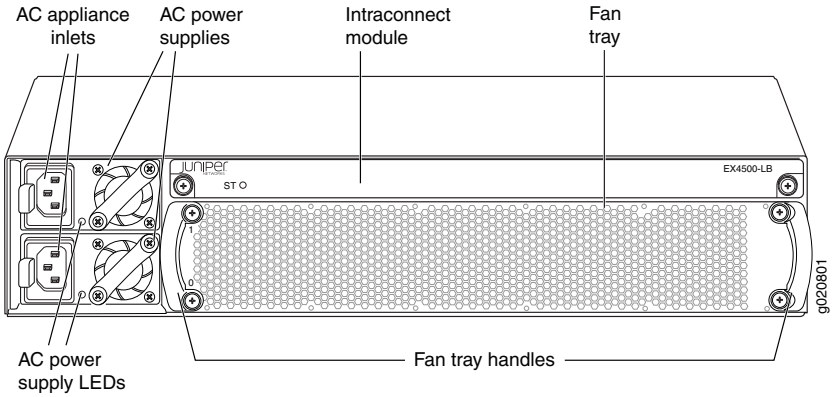
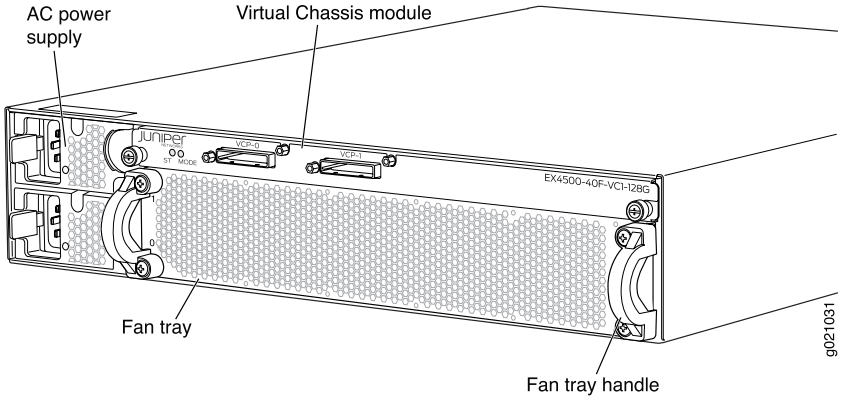


Figure 7 on page 14 shows the rear panel of an EX4500 switch with AC power supplies and a Virtual Chassis module installed.

Figure 7: EX4500 Switch Rear Panel with a Virtual Chassis Module Installed



Related Documentation

- Front Panel of an EX4500 Switch on page 12
- Cooling System and Airflow in an EX4500 Switch on page 32

- AC Power Supply in EX4500 Switches on page 27
- DC Power Supply in EX4500 Switches on page 30
- Intraconnect Module in EX4500 Switches on page 38
- Virtual Chassis Module in EX4500 Switches on page 39
- Installing and Removing EX4500 Switch Hardware Components on page 121

EX4500 Switch Hardware and CLI Terminology Mapping

This topic describes the hardware terms used in EX4500 switch documentation and the corresponding terms used in the Junos OS command line interface (CLI). See Table 5 on page 15.

Table 5: CLI Equivalents of Terms Used in Documentation for EX4500 Switches

Hardware Item (CLI)	Description (CLI)	Value (CLI)	Item In Documentation	Additional Information
Chassis	EX4500-40F	–	Switch chassis	"Chassis Physical Specifications for EX4500 Switches" on page 11
PIC (*n*)	Abbreviated name of the Physical Interface Card (PIC)	*n* is a value in the range of 0–3.	The switch does not have actual PIC devices; see entries for PIC 0 through PIC 3 for the equivalent item on the switch.	*Understanding Interface Naming Conventions on EX Series Switches*
	40x 1/10GE	PIC 0	Built-in network ports on the front panel of the switch	"Front Panel of an EX4500 Switch" on page 12
	4x XE SFP+	PIC 1	Uplink module installed in the left slot on the front panel of the switch	"Uplink Modules in EX4500 Switches" on page 36
	4x XE SFP+	PIC 2	Uplink module installed in the right slot on the front panel of the switch	"Uplink Modules in EX4500 Switches" on page 36
	Intraconnect module (EX4500 LB)	PIC 3	Intraconnect module	"Intraconnect Module in EX4500 Switches" on page 38
	Virtual Chassis module	PIC 3	Virtual Chassis module	"Virtual Chassis Module in EX4500 Switches" on page 39

Table 5: CLI Equivalents of Terms Used in Documentation for EX4500 Switches *(continued)*

Hardware Item (CLI)	Description (CLI)	Value (CLI)	Item In Documentation	Additional Information
Xcvr (*n*)	Abbreviated name of the transceiver	*n* is a value equivalent to the number of the port in which the transceiver is installed.	Optical transceivers	"Pluggable Transceivers Supported on EX4500 Switches" on page 49
Power supply (*n*)	One of the following: • PS 1000W /1200W AC Front-to-back airflow • PS 1000W /1200W AC Back-to-front airflow • PS 1000W /1200W DC Front-to-back airflow	*n* is a value in the range of 0–1. The value corresponds to the power supply slot number. NOTE: Mixing different types (AC and DC) of power supplies or power supplies with front-to-back and back-to-front airflow in the same chassis is not supported.	AC power supply or DC power supply	• AC Power Supply in EX4500 Switches on page 27 • DC Power Supply in EX4500 Switches on page 30
Fan tray	One of the following: • Fan tray, front-to-back airflow • Fan tray, back-to-front airflow	–	Fan tray	"Cooling System and Airflow in an EX4500 Switch" on page 32

Related Documentation

- *EX Series Switches Hardware and CLI Terminology Mapping*
- EX4500 Switches Hardware Overview on page 3

CHAPTER 2

Component Descriptions

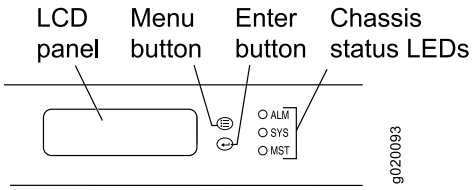
LCD Panel in EX4500 Switches

The LCD panel on the front panel of EX4500 switch shows two lines of text, each that can contain a maximum of 16 characters. The LCD panel displays a variety of information about the switch and also provides a menu to perform basic operations such as initial setup and reboot.

There are two navigation buttons—*Menu* and *Enter*—to the right of the LCD panel.

See Figure 8 on page 17.

Figure 8: LCD Panel in EX4500 Switches



You can configure the second line of the LCD panel to display a custom message. If the LCD panel is configured to display a custom message, the *Menu* button and the *Enter* button are disabled. See *Configuring the LCD Panel on EX Series Switches (CLI Procedure)*.

The LCD panel has a backlight. If the LCD panel remains idle for 60 seconds, the backlight turns off. You can turn on the backlight by pressing the *Menu* or *Enter* button once. After turning on the backlight, you can toggle between the LCD panel menus by pressing the *Menu* button and navigate through the menu options by pressing the *Enter* button.

NOTE: The chassis viewer in the J-Web interface also displays the LCD panel. From the J-Web interface, you can view real-time status information in the LCD panel. See *Dashboard for EX Series Switches*.

This topic describes:

- LCD Panel Modes on page 18
- LCD Panel Menus on page 19

LCD Panel Modes

The LCD panel operates in four modes: boot, idle, status, and maintenance.

The LCD panel operates in boot mode during switch reboot. The boot mode displays the key milestones in the switch boot process. The boot mode does not have any menu options. After the boot process is complete, the LCD panel automatically reverts to the Idle menu.

The first line of text on the LCD panel displays the slot number, the role of the switch, and hostname. For a standalone EX4500 switch, the slot number is always 00, and the role is always RE.

In an EX4500 switch that is a member of a Virtual Chassis, the first line of the LCD panel displays:

- The slot number (the member ID for the Virtual Chassis member)
- Role of the switch in a Virtual Chassis (RE for master, BK for backup, and LC for linecard member)
- Hostname

In the idle mode, the second line of text on the LCD panel displays the mode of the network ports' Status LED and the number of chassis alarms. The number of alarms is updated every second.

In the status mode, the second line displays:

- Virtual Chassis port (VCP) status (supported only on EX4500 switches in a Virtual Chassis configuration running Junos OS Release 11.1 or later. This option is not supported on standalone EX4500 switches.)
- Status of the power supplies

- Status of the fans in the fan tray and the chassis temperature
- Version of Junos OS for EX Series switches loaded on the switch

In the maintenance mode, the second line displays one of the following options that you can use to configure and troubleshoot the switch:

- System halt
- System reboot
- Load rescue
- Request VC port (supported only on EX4500 switches in a Virtual Chassis configuration running Junos OS Release 11.1 or later. This option is not supported on standalone EX4500 switches.)
- Factory default
- EZSetup

LCD Panel Menus

The LCD panel has three menus: Idle, Status, and Maintenance. You can toggle between the LCD panel menus by pressing the *Menu* button and navigate through the menu options by pressing the *Enter* button.

Table 6 on page 19 describes the LCD panel menu options.

Table 6: LCD Panel Menu Options in EX4500 Switches

Menu	Description

IDLE	In the Idle menu:
	• Press *Enter* to cycle through the Status LED modes, which are port status indicators:
	  ◦ ADM (administrative status)
	  ◦ DPX (duplex)
	  ◦ SPD (speed)
	  See "Network Port and Uplink Module Port LEDs in EX4500 Switches" on page 24 for information on the Status LED modes.
	• Press *Menu* to exit the Idle menu and go to the Status menu.

Table 6: LCD Panel Menu Options in EX4500 Switches *(continued)*

Menu	Description

STATUS	The Status menu has the following options:
	• Show VCP status—Choose one of the following:
	  • Press the Enter button to display the Virtual Chassis port (VCP) status: Up, Down.
	  NOTE: This option is supported only on EX4500 switches in a Virtual Chassis configuration running Junos OS Release 11.1 or later.
	  This option is not supported on standalone EX4500 switches.
	  • Press the Menu button to go to the next option in the Status menu.
	• Show PSU Status—Choose one of the following:
	  • Press *Enter* to display the status of power supplies: OK, Fld (Failed), ABS (Absent).
	  • Press *Menu* to go to the next option in the Status menu.
	• Show Environment Status—Choose one of the following:
	  • Press *Enter* to display the status of the fan tray and the chassis temperature:
	  • Fan tray status: OK, Fld, ABS
	  • Chassis temperature status: OK, High, Shutdown
	  • Press *Menu* to go to the next option in the Status menu.
	• Show Junos Version Status—Choose one of the following: .
	  • Press *Enter* to display the version of Junos OS for EX Series switches loaded on the switch.
	  • Press *Menu* to go to the next option in the Status menu.
	• EXIT STAT MENU?—Choose one of the following:
	  • Press *Enter* to exit the Status menu.
	  • Press *Menu* to return to the Show VCP Status option.
	You can disable the Status menu or the options in the Status menu in the LCD panel. See *Configuring the LCD Panel on EX Series Switches (CLI Procedure)*.

Table 6: LCD Panel Menu Options in EX4500 Switches *(continued)*

Menu	Description
MAINT (Maintenance Menu)	The Maintenance menu has the following options to configure and troubleshoot the switch: • SYSTEM HALT?—Choose one of the following: ◦ Press *Enter* to halt the switch. Press *Enter* again to confirm the halt. ◦ Press *Menu* to go to the next option in the Maintenance menu. • SYSTEM REBOOT?—Choose one of the following: ◦ Press *Enter* to reboot the switch. Press *Enter* again to confirm the reboot. ◦ Press *Menu* to go to the next option in the Maintenance menu. • LOAD RESCUE?—Choose one of the following: ◦ Press *Enter* to roll back the switch to the previous valid configuration. Press *Enter* again to confirm the rollback. ◦ Press *Menu* to go to the next option in the Maintenance menu. • REQUEST VC PORT?—Choose one of the following: ◦ Press the Enter button to configure an uplink module port or a network port to be a Virtual Chassis port (VCP) or to delete a VCP from the switch configuration (when you delete the VCP, the port is reset to an uplink module port or network port). NOTE: This option is supported only on EX4500 switches in a Virtual Chassis configuration running Junos OS Release 11.1 or later. This option is not supported on standalone EX4500 switches. ◦ Press the Menu button to go to the next option in the Maintenance menu. • FACTORY DEFAULT?—Choose one of the following: ◦ Press *Enter* to restore the switch to the factory default configuration. Press *Enter* again to confirm the restoration. The LCD panel flashes a success or failure message and returns to the Idle menu. ◦ Press *Menu* to go to the next option in the Maintenance menu. • ENTER EZSETUP?—Choose one of the following: ◦ Press *Enter* to launch EZSetup. Press *Enter* again to confirm the launch. EZSetup configures DHCP and enables the J-Web user interface on the switch. The LCD panel flashes a success or failure message for approximately 10 seconds and returns to the Idle menu. NOTE: You can use EZSetup only on a standalone switch that is in the factory default configuration. For information about EZSetup, see "Connecting and Configuring an EX Series Switch (J-Web Procedure)" on page 164. ◦ Press *Menu* to go to the next option in the Maintenance menu. • EXIT MAINT MENU?—Choose one of the following: ◦ Press *Enter* to exit the Maintenance menu. ◦ Press *Menu* to return to the SYSTEM HALT option. You can disable the Maintenance menu or the options in the Maintenance menu in the LCD panel. See *Configuring the LCD Panel on EX Series Switches (CLI Procedure)*.

Related Documentation

- Front Panel of an EX4500 Switch on page 12
- Field-Replaceable Units in EX4500 Switches on page 23
- Connecting and Configuring an EX Series Switch (CLI Procedure) on page 161
- Connecting and Configuring an EX Series Switch (J-Web Procedure) on page 164

Chassis Status LEDs in EX4500 Switches

The front panel of an EX4500 switch has three chassis status LEDs (labeled ALM, SYS, and MST) on the far right side of the panel, next to the *Menu* and *Enter* buttons (see Figure 9 on page 22).

Figure 9: Chassis Status LEDs in an EX4500 Switch

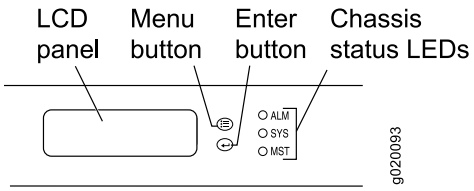


Table 7 on page 22 describes the chassis status LEDs in an EX4500 switch, their colors and states, and the status they indicate. You can view the colors of the three LEDs remotely through the CLI by issuing the operational mode command **show chassis led**.

Table 7: Chassis Status LEDs in an EX4500 Switch

LED Label	Color	State and Description
ALM (Alarm)	Unlit	There is no alarm or the switch is halted.
	Red	There is a major alarm.
	Amber	There is a minor alarm.
SYS (System)	Green	• On steadily—Junos OS for EX Series switches has been loaded on the switch. • Blinking—The switch is booting. • Off—The switch is powered off or is halted.
MST (Master)	Green	In a standalone EX4500 switch: • On steadily—The switch is functioning normally. • Off—The switch is powered off or is halted. In a Virtual chassis configuration: • On steadily—The switch is the master in the Virtual Chassis configuration. • Blinking—The switch is the backup in the Virtual Chassis configuration. • Off—The switch is a linecard member in the Virtual Chassis configuration or is halted.

A major alarm (red) indicates a critical error condition that requires immediate action.

A minor alarm (amber) indicates a noncritical condition that requires monitoring or maintenance. A minor alarm that is left unchecked might cause interruption in service or performance degradation.

All three LEDs can be lit simultaneously.

Related Documentation

- Front Panel of an EX4500 Switch on page 12
- *Checking Active Alarms with the J-Web Interface*
- *Understanding Alarm Types and Severity Levels on EX Series Switches*

Field-Replaceable Units in EX4500 Switches

Field-replaceable units (FRUs) are components that you can replace at your site. The FRUs in EX4500 switches are:

- Power supplies
- Fan tray
- Uplink module(s)
- Intraconnect module
- Virtual Chassis module
- SFP+ transceivers
- SFP transceivers

NOTE: **Uplink modules, transceivers, Virtual Chassis cables, and Virtual Chassis cable connector retainers are not part of the standard package and must be ordered separately.**

The power supplies, fan tray, uplink module(s), and transceivers are hot-removable and hot-insertable: You can remove and replace them without powering off the switch or disrupting switch functions.

The Intraconnect module and Virtual Chassis module are offline field-replaceable: You can remove and replace these components, but the switch must be powered off to replace the component.

NOTE: If you have a Juniper J-Care service contract, register any addition, change, or upgrade of hardware components at https://www.juniper.net/customers/csc/management/updateinstallbase.jsp . Failure to do so can result in significant delays if you need replacement parts. This note applies if you change the type of power supply or add a new type of uplink module. It does not apply if you replace these components with the same type of component.

Related Documentation

- Installing and Removing EX4500 Switch Hardware Components on page 121

Network Port and Uplink Module Port LEDs in EX4500 Switches

Each network port and uplink module port on an EX4500 switch has two LEDs that indicate link/activity and status. The figures in this topic show the location of these LEDs:

- Figure 10 on page 24 shows the location of the LEDs on the network ports on the front panel of an EX4500 switch. The LEDs point toward the port to which the LEDs belong.
- Figure 11 on page 25 shows the location of the LEDs on the uplink module ports on the SFP+ uplink module.

Figure 10: Network Port LEDs

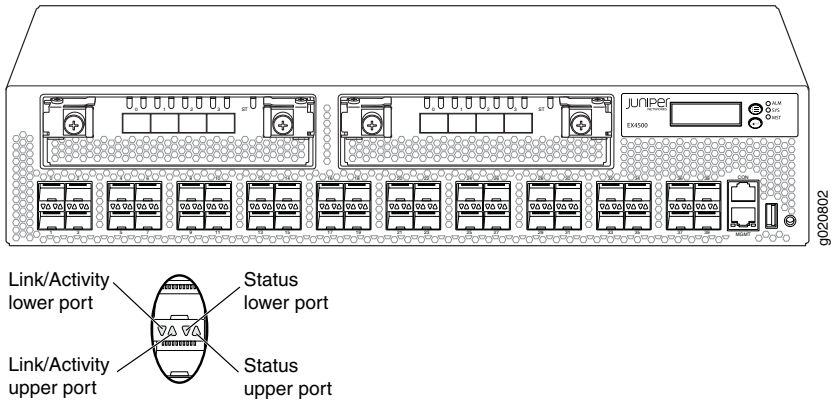
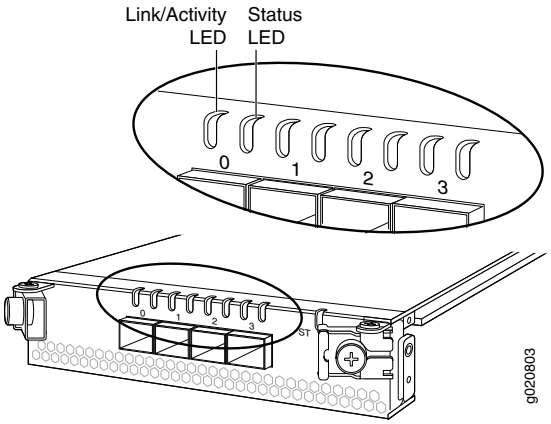


Figure 11: Uplink Module Port LEDs



The LEDs labeled Link/Activity LED in Figure 10 on page 24 and Figure 11 on page 25 indicate link activity.

Table 8 on page 25 describes the Link/Activity LED.

Table 8: Link/Activity LED on Network Ports and Uplink Module Ports in EX4500 Switches

LED	Color	State and Description
Link/Activity	Green	• Blinking—The port and the link are active, and there is link activity. • On steadily—The port and the link are active, but there is no link activity. • Off—The port is not active.

The Status LED in Figure 10 on page 24 and Figure 11 on page 25 indicate the status of one of the three port parameters. The port parameters are administrative status, duplex mode, and speed.

Table 9 on page 26 describes the Status LED on network ports and uplink module ports in EX4500 switches. From the Idle menu of the LCD, use the *Enter* button on the LCD panel to toggle between the ADM, DPX, and SPD indicators.

Table 9: Status LED on Network Ports and Uplink Module Ports in EX4500 Switches

LED	LCD Indicator	State and Description
Status	LED: ADM	Indicates the administrative status (enabled or disabled). The status indicators are: • Green—Port is administratively enabled. • Unlit—Port is administratively disabled.
	LED: DPX	Indicates the duplex mode. The status indicators for network ports on the front panel are: • Green—Port is set to full-duplex mode. • Unlit—Port is set to half-duplex mode. The uplink module ports are always set to full-duplex mode; therefore, the LED is always green.
	LED: SPD	Indicates the speed. The speed indicators are: • Blinking green—1 Gbps • Steadily green—10 Gbps

Related Documentation

- Front Panel of an EX4500 Switch on page 12
- Uplink Modules in EX4500 Switches on page 36

Management Port LEDs in EX4500 Switches

The management port on the front panel of an EX4500 switch has two LEDs that indicate link/activity and port status (see Figure 12 on page 26).

Figure 12: LEDs on the Management Port on an EX4500 Switch

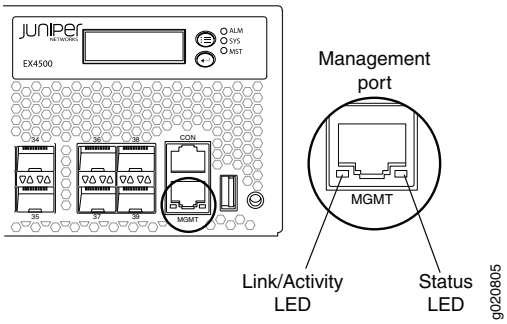


Table 10 on page 27 describes the Link/Activity LED.

Table 10: Link/Activity LED on the Management Port on an EX4500 Switch

LED	Color	State and Description
Link/Activity	Green	• Blinking—The port and the link are active, and there is link activity. • On steadily—The port and the link are active, but there is no link activity. • Off—The port is not active.

Table 11 on page 27 describes the Status LED.

Table 11: Status LED on the Management Port on an EX4500 Switch

LED	Color	State and Description
Status	Green	Indicates the speed. The speed indicators are: • One blink per second—10 Mbps • Two blinks per second—100 Mbps • Three blinks per second—1000 Mbps

Related Documentation

- Front Panel of an EX4500 Switch on page 12
- Connecting a Switch to a Network for Out-of-Band Management on page 149

AC Power Supply in EX4500 Switches

The AC power supply in EX4500 switches is a hot-insertable and hot-removable field-replaceable unit (FRU): You can install it without powering off the switch or disrupting the switching function.

EX4500 switches ship with an AC power supply that gives an output of 1000 W at low-voltage line (100–120 VAC) and 1200 W at high-voltage line (200–240 VAC). You can install a second power supply in the switch too.

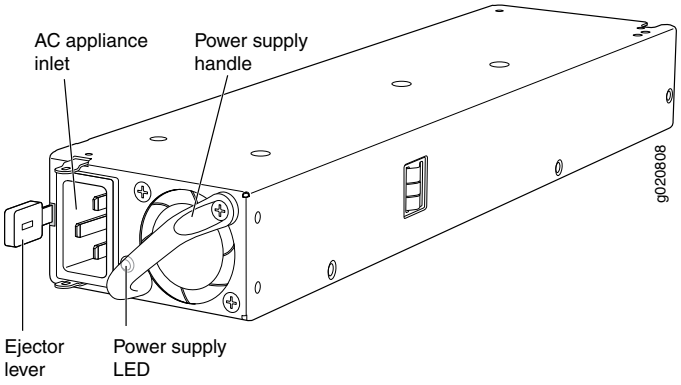
Power supplies are installed at the rear of the chassis in slots labeled 1 and 0. Both power supplies are accessible from the rear of the chassis.

WARNING: **The switch is pluggable type A equipment installed in a restricted-access location. It has a separate protective earthing terminal provided on the chassis in addition to the grounding pin of the power supply cord. This separate protective earthing terminal must be permanently connected to earth ground. See** **"Connecting Earth Ground to an EX Series Switch" on page 137**

Each AC power supply weighs approximately 3 lb (1.3 kg) and has an independent 12 A rated AC appliance inlet on its front. Each inlet requires a dedicated AC power feed. Each

AC power supply has a fan, a bicolor LED on the faceplate that indicates the status of the power supply, and a colored ejector lever. See Figure 13 on page 28.

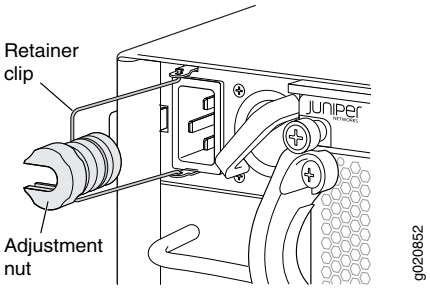
Figure 13: AC Power Supply



Each AC power supply has an ejector lever that holds the power supply in place. The ejector lever locks into the corresponding hole in the chassis on the left side of the AC appliance inlet. For instructions for installing the power supply, see "Installing an AC Power Supply in an EX4500 Switch" on page 122.

Each AC power supply comes with a power cord retainer that holds the power cord in place. See Figure 14 on page 28. The power cord retainer has a clip and an adjustment nut. The L-shaped ends of the retainer clip hook into the bracket holes on each side of the AC appliance inlet. The adjustment nut holds the power cord in the correct position. For instructions for installing the power cord retainer, see "Installing an AC Power Supply in an EX4500 Switch" on page 122.

Figure 14: Power Cord Retainer for an AC Power Supply



Each power supply has its own fan and is cooled by its own internal cooling system. The airflow for a power supply is either from the front of the power supply to the back or from the back of the power supply to the front depending on the switch model you purchase.

The color of the ejector lever on the power supply indicates the direction of airflow of the power supply.

- Green—Front-to-back airflow
- Orange—Back-to-front airflow

The color of the power supply's ejector lever must match the color of the intake or exhaust label visible through the vents of the installed fan tray. The color match indicates that the direction of airflow through the fan tray matches the direction of airflow through the power supply.

CAUTION: **Verify that the direction of airflow through the power supply matches the direction of airflow through the fan tray to prevent overheating of the chassis.**

Each AC power supply provides power to all components in the switch. The two power supplies provide full power redundancy to the switch. If one power supply fails or is removed, the second power supply balances the electrical load without interruption. The switch reassesses the power required to support the switch configuration and issues error messages if the available power is insufficient.

Related Documentation

- Installing an AC Power Supply in an EX4500 Switch on page 122
- AC Power Supply Specifications for EX4500 Switches on page 95
- AC Power Supply LEDs in EX4500 Switches on page 29

AC Power Supply LEDs in EX4500 Switches

An AC power supply has one bicolor LED on its faceplate. This LED displays information about the status of the power supply. See Figure 15 on page 29.

Figure 15: AC Power Supply LEDs in EX4500 Switches

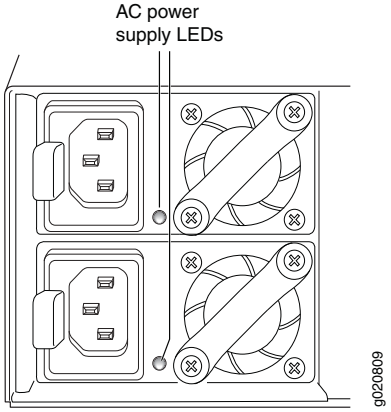


Table 12 on page 30 describes the LED on an AC power supply in an EX4500 switch.

Table 12: Power Supply LED on EX4500 Switches

LED State	Description
Unlit	Indicates one of the following: • Power supply is disconnected from AC power feed. • AC power input voltage is not within normal operating range. • No AC power input.
Green	• On steadily—Power supply is functioning normally. • Blinking—Power supply has failed.
Amber	• On steadily—Power supply has failed. • Blinking—Power supply has failed.

Related Documentation

- AC Power Supply Specifications for EX4500 Switches on page 95
- AC Power Cord Specifications for an EX4500 Switch on page 96
- Connecting AC Power to an EX4500 Switch on page 143

DC Power Supply in EX4500 Switches

The DC power supply in EX4500 switches is a hot-insertable and hot-removable field-replaceable unit (FRU).

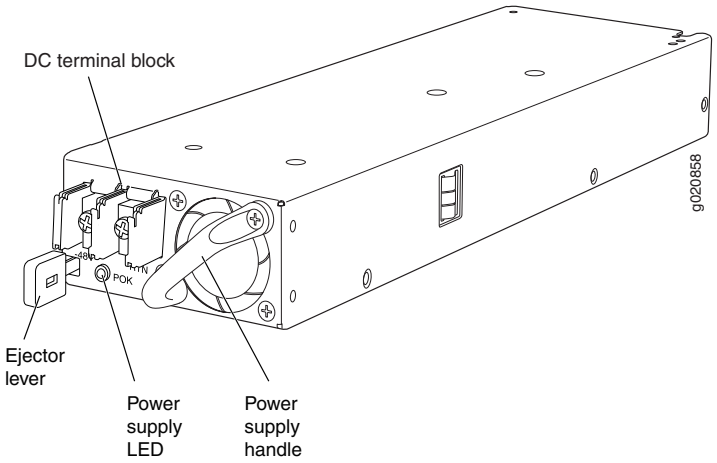
EX4500 switches are shipped with one power supply. A cover panel is installed in the second power supply slot. You can add a second power supply to the switch.

Power supplies are installed at the rear of the chassis in slots labeled 1 and 0. Both power supplies are accessible from the rear of the chassis.

WARNING: **The switch is pluggable type A equipment installed in a restricted-access location. It has a separate protective earthing terminal provided on the chassis in addition to the grounding pin of the power supply cord. This separate protective earthing terminal must be permanently connected to earth ground. See** "Connecting Earth Ground to an EX Series Switch" on page 137.

Each DC power supply weighs approximately 3 lb (1.3 kg) and has a pair of DC input lugs (–48 VDC and RTN) on the front of the power supply. Each DC power supply also has a fan, a bicolor LED on the faceplate that indicates the status of the power supply, and a colored ejector lever. See Figure 16 on page 31.

Figure 16: DC Power Supply



NOTE: A 1200 W DC power supply requires a dedicated 30 A circuit breaker for the input DC feed.

Each DC power supply has an ejector lever that holds the power supply in place. The ejector lever locks into the corresponding hole in the chassis. For instructions for installing the power supply, see "Installing a DC Power Supply in an EX4500 Switch" on page 124.

Each power supply has its own fan and is cooled by its own internal cooling system. The airflow for a power supply is from the front of the power supply to the back.

The color of the ejector lever on the power supply indicates the direction of airflow of the power supply.

- Green—Front-to-back airflow

The color of the power supply's ejector lever must match the color of the exhaust label visible through the vents of the installed fan tray. The color match indicates that the direction of airflow through the fan tray matches the direction of airflow through the power supply.

CAUTION: Verify that the direction of airflow through the power supply matches the direction of airflow through the fan tray to prevent overheating of the chassis.

Each DC power supply provides power to all components in the switch. Two power supplies provide full power redundancy to the switch. If one power supply fails or is removed, the second power supply balances the electrical load without interruption. The switch reassesses the power required to support the switch configuration and issues error messages if the available power is insufficient.

The output for the DC power supply is 12 VDC. The output power is 1200 W.

Related Documentation

- Installing a DC Power Supply in an EX4500 Switch on page 124
- DC Power Specifications for EX4500 Switches on page 96
- DC Power Supply LEDs in EX4500 Switches on page 32

DC Power Supply LEDs in EX4500 Switches

A DC power supply has one bicolor LED (labeled POK) on its faceplate. This LED displays information about the status of the power supply. See Figure 17 on page 32.

Figure 17: DC Power Supply LED in EX4500 Switches

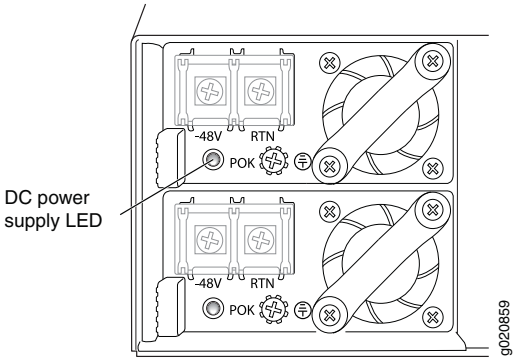


Table 13 on page 32 describes the LED on a DC power supply in an EX4500 switch.

Table 13: DC Power Supply LED on EX4500 Switches

LED	LED State	Description
P OK	Unlit	Indicates one of the following: • Power supply is disconnected from DC power feed. • DC power input voltage is not within normal operating range (–42 VDC through –60 VDC). • No DC power input.
	Green	• On steadily—Power supply is functioning normally. • Blinking—Power supply has failed.
	Amber	• On steadily—Power supply has failed. • Blinking—Power supply has failed.

Related Documentation

- DC Power Specifications for EX4500 Switches on page 96
- Connecting DC Power to an EX4500 Switch on page 145

Cooling System and Airflow in an EX4500 Switch

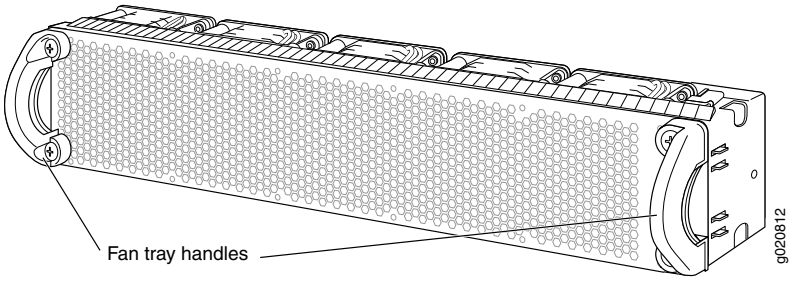
The cooling system in an EX4500 switch consists of a single fan tray.

This topic describes:

Fan Tray

The fan tray is a hot-insertable and hot-removable field-replaceable unit (FRU). The fan tray contains five fans (see Figure 18 on page 33).

Figure 18: Fan Tray Used in an EX4500 Switch



The fan tray installs horizontally in the rear of the chassis. The fan tray has two handles, one on each side that facilitate handling of the fan tray.

You remove and replace the fan tray from the rear of the chassis. The switch continues to operate for a limited time (30 seconds) during the replacement of the fan tray without thermal shutdown.

The fan tray provides front-to-back or back-to-front airflow depending on the switch model you purchase.

NOTE: The side of the switch where the network ports are located is the front of the switch.

Airfow Direction in EX4500 Switch Models

Table 14 on page 33 shows the different EX4500 switch models and their direction of airflow.

Table 14: Airflow Direction in EX4500 Switch Models

Model	Direction of Airflow
EX4500-40F-FB	Front-to-back
EX4500-40F-BF	Back-to-front
EX4500-40F-FB- C	Front-to-back

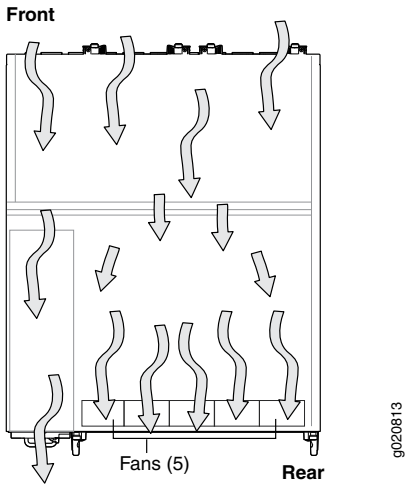
Table 14: Airflow Direction in EX4500 Switch Models *(continued)*

Model	Direction of Airflow
EX4500-40F-BF-C	Back-to-front
EX4500-40F-DC-C	Front-to-back
EX4500-40F-VC1-FB	Front-to-back
EX4500-40F-VC1-BF	Back-to-front
EX4500-40F-VC1-DC	Front-to-back

Front-to-Back Airflow

In the EX4500 switch models that have front-to-back airflow, the air intake to cool the chassis is located on the front of the chassis. Air is pulled into the chassis and pushed toward the fan tray. Hot air exhausts from the rear of the chassis. See Figure 19 on page 34.

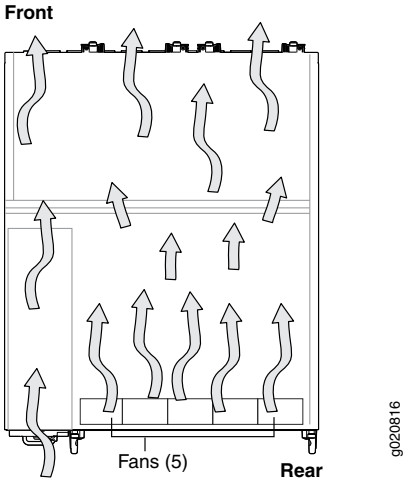
Figure 19: Front-to-Back Airflow Through the EX4500 Switch Chassis



Back-to-Front Airflow

In the EX4500 switch models that have back-to-front airflow, the air intake to cool the chassis is located on the rear of the chassis. Air is pulled into the chassis and pushed away from the fan tray. Hot air exhausts from the front of the chassis. See Figure 20 on page 35.

Figure 20: Back-to-Front Airflow Through the EX4500 Switch Chassis



Each fan tray has colored intake or exhaust labels that are visible through the fan tray vents. The **INTAKE** label is orange. The **EXHAUST** label is green.

NOTE: Only one of the labels, **INTAKE** or **EXHAUST**, is visible through the vents of the installed fan tray.

The color of the label visible through the vents of the installed fan tray must match the color of the ejector lever on the installed power supply. The color match indicates that the power supply has the correct airflow for this model. See "AC Power Supply in EX4500 Switches" on page 27.

CAUTION: To prevent overheating of the chassis, verify that the color of the label visible through the vents of the installed fan tray matches the color of the ejector lever of the installed power supply. A color match indicates that the direction of airflow through the fan tray matches the direction of airflow of the power supply.

Temperature sensors in the chassis monitor the temperature within the chassis. The fan tray used in the switch comes with load-sharing redundancy that can tolerate a single fan failure at room temperature (below 113° F/45° C) to still provide sufficient cooling.

Under normal operating conditions, the fans in the fan tray run at less than full speed. If a fan fails or the ambient temperature rises above the threshold 113° F (45° C), the speed of the remaining fans is automatically adjusted to keep the temperature within the acceptable range, 32° F (0° C) through 113° F (45° C).

The system raises an alarm if the fan fails or if the ambient temperature inside the chassis rises above the acceptable range. If the temperature inside the chassis rises above the threshold temperature, the system shuts down automatically.

You can check the status of fans and the chassis temperature from the Environment Status option in the Status menu on the LCD panel. See "LCD Panel in EX4500 Switches" on page 17.

You cannot replace a single fan. If one or more fans fail, you must replace the entire fan tray.

Related Documentation

- Installing a Fan Tray in an EX4500 Switch on page 125
- Removing a Fan Tray from an EX4500 Switch on page 184
- Field-Replaceable Units in EX4500 Switches on page 23
- Rear Panel of an EX4500 Switch on page 13
- Prevention of Electrostatic Discharge Damage on page 250

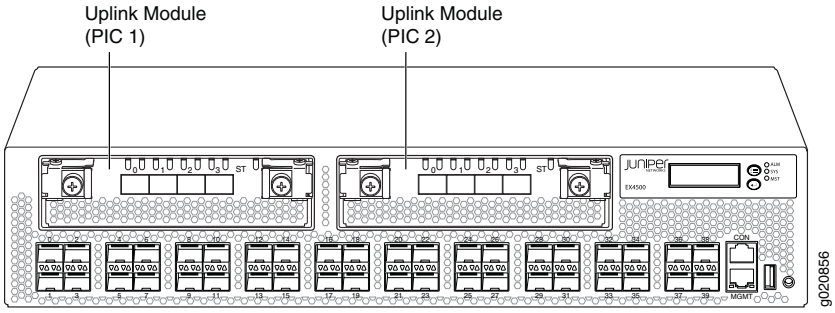
Uplink Modules in EX4500 Switches

EX4500 switches support SFP+ uplink modules. The SFP+ uplink module is a hot-insertable and hot-removable field replaceable unit (FRU).

NOTE: **Uplink modules and transceivers are not part of the EX4500 switch's shipping configuration. You must order them separately.**

You can install up to two SFP+ uplink modules in an EX4500 switch. Both uplink modules install horizontally on the front of the chassis. The uplink module slot on the left is PIC 1. The uplink module slot on the right is PIC 2. See Figure 21 on page 36.

Figure 21: Uplink Module Slots in an EX4500 Switch



Each SFP+ uplink module provides four ports. Each module can house four 10-gigabit small form-factor pluggable (SFP+) transceivers or four 1-gigabit small form-factor pluggable (SFP) transceivers.

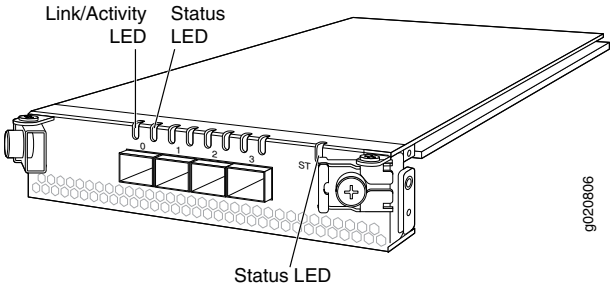
NOTE: **When a new uplink module is installed in the switch or an existing uplink module is replaced with another uplink module, the switch detects the newly installed uplink module. The switch creates the required interfaces when new transceivers are installed in those ports.**

The operating mode for an SFP+ uplink module is shown in the output of the **show chassis pic fpc-slot *slot number* pic-slot 1** command.

You can use the uplink module ports to connect an access switch to a distribution switch.

Figure 22 on page 37 shows the SFP+ uplink module.

Figure 22: SFP+ Uplink Module



The SFP+ uplink module has an LED on the faceplate (labeled ST) that indicates the status of the uplink module. See Figure 22 on page 37.

Table 15 on page 37 describes the LED on the uplink module in an EX4500 switch.

Table 15: Uplink Module Status LED

LED	State	Description
ST	Unlit	• The uplink module is offline. • The chassis is powered off.
	Green	• The uplink module is online and functioning normally.

Each uplink module port has a pair of LEDs that indicate the link/activity and status of the port. See "Network Port and Uplink Module Port LEDs in EX4500 Switches" on page 24 for details about the uplink module port LEDs.

The SFP+ uplink modules are shipped with dust covers preinstalled in the ports.

The SFP+ uplink modules require Junos OS for EX Series switches, Release 9.4 or later.

Related Documentation

- Network Port and Uplink Module Port LEDs in EX4500 Switches on page 24
- Network Port and Uplink Module Port Connector Pinout Information for EX4500 Switches on page 45
- Pluggable Transceivers Supported on EX4500 Switches on page 49
- SFP+ Direct Attach Cables for EX Series Switches on page 67
- *EX Series Switches Interfaces Overview*
- Installing an Uplink Module in an EX4500 Switch on page 127
- Removing an Uplink Module from an EX4500 Switch on page 186

Intraconnect Module in EX4500 Switches

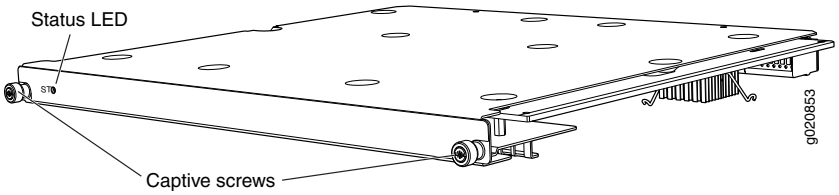
The intraconnect module is installed horizontally on the rear of an EX4500 switch chassis. The intraconnect module helps the switch achieve line rate on all its ports. The module is an offline field-replaceable unit (FRU).

The intraconnect module comes preinstalled in the switch chassis in the EX4500-40F-FB, EX4500-40F-BF, EX4500-40F-FB-C, EX4500-40F-BF-C, and EX4500-40F-DC-C switch models. You must order it separately for all other switch models. See "EX4500 Switch Models" on page 7.

CAUTION: Operating an EX4500 switch without the intraconnect module or the Virtual Chassis module is not supported.
EX4500 switches running Junos OS Release 10.4R2 or later 10.4 releases will not boot if you do not install the intraconnect module in the switch.
EX4500 switches running Junos OS Release 11.1R1 or later releases will not boot if you install neither the intraconnect module nor the Virtual Chassis module in the switch.

Figure 23 on page 38 shows the intraconnect module.

Figure 23: Intraconnect Module



The intraconnect module has an LED (labeled ST) on the faceplate that indicates the status of the intraconnect module.

Table 16 on page 38 describes the LED on the intraconnect module in an EX4500 switch.

Table 16: Intraconnect Module Status LED

LED	State	Description
ST	Green	The intraconnect module is functioning normally.
	Unlit	• The intraconnect module is not functioning normally. • The switch has been powered off.

The intraconnect module has two captive screws on the faceplate that secure the module in the chassis. To remove or replace the intraconnect module, follow the instructions in "Removing an Intraconnect Module from an EX4500 Switch" on page 188.

Related Documentation

- Rear Panel of an EX4500 Switch on page 13
- Field-Replaceable Units in EX4500 Switches on page 23
- Installing an Intraconnect Module in an EX4500 Switch on page 129

Virtual Chassis Module in EX4500 Switches

The Virtual Chassis module is installed horizontally on the rear panel of an EX4500 switch chassis. The Virtual Chassis module has two dedicated Virtual Chassis ports (VCPs) that can be used to interconnect the EX4500 switch with an EX4200 switch or an EX4500 switch in a Virtual Chassis configuration. The module is an offline field-replaceable unit (FRU).

NOTE: The Virtual Chassis module is supported on EX4500 switches in Junos OS Releases 11.1 and later.

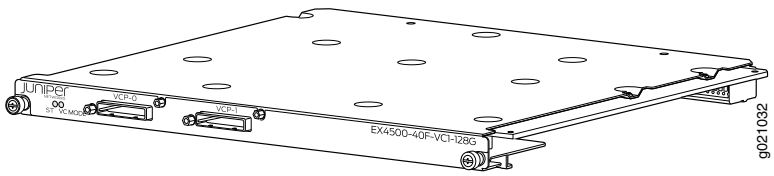
The Virtual Chassis module comes preinstalled in the switch chassis in the EX4500-40F-VC1-FB, EX4500-40F-VC1-BF, and EX4500-40F-VC1-DC switch models. You must order it separately for all other switch models. See "EX4500 Switch Models" on page 7.

NOTE: Virtual Chassis cables and Virtual Chassis cable connector retainers are not part of the EX4500 switch's shipping configuration. If you want to purchase these, you must order them separately.

CAUTION: Operating an EX4500 switch without the intraconnect module or the Virtual Chassis module is not supported.
EX4500 switches running Junos OS Release 10.4R2 or later 10.4 releases will not boot if you do not install the intraconnect module in the switch.
EX4500 switches running Junos OS Release 11.1R1 or later releases will not boot if you install neither the intraconnect module nor the Virtual Chassis module in the switch.

Figure 24 on page 39 shows the Virtual Chassis module.

Figure 24: Virtual Chassis Module



The Virtual Chassis module has two LEDs (labeled ST and VC MODE) on the left side of its faceplate that indicate the status and the operating mode of the Virtual Chassis module. See Figure 25 on page 40.

Figure 25: Virtual Chassis Module LEDs

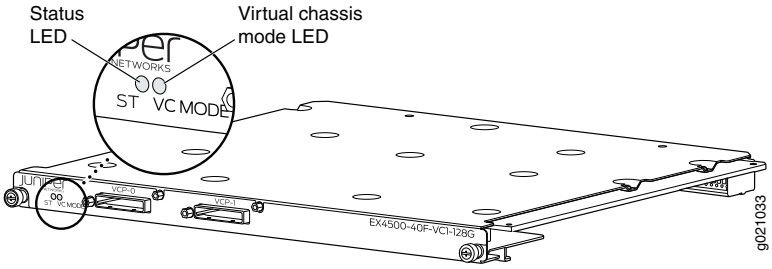


Table 17 on page 40 describes the LEDs on the Virtual Chassis module in an EX4500 switch.

Table 17: Virtual Chassis Module LEDs

LED	State	Description
ST	Green	The Virtual Chassis module is functioning normally.
	Unlit	One of the following: • The Virtual Chassis module is not functioning normally. • The switch has been powered off.
VC Mode	Green	The Virtual Chassis module and VCPs are active.
	Unlit	The Virtual Chassis module is operating in Intraconnect mode. The VCPs are not active.

The Virtual Chassis module has two captive screws on the faceplate that secure the module to the switch chassis. To remove or replace the Virtual Chassis module, follow the instructions in "Removing a Virtual Chassis Module from an EX4500 Switch" on page 190.

Related Documentation

- Rear Panel of an EX4500 Switch on page 13
- Field-Replaceable Units in EX4500 Switches on page 23
- Installing a Virtual Chassis Module in an EX4500 Switch on page 131

CHAPTER 3

Component Specifications

USB Port Specifications for an EX Series Switch

The following Juniper Networks USB flash drives have been tested and are officially supported for the USB port on all EX Series switches:

- RE-USB-1G-S
- RE-USB-2G-S
- RE-USB-4G-S

CAUTION: Any USB memory product not listed as supported for EX Series switches has not been tested by Juniper Networks. The use of any unsupported USB memory product could expose your EX Series switch to unpredictable behavior. Juniper Networks Technical Assistance Center (JTAC) can provide only limited support for issues related to unsupported hardware. We strongly recommend that you use only supported USB flash drives.

All USB flash drives used on EX Series switches must have the following features:

- USB 2.0 or later.
- Formatted with a FAT or MS-DOS file system.

- If the switch is running Junos OS Release 9.5 or earlier, the formatting method must use a master boot record. Microsoft Windows formatting, by default, does not use a master boot record. See the documentation for your USB flash drive for information about how your USB flash drive is formatted.

Related Documentation

- *EX2200 Switches Hardware Overview*
- *Rear Panel of an EX3200 Switch*
- *Rear Panel of an EX3300 Switch*
- *Rear Panel of an EX4200 Switch*
- *EX4300 Switches Hardware Overview*
- Front Panel of an EX4500 Switch on page 12
- *Management Panel of an EX4600 Switch*
- *EX4550 Switches Hardware Overview*
- *Switch Fabric and Routing Engine (SRE) Module in an EX6200 Switch*
- *Switch Fabric and Routing Engine (SRE) Module in an EX8208 Switch*
- *Routing Engine (RE) Module in an EX8216 Switch*
- *Routing Engine Module in an EX9200 Switch*
- *Booting an EX Series Switch Using a Software Package Stored on a USB Flash Drive*

Console Port Connector Pinout Information for an EX Series Switch

The console port on an EX Series switch is an RS-232 serial interface that uses an RJ-45 connector to connect to a console management device. The default baud rate for the console port is 9600 baud.

Table 18 on page 42 provides the pinout information for the RJ-45 console connector. An RJ-45 cable and an RJ-45 to DB-9 serial port adapter are supplied with the switch.

NOTE: If your laptop or PC does not have a DB-9 male connector pin and you want to connect your laptop or PC directly to an EX Series switch, use a combination of the RJ-45 to DB-9 female adapter supplied with the switch and a USB to DB-9 male adapter. You must provide the USB to DB-9 male adapter.

Table 18: EX Series Switches Console Port Connector Pinout Information

Pin	Signal	Description
1	RTS Output	Request to send
2	DTR Output	Data terminal ready

Table 18: EX Series Switches Console Port Connector Pinout Information *(continued)*

Pin	Signal	Description
3	TxD Output	Transmit data
4	Signal Ground	Signal ground
5	Signal Ground	Signal ground
6	RxD Input	Receive data
7	CD Input	Data carrier detect
8	CTS Input	Clear to send

Related Documentation

- *EX2200 Switches Hardware Overview*
- *Rear Panel of an EX3200 Switch*
- *Rear Panel of an EX3300 Switch*
- *Rear Panel of an EX4200 Switch*
- *EX4300 Switches Hardware Overview*
- Front Panel of an EX4500 Switch on page 12
- *EX4550 Switches Hardware Overview*
- *Management Panel of an EX4600 Switch*
- *Switch Fabric and Routing Engine (SRE) Module in an EX6200 Switch*
- *Switch Fabric and Routing Engine (SRE) Module in an EX8208 Switch*
- *Routing Engine (RE) Module in an EX8216 Switch*
- Connecting a Switch to a Management Console on page 150
- *Configuring the Console Port Type (CLI Procedure)*

RJ-45 to DB-9 Serial Port Adapter Pinout Information for a Switch

The console port is an RS-232 serial interface that uses an RJ-45 connector to connect to a management device such as a PC or a laptop. If your laptop or PC does not have a DB-9 male connector pin and you want to connect your laptop or PC to the switch, use a combination of the RJ-45 to DB-9 female adapter supplied with the switch along with a USB to DB-9 male adapter.

Table 19 on page 44 provides the pinout information for the RJ-45 to DB-9 serial port adapter.

Table 19: RJ-45 to DB-9 Serial Port Adapter Pinout Information

RJ-45 Pin	Signal	DB-9 Pin	Signal
1	RTS	8	CTS
2	DTR	6	DSR
3	TXD	2	RXD
4	GND	5	GND
6	RXD	3	TXD
7	DSR	4	DTR
8	CTS	7	RTS

Related Documentation

- Connecting a Switch to a Management Console on page 150
- Connecting and Configuring an EX Series Switch (CLI Procedure) on page 161
- *Connecting an EX9200 Switch to a Management Console or an Auxiliary Device*
- *Connecting and Configuring an EX9200 Switch (CLI Procedure)*
- *Connecting and Configuring an OCX1100 Switch (CLI Procedure)*

Management Port Connector Pinout Information for an EX4500 Switch

The management port on an EX4500 switch uses an RJ-45 connector to connect to a management device for out-of-band management.

The port uses an autosensing RJ-45 connector to support a 10/100/1000Base-T connection. Two LEDs on the port indicate link/activity on the port and the administrative status of the port. See "Management Port LEDs in EX4500 Switches" on page 26.

Table 20 on page 44 provides the pinout information for the RJ-45 connector for the management port. An RJ-45 cable, with a connector attached, is supplied with the switch.

Table 20: Management Port Connector Pinout Information for EX4500 Switches

Pin	Signal	Description
1	TRP1+	Transmit/receive data pair 1
2	TRP1-	Transmit/receive data pair 1
3	TRP2+	Transmit/receive data pair 2
4	TRP3+	Transmit/receive data pair 3

Table 20: Management Port Connector Pinout Information for EX4500 Switches *(continued)*

Pin	Signal	Description
5	TRP3-	Transmit/receive data pair 3
6	TRP2-	Transmit/receive data pair 2
7	TRP4+	Transmit/receive data pair 4
8	TRP4-	Transmit/receive data pair 4

Related Documentation

- See Front Panel of an EX4500 Switch on page 12 for port location.
- Connecting a Switch to a Network for Out-of-Band Management on page 149

Network Port and Uplink Module Port Connector Pinout Information for EX4500 Switches

The network ports and uplink module ports on an EX4500 switch have two LEDs on each port that indicate link/activity on the port and the port status. See "Network Port and Uplink Module Port LEDs in EX4500 Switches" on page 24.

Table 21 on page 45 provides the pinout information for the network port and uplink module port connector pinout.

Table 21: Network Port and Uplink Module Port Connector Pinout Information for EX4500 Switches

Pin	Signal	Description
1	VeeT	Module transmitter ground
2	TX_Fault	Module transmitter fault
3	TX_Disable	Transmitter disable
4	SDA	2-wire serial interface data line
5	SCL-	2-wire serial interface clock
6	MOD_ABS	Module absent
7	RS0	Rate select 0, optionally controls SFP+ module receiver.
8	RX_LOS	Receiver loss of signal indication
9	RS1	Rate select 1, optionally controls SFP+ transmitter.
10	VeeR	Module receiver ground

Table 21: Network Port and Uplink Module Port Connector Pinout Information for EX4500 Switches *(continued)*

Pin	Signal	Description
11	VeeR	Module receiver ground
12	RD-	Receiver inverted data output
13	RD+	Receiver non inverted data output
14	VeeR	Module receiver ground
15	VccR	Module receiver 3.3 V supply
16	VccT	Module transmitter 3.3 V supply
17	VeeT	Module transmitter ground
18	TD+	Transmitter non inverted data input
19	TD-	Transmitter inverted data input
20	VeeT	Module transmitter ground

Related Documentation

- Front Panel of an EX4500 Switch on page 12
- Uplink Modules in EX4500 Switches on page 36

Virtual Chassis Ports Connector Pinout Information for EX4500 Switches

EX4500 switches use a 68-pin connector cable to interconnect switches to form a Virtual Chassis. Table 22 on page 46 provides the Virtual Chassis ports (VCPs) connector pinout information.

Table 22: Virtual Chassis Ports (VCPs) Connector Pinout Information

Pin Number	Pin Name
A1	GND
A2	P1TXP0
A3	P1TXN0
A4	GND
A5	P1TXP1
A6	P1TXN1

Table 22: Virtual Chassis Ports (VCPs) Connector Pinout Information *(continued)*

Pin Number	Pin Name
A7	GND
A8	P1TXP2
A9	P1TXN2
A10	GND
A11	P1TXP3
A12	P1TXN3
A13	GND
A14	NC
A15	NC
A16	GND
A17	NC
A18	NC
A19	NC
A20	NC
A21	NC
A22	GND
A23	P2TXP0
A24	P2TXN0
A25	GND
A26	P2TXP1
A27	P2TXN1
A28	GND
A29	P2TXP2
A30	P2TXN2

Table 22: Virtual Chassis Ports (VCPs) Connector Pinout Information *(continued)*

Pin Number	Pin Name
A31	GND
A32	P2TXP3
A33	P2TXN3
A34	GND
B1	GND
B2	P1RXP0
B3	P1RXN0
B4	GND
B5	P1RXP1
B6	P1RXN1
B7	GND
B8	P1RXP2
B9	P1RXN2
B10	GND
B11	P1RXP3
B12	P1RXN3
B13	GND
B14	NC
B15	NC
B16	NC
B17	NC
B18	NC
B19	NC
B20	NC

Table 22: Virtual Chassis Ports (VCPs) Connector Pinout Information *(continued)*

Pin Number	Pin Name
B21	NC
B22	GND
B23	P2RXP0
B24	P2RXN0
B25	GND
B26	P2RXP1
B27	P2RXN1
B28	GND
B29	P2RXP2
B30	P2RXN2
B31	GND
B32	P2RXP3
B33	P2RXN3
B34	GND

Related Documentation

- Planning EX4200, EX4500, and EX4550 Virtual Chassis on page 106
- *Understanding EX Series Virtual Chassis Components*
- Understanding EX4200, EX4500, and EX4550 Virtual Chassis Hardware Configurations on page 103
- Connecting a Virtual Chassis Cable to an EX4500 Switch on page 133

Pluggable Transceivers Supported on EX4500 Switches

Uplink module ports on EX4500 switches support SFP and SFP+ transceivers. This topic describes the optical interfaces supported for those transceivers. It also lists the copper interface supported for the SFP transceivers.

NOTE: We recommend that you use only optical transceivers and optical connectors purchased from Juniper Networks with your Juniper Networks device.

CAUTION: If you are having a problem running a Juniper Networks device that is using a third-party optic or cable, the Juniper Networks Technical Assistance Center (JTAC) can help you diagnose the source of the problem. Your JTAC engineer might recommend that you check the third-party optic or cable and potentially replace it with an equivalent Juniper Networks optic or cable that is qualified for the device.

The Gigabit Ethernet SFP and SFP+ transceivers installed in EX4500 switches support digital optical monitoring (DOM): You can view the diagnostic details for these transceivers by issuing the operational mode CLI command **show interfaces diagnostics optics**.

NOTE: The transceivers support DOM even if they are installed in uplink module ports configured as Virtual Chassis ports.

The tables in this topic describe the optical interface support over single-mode fiber-optic (SMF) and multimode fiber-optic (MMF) cables for SFP and SFP+ transceivers and over the copper interface for SFP transceivers:

- Table 23 on page 51—Optical interface support and copper interface support for Gigabit Ethernet SFP transceivers.
- Table 24 on page 62—Optical interface support for Gigabit Ethernet SFP+ transceivers.

Table 23: Optical interface Support and Copper Interface Support for Gigabit Ethernet SFP Transceivers in EX4500 Switches

Ethernet Standard	Specification	Value
1000BASE-T	Model number	EX-SFP-1GE-T
	Rate	1000 Mbps
	Connector type	RJ-45
	Fiber count	Copper
	Transmitter wavelength	–
	Minimum launch power	–
	Maximum launch power	–
	Minimum receiver sensitivity	–
	Maximum input power	–
	Fiber type	Copper
	Core/Cladding size	–
	Modal bandwidth	–
	Distance	100 m (328 ft)
	DOM support	Not available
	Software required	Junos OS for EX Series switches, Release 10.2 or later
	Support for Virtual Chassis configuration	No

Table 23: Optical interface Support and Copper Interface Support for Gigabit Ethernet SFP Transceivers in EX4500 Switches *(continued)*

Ethernet Standard	Specification	Value			
1000BASE-SX	Model number	EX-SFP-1GE-SX			
	Rate	1000 Mbps			
	Connector type	LC			
	Transmitter wavelength	850 nm			
	Minimum launch power	–9.5 dBm			
	Maximum launch power	–3 dBm			
	Minimum receiver sensitivity	–21 dBm			
	Maximum input power	0 dBm			
	Fiber type	MMF			
	Core size	62.5 µm	62.5 µm	50 µm	50 µm
	Modal bandwidth	160 MHz/km	200 MHz/km	400 MHz/km	500 MHz/km
	Distance	220 m (721 ft)	275 m (902 ft)	500 m (1640 ft)	550 m (1804 ft)
	DOM support	Available			
	Software required	Junos OS for EX Series switches, Release 10.3 or later			
	Support for Virtual Chassis configuration	Yes			

Table 23: Optical interface Support and Copper Interface Support for Gigabit Ethernet SFP Transceivers in EX4500 Switches *(continued)*

Ethernet Standard	Specification	Value
1000BASE-LX	Model number	EX-SFP-1GE-LX
	Rate	1000 Mbps
	Connector type	LC
	Fiber count	Dual
	Transmitter wavelength	1310 nm
	Minimum launch power	–9.5 dBm
	Maximum launch power	–3 dBm
	Minimum receiver sensitivity	–25 dBm
	Maximum input power	–3 dBm
	Fiber type	SMF
	Core/Cladding size	9/125 µm
	Modal bandwidth	–
	Distance	10 km (6.2 miles)
	DOM support	Available
	Software required	Junos OS for EX Series switches, Release 10.2 or later
	Support for Virtual Chassis configuration	Yes

Table 23: Optical interface Support and Copper Interface Support for Gigabit Ethernet SFP Transceivers in EX4500 Switches *(continued)*

Ethernet Standard	Specification	Value
1000BASE-BX-U	Model number	EX-SFP-GE10KT13R14
	Rate	1000 Mbps
	Connector type	LC
	Fiber count	Single
	Transmitter wavelength	1310 nm
	Receiver wavelength	1490 nm
	Minimum launch power	–9 dBm
	Maximum launch power	–3 dBm
	Minimum receiver sensitivity	–30 dBm
	Maximum input power	–3 dBm
	Fiber type	SMF
	Core/Cladding size	9/125 µm
	Modal bandwidth	–
	Distance	10 km (6.2 miles)
	DOM support	Available
	Software required	Junos OS for EX Series switches, Release 11.2 or later
	Support for Virtual Chassis configuration	Yes

Table 23: Optical interface Support and Copper Interface Support for Gigabit Ethernet SFP Transceivers in EX4500 Switches *(continued)*

Ethernet Standard	Specification	Value
1000BASE-BX-D	Model number	EX-SFP-GE10KT14R13
	Rate	1000 Mbps
	Connector type	LC
	Fiber count	Single
	Transmitter wavelength	1490 nm
	Receiver wavelength	1310 nm
	Minimum launch power	–9 dBm
	Maximum launch power	–3 dBm
	Minimum receiver sensitivity	–30 dBm
	Maximum input power	–3 dBm
	Fiber type	SMF
	Core/Cladding size	9/125 µm
	Modal bandwidth	–
	Distance	10 km (6.2 miles)
	DOM support	Available
	Software required	Junos OS for EX Series switches, Release 11.2 or later
	Support for Virtual Chassis configuration	Yes

Table 23: Optical interface Support and Copper Interface Support for Gigabit Ethernet SFP Transceivers in EX4500 Switches *(continued)*

Ethernet Standard	Specification	Value
1000BASE-BX-U	Model number	EX-SFP-GE10KT13R15
	Rate	1000 Mbps
	Connector type	LC
	Fiber count	Single
	Transmitter wavelength	1310 nm
	Receiver wavelength	1550 nm
	Minimum launch power	–9 dBm
	Maximum launch power	–3 dBm
	Minimum receiver sensitivity	–21 dBm
	Maximum input power	–3 dBm
	Fiber type	SMF
	Core/Cladding size	9/125 µm
	Modal bandwidth	–
	Distance	10 km (6.2 miles)
	DOM support	Available
	Software required	Junos OS for EX Series switches, Release 11.2 or later
	Support for Virtual Chassis configuration	Yes

Table 23: Optical interface Support and Copper Interface Support for Gigabit Ethernet SFP Transceivers in EX4500 Switches *(continued)*

Ethernet Standard	Specification	Value
1000BASE-BX-D	Model number	EX-SFP-GE10KT15R13
	Rate	1000 Mbps
	Connector type	LC
	Fiber count	Single
	Transmitter wavelength	1550 nm
	Receiver wavelength	1310 nm
	Minimum launch power	–9 dBm
	Maximum launch power	–3 dBm
	Minimum receiver sensitivity	–21 dBm
	Maximum input power	–3 dBm
	Fiber type	SMF
	Core/Cladding size	9/125 µm
	Modal bandwidth	–
	Distance	10 km (6.2 miles)
	DOM support	Available
	Software required	Junos OS for EX Series switches, Release 11.2 or later
	Support for Virtual Chassis configuration	Yes

Table 23: Optical interface Support and Copper Interface Support for Gigabit Ethernet SFP Transceivers in EX4500 Switches *(continued)*

Ethernet Standard	Specification	Value
1000BASE-BX-U	Model number	EX-SFP-GE40KT13R15
	Rate	1000 Mbps
	Connector type	LC
	Fiber count	Single
	Transmitter wavelength	1310 nm
	Receiver wavelength	1550 nm
	Minimum launch power	–6.5 dBm
	Maximum launch power	2 dBm
	Minimum receiver sensitivity	–23 dBm
	Maximum input power	–3 dBm
	Fiber type	SMF
	Core/Cladding size	9/125 µm
	Modal bandwidth	–
	Distance	40 km (24.8 miles)
	DOM support	Available
	Software required	Junos OS for EX Series switches, Release 11.2 or later
	Support for Virtual Chassis configuration	Yes

Table 23: Optical interface Support and Copper Interface Support for Gigabit Ethernet SFP Transceivers in EX4500 Switches *(continued)*

Ethernet Standard	Specification	Value
1000BASE-BX-D	Model number	EX-SFP-GE40KT15R13
	Rate	1000 Mbps
	Connector type	LC
	Fiber count	Single
	Transmitter wavelength	1550 nm
	Receiver wavelength	1310 nm
	Minimum launch power	–6.5 dBm
	Minimum receiver sensitivity	–23 dBm
	Maximum input power	–3 dBm
	Fiber type	SMF
	Core/Cladding size	9/125 µm
	Modal bandwidth	–
	Distance	40 km (24.8 miles)
	DOM support	Available
	Software required	Junos OS for EX Series switches, Release 11.2 or later
	Support for Virtual Chassis configuration	Yes

Table 23: Optical interface Support and Copper Interface Support for Gigabit Ethernet SFP Transceivers in EX4500 Switches *(continued)*

Ethernet Standard	Specification	Value
1000BASE-LX	Model number	EX-SFP-1GE-LX40K
	Rate	1000 Mbps
	Connector type	LC
	Fiber count	Double
	Transmitter wavelength	1310 nm
	Minimum launch power	–14 dBm
	Maximum launch power	–8 dBm
	Minimum receiver sensitivity	–45 dBm
	Maximum input power	–3 dBm
	Fiber type	SMF
	Core/Cladding size	9/125 µm
	Modal bandwidth	–
	Distance	40 km (24.8 miles)
	DOM support	Available
	Software required	Junos OS for EX Series switches, Release 11.2 or later
	Support for Virtual Chassis configuration	Yes

Table 23: Optical interface Support and Copper Interface Support for Gigabit Ethernet SFP Transceivers in EX4500 Switches *(continued)*

Ethernet Standard	Specification	Value
1000BASE-LH (or 1000BASE-ZX)	Model number	EX-SFP-1GE-LH
	Rate	1000 Mbps
	Connector type	LC
	Fiber count	Dual
	Transmitter wavelength	1550 nm
	Minimum launch power	–2 dBm
	Maximum launch power	5 dBm
	Minimum receiver sensitivity	–25 dBm
	Maximum input power	–3 dBm
	Fiber type	SMF
	Core/Cladding size	9/125 µm
	Modal bandwidth	–
	Distance	70 km (43.5 miles)
	DOM support	Available
	Software required	Junos OS for EX Series switches, Release 11.2 or later
	Support for Virtual Chassis configuration	Yes

Table 24: Optical interface Support for Gigabit Ethernet SFP+ Transceivers in EX4500 Switches

Ethernet Standard	Specification	Value		
10GBASE-USR	Model number	EX-SFP-10GE-USR		
	Rate	10 Gbps		
	Connector type	LC		
	Fiber count	Dual		
	Transmitter wavelength	850 nm		
	Minimum launch power	–7.3 dBm		
	Maximum launch power	–1.3 dBm		
	Minimum receiver sensitivity	–11.1 dBm		
	Maximum input power	–1.0 dBm		
	Fiber type	MMF		
	Core/Cladding size	62.5/125 µm	50/125 µm	50/125 µm
	Fiber grade	OM1	OM3	OM3
	Modal bandwidth	200 MHz/km	500 MHz/km	1500 MHz/km
	Distance	10 m (32.8 ft)	30 m (98.4 ft)	100 m (328 ft)
	DOM support	Available		
	Software required	Junos OS for EX Series switches, Release 10.2 or later		
	Support for Virtual Chassis configuration	Yes		

Table 24: Optical interface Support for Gigabit Ethernet SFP+ Transceivers in EX4500 Switches *(continued)*

Ethernet Standard	Specification	Value				
10GBASE-SR	Model number	EX-SFP-10GE-SR				
	Rate	10 Gbps				
	Connector type	LC				
	Fiber count	Dual				
	Transmitter wavelength	850 nm				
	Minimum launch power	–7.3 dBm				
	Maximum launch power	–1 dBm				
	Minimum receiver sensitivity	–9.9 dBm				
	Maximum input power	–1 dBm				
	Fiber type	MMF				
	Core/Cladding size	62.5/125µm	62.5/125µm	50/125 µm	50/125 µm	50/125 µm
	Fiber grade	FDDI	OM1	–	OM2	OM3
	Modal bandwidth	160 MHz/km	200 MHz/km	400 MHz/km	500 MHz/km	1500 MHz/km
	Distance	26 m (85 ft)	33 m (108 ft)	66 m (216 ft)	82 m (269 ft)	300 m (984 ft)
	DOM support	Available				
	Software required	Junos OS for EX Series switches, Release 10.2 or later				
	Support for Virtual Chassis configuration	Yes				

Table 24: Optical interface Support for Gigabit Ethernet SFP+ Transceivers in EX4500 Switches *(continued)*

Ethernet Standard	Specification	Value		
10GBASE-LRM	Model number	EX-SFP-10GE-LRM		
	Rate	10 Gbps		
	Connector type	LC		
	Fiber count	Dual		
	Transmitter wavelength	1310 nm		
	Minimum launch power	–6.5 dBm		
	Maximum launch power	0.5 dBm		
	Minimum receiver sensitivity	–21 dBm		
	Maximum input power	0.5 dBm		
	Fiber type	MMF		
	Core/Cladding size	62.5/125µm	50/125 µm	50/125 µm
	Fiber grade	FDDI/OM1	OM2	OM3
	Modal bandwidth	500 MHz/km	500 MHz/km	500 MHz/km
	Distance	220 m (722 ft)	220 m (722 ft)	220 m (722 ft)
	DOM support	Available		
	Software required	Junos OS for EX Series switches, Release 10.3R2 or later		
	Support for Virtual Chassis configuration	Yes		

Table 24: Optical interface Support for Gigabit Ethernet SFP+ Transceivers in EX4500 Switches *(continued)*

Ethernet Standard	Specification	Value
10GBASE-LR	Model number	EX-SFP-10GE-LR
	Rate	10 Gbps
	Connector type	LC
	Fiber count	Dual
	Transmitter wavelength	1310 nm
	Minimum launch power	–8.2 dBm
	Maximum launch power	0.5 dBm
	Minimum receiver sensitivity	–18 dBm
	Maximum input power	0.5 dBm
	Fiber type	SMF
	Core/Cladding size	9/125 µm
	Modal bandwidth	–
	Distance	10 km (6.2 miles)
	DOM support	Available
	Software required	Junos OS for EX Series switches, Release 10.2 or later
	Support for Virtual Chassis configuration	Yes

Table 24: Optical interface Support for Gigabit Ethernet SFP+ Transceivers in EX4500 Switches *(continued)*

Ethernet Standard	Specification	Value
10GBASE-ER	Model number	EX-SFP-10GE-ER
	Rate	10 Gbps
	Connector type	LC
	Fiber count	Dual
	Transmitter wavelength	1550 nm
	Minimum launch power	–4.7 dBm
	Maximum launch power	4 dBm
	Minimum receiver sensitivity	–11.3 dBm
	Maximum input power	–1 dBm
	Fiber type	SMF
	Core/Cladding size	9/125 µm
	Modal bandwidth	–
	Distance	40 km (24.8 miles)
	DOM support	Available
	Software required	Junos OS for EX Series switches, Release 11.1 or later
	Support for Virtual Chassis configuration	Yes

Table 24: Optical interface Support for Gigabit Ethernet SFP+ Transceivers in EX4500 Switches *(continued)*

Ethernet Standard	Specification	Value
10GBASE-ZR	Model number	EX-SFP-10GE-ZR
	Rate	10 Gbps
	Connector type	LC
	Fiber count	Dual
	Transmitter wavelength	1550 nm
	Minimum launch power	0 dBm
	Maximum launch power	5 dBm
	Minimum receiver sensitivity	–20 dBm
	Maximum input power	–8 dBm
	Fiber type	SMF
	Core/Cladding size	9/125 µm
	Modal bandwidth	–
	Distance	80 km (49.7 miles)
	DOM support	Available
	Software required	Junos OS for EX Series switches, Release 11.4R5 or later
	Support for Virtual Chassis configuration	Yes

Related Documentation

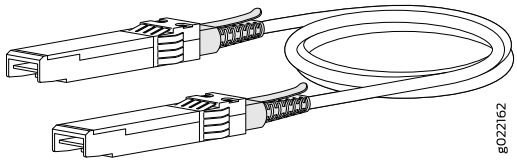
- Front Panel of an EX4500 Switch on page 12
- Installing a Transceiver in an EX Series Switch on page 134
- Removing a Transceiver from a Switch on page 195

SFP+ Direct Attach Cables for EX Series Switches

Small form-factor pluggable plus transceiver (SFP+) direct attach copper cables, also known as Twinax cables, are suitable for in-rack connections between servers and switches. They are suitable for short distances of up to 7 m (23 ft), making them ideal

for highly cost-effective networking connectivity within a rack and between adjacent racks. See Figure 26 on page 68.

Figure 26: SFP+ Direct Attach Cables for EX Series Switches



This topic describes:

Cable Specifications

EX Series switches support SFP+ passive direct attach cables. The passive Twinax cable is a straight cable with no active electronic components. EX Series switches support 1 m, 3 m, 5 m, and 7 m long SFP+ passive direct attach cables.

Table 25 on page 68 describes the support for SFP+ passive direct attach cable lengths on EX Series switches for Junos OS releases.

Table 25: Software Support for SFP+ Passive Direct Attach Cables for EX Series Switches

Switch	Software Support Added	Cable Length
EX3200 switches	Junos OS Release 10.3	1 m (3 ft), 3 m (10 ft), 5 m (16 ft), and 7 m (23 ft)
EX4200-24T, EX4200-24T-DC, EX4200-24P, EX4200-24PX, EX4200-24F, EX4200-24F-DC, EX4200-48T, EX4200-48T-DC, EX4200-48P, and EX4200-48PX switches	Junos OS Release 10.3	1 m (3 ft), 3 m (10 ft), 5 m (16 ft), and 7 m (23 ft)
EX4200-24F-S and EX4200-48T-S switches	Junos OS Release 12.3R4	1 m (3 ft), 3 m (10 ft), 5 m (16 ft), and 7 m (23 ft)
EX3300 switches	Junos OS Release 11.3	1 m (3 ft), 3 m (10 ft), 5 m (16 ft), and 7 m (23 ft)
EX4300-24T, EX4300-24P, EX4300-48T, EX4300-48T-AFI, EX4300-48P, EX4300-48T-DC, and EX4300-48T-DC-AFI switches	Junos OS Release 13.2X50-D10	1 m (3 ft), 3 m (10 ft), 5 m (16 ft), and 7 m (23 ft)
EX4300-32F switches	Junos OS Release 13.2X51-D15	1 m (3 ft) and 3 m (10 ft)
EX4300-24T-S, EX4300-24P-S, EX4300-48T-S, and EX4300-48P-S switches	Junos OS Release 13.2X51-D26	1 m (3 ft), 3 m (10 ft), 5 m (16 ft), and 7 m (23 ft)
EX4300-32F-S switches	Junos OS Release 13.2X51-D26	1 m (3 ft) and 3 m (10 ft)

Table 25: Software Support for SFP+ Passive Direct Attach Cables for EX Series Switches *(continued)*

Switch	Software Support Added	Cable Length
EX4500 switches	Junos OS Release 10.2	1 m (3 ft), 3 m (10 ft), and 7 m (23 ft)
	Junos OS Release 11.2	5 m (16 ft)
EX4550-32T-AFI, EX4550-32T-AFO, EX4550-32T-DC-AFI, EX4550-32T-DC-AFO, EX4550-32F-AFI, EX4550-32F-AFO, EX4550-32F-DC-AFI, and EX4550-32F-DC-AFO switches	Junos OS Release 12.2	1 m (3 ft), 3 m (10 ft), 5 m (16 ft), and 7 m (23 ft)
EX4550-32F-S switches	Junos OS Release 12.3R5	1 m (3 ft), 3 m (10 ft), 5 m (16 ft), and 7 m (23 ft)
EX8200 8-port SFP+ line cards (EX8200-8XS)	Junos OS Release 10.0	1 m (3 ft), 3 m (10 ft), and 7 m (23 ft)
	Junos OS Release 10.3	5 m (16 ft)
EX8200 40-port SFP+ line cards (EX8200-40XS)	Junos OS Release 10.3	1 m (3 ft), 3 m (10 ft), and 7 m (23 ft)
	Junos OS Release 11.1	5 m (16 ft)

NOTE: We recommend that you use only SFP+ direct attach cables purchased from Juniper Networks with your Juniper Networks device.

CAUTION: If you are having a problem running a Juniper Networks device that is using a third-party optic or cable, the Juniper Networks Technical Assistance Center (JTAC) can help you diagnose the source of the problem. Your JTAC engineer might recommend that you check the third-party optic or cable and potentially replace it with an equivalent Juniper Networks optic or cable that is qualified for the device.

The cables are hot-removable and hot-insertable: You can remove and replace them without powering off the switch or disrupting switch functions. A cable comprises a low-voltage cable assembly that connects directly into two SFP+ ports, one at each end of the cable. The cables use high-performance integrated duplex serial data links for bidirectional communication and are designed for data rates of up to 10 Gbps.

Table 26 on page 70 describes the cable specifications.

Table 26: SFP+ Direct Attach Cable Specifications

Model Number	Specification	Value
EX-SFP-10GE-DAC-1M	Rate	10-Gbps full-duplex serial transmission
	Connector type	SFP+ passive Twinax cable assembly
	Supply voltage	3.3 V
	Power consumption (per end)	0.57 W
	Storage temperature	–40°C through 85°C
	Cable type	Twinax
	Wire AWG	30 AWG
	Minimum cable bend radius	1 in. (2.54 cm)
	Cable characteristic impedance	100 ohms
	Crosstalk between pairs	2% maximum
	Time delay	1.31 nsec/ft
	Length	3.3 ft (1 m)
EX-SFP-10GE-DAC-3M	Rate	10-Gbps full-duplex serial transmission
	Connector type	SFP+ passive Twinax cable assembly
	Supply voltage	3.3 V
	Power consumption (per end)	0.57 W
	Storage temperature	–40°C through 85°C
	Cable type	Twinax
	Wire AWG	30 AWG
	Minimum cable bend radius	1 in. (2.54 cm)
	Cable characteristic impedance	100 ohms
	Crosstalk between pairs	2% maximum
	Time delay	1.31 nsec/ft
	Length	9.9 ft (3 m)

Table 26: SFP+ Direct Attach Cable Specifications *(continued)*

Model Number	Specification	Value
EX-SFP-10GE-DAC-5M	Rate	10-Gbps full-duplex serial transmission
	Connector type	SFP+ passive Twinax cable assembly
	Supply voltage	3.3 V
	Power consumption (per end)	0.57 W
	Storage temperature	–40°C through 85°C
	Cable type	Twinax
	Wire AWG	24 AWG
	Minimum cable bend radius	1 in. (2.54 cm)
	Cable characteristic impedance	100 ohms
	Crosstalk between pairs	2% maximum
	Time delay	1.31 nsec/ft
	Length	16.4 ft (5 m)
EX-SFP-10GE-DAC-7M	Rate	10-Gbps full-duplex serial transmission
	Connector type	SFP+ passive Twinax cable assembly
	Supply voltage	3.3 V
	Power consumption (per end)	0.57 W
	Storage temperature	–40°C through 85°C
	Cable type	Twinax
	Wire AWG	24 AWG
	Minimum cable bend radius	1 in. (2.54 cm)
	Cable characteristic impedance	100 ohms
	Crosstalk between pairs	2% maximum
	Time delay	1.31 nsec/ft
	Length	23 ft (7 m)

Standards Supported by These Cables

The cables comply with the following standards:

- SFP mechanical standard SFF-843—see ftp://ftp.seagate.com/sff/SFF-8431.PDF .
- Electrical interface standard SFF-8432—see ftp://ftp.seagate.com/sff/SFF-8432.PDF .
- SFP+ Multi-Source Alliance (MSA) standards.

Related Documentation

- *Pluggable Transceivers Supported on EX Series Switches*
- Installing a Transceiver in an EX Series Switch on page 134
- Removing a Transceiver from a Switch on page 195

Grounding Cable and Lug Specifications for EX4500 Switches

For installations that require a separate grounding conductor to the chassis, the switch must be adequately grounded before power is connected to ensure proper operation and to meet safety and electromagnetic interference (EMI) requirements. To ground an EX4500 switch, connect a grounding cable to earth ground and then attach it to the chassis grounding points.

CAUTION: For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the switch chassis to connect to earth ground. Before switch installation begins, a licensed electrician must attach a cable lug to the grounding cables that you supply. See "Connecting Earth Ground to an EX Series Switch" on page 137. A cable with an incorrectly attached lug can damage the switch.

A pair of threaded inserts (PEM nuts) is provided on the left side towards the rear corner of the chassis for connecting the switch to earth ground. The grounding points fit UNC 10-32 screws. The grounding points are spaced at 0.625 in. (15.86 mm).

The grounding cable that you provide for an EX4500 switch must be 14 AWG (2 mm^2), minimum 90ºC wire, or as permitted by the local code.

NOTE: Grounding is provided to an AC-powered switch when you plug its power supplies into grounded AC power receptacles.

WARNING: The switch is pluggable type A equipment installed in a restricted-access location. It has a separate protective earthing terminal provided on the chassis in addition to the grounding pin of the power supply cord. This separate protective earthing terminal must be permanently

connected to earth ground for installations that require a separate grounding conductor to the chassis.

Related Documentation

- AC Power Supply in EX4500 Switches on page 27
- Installing an AC Power Supply in an EX4500 Switch on page 122

PART 2

Planning for Switch Installation

CHAPTER 4

Site Preparation

Site Preparation Checklist for EX4500 Switches

The checklist in Table 27 on page 77 summarizes the tasks you need to perform when preparing a site for EX4500 switch installation.

Table 27: 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 for EX Series Switches" on page 81		
Power			
Measure distance between external power sources and switch installation site.			
Locate sites for connection of system grounding.			
Calculate the power consumption and requirements.	"AC Power Supply Specifications for EX4500 Switches" on page 95		
Hardware Configuration			
Choose the number and types of switches you want to install.	"EX4500 Switches Hardware Overview" on page 3		
Rack or Cabinet			

Table 27: Site Preparation Checklist *(continued)*

Item or Task	For More Information	Performed by	Date
Verify that your rack or cabinet meets the minimum requirements for the installation of the switch.	"Rack Requirements for EX4500 Switches" on page 85 "Cabinet Requirements for EX4500 Switches" on page 86		
Plan rack or cabinet location, including required space clearances.	"Clearance Requirements for Airflow and Hardware Maintenance for EX4500 Switches" on page 87		
Secure the rack or cabinet to the floor and building structure.			
Cables			
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 Documentation

- General Safety Guidelines and Warnings on page 221
- General Site Guidelines on page 78
- Installing and Connecting an EX4500 Switch on page 111
- Mounting an EX4500 Switch on page 114

General Site Guidelines

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches, the EX Series Redundant Power System (RPS), and the XRE200 External Routing Engine.

This topic also applies to hardware devices in the QFX Series and to OCX1100 switches.

Efficient device operation requires proper site planning and maintenance and proper layout of the equipment, rack or cabinet (if used), and wiring closet.

To plan and create an acceptable operating environment for your device and prevent environmentally caused equipment failures:

- Keep the area around the chassis free from dust and conductive material, such as metal flakes.
- Follow prescribed airflow guidelines to ensure that the cooling system functions properly and that exhaust from other equipment does not blow into the intake vents of the device.
- Follow the prescribed electrostatic discharge (ESD) prevention procedures to prevent damaging the equipment. Static discharge can cause components to fail completely or intermittently over time.
- Install the device in a secure area, so that only authorized personnel can access the device.

Related Documentation

- Prevention of Electrostatic Discharge Damage on page 250
- Environmental Requirements and Specifications for EX Series Switches on page 81
- *Environmental Requirements and Specifications for OCX1100 Switches*
- *Environmental Requirements and Specifications for a QFX3100 Director Device*
- *Environmental Requirements and Specifications for a QFX3008-I Interconnect Device*
- *Environmental Requirements and Specifications for a QFX3500 Device*
- *Environmental Requirements and Specifications for QFX3600 and QFX3600-I Devices*
- *Environmental Requirements and Specifications for a QFX5100 Device*

Site Electrical Wiring Guidelines

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches, the EX Series Redundant Power System (RPS), and the XRE200 External Routing Engine.

This topic also applies to hardware devices in the QFX Series and to OCX1100 switches.

Table 28 on page 80 describes the factors you must consider while planning the electrical wiring at your site.

WARNING: **It is particularly important to provide a properly grounded and shielded environment and to use electrical surge-suppression devices.**

Table 28: Site Electrical Wiring Guidelines

Site Wiring Factor	Guidelines
Signaling limitations	If your site experiences any of the following problems, consult experts in electrical surge suppression and shielding: • Improperly installed wires cause radio frequency interference (RFI). • Damage from lightning strikes occurs when wires exceed recommended distances or pass between buildings. • Electromagnetic pulses (EMPs) caused by lightning damage unshielded conductors and electronic devices.
Radio frequency interference	To reduce or eliminate RFI from your site wiring, do the following: • Use a 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, 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

Related Documentation

- General Safety Guidelines and Warnings on page 221
- General Electrical Safety Guidelines and Warnings on page 249
- Prevention of Electrostatic Discharge Damage on page 250
- *Power Supply in EX2200 Switches*
- *Power Supply in EX3200 Switches*
- *Power Supply in EX3300 Switches*
- *Power Supply in EX4200 Switches*
- *AC Power Supply in EX4300 Switches*
- *DC Power Supply in EX4300 Switches*
- AC Power Supply in EX4500 Switches on page 27
- DC Power Supply in EX4500 Switches on page 30
- *AC Power Supply in EX4550 Switches*
- *DC Power Supply in EX4550 Switches*
- *AC Power Supply in an EX4600 Switch*
- *DC Power Supply in an EX4600 Switch*

- *AC Power Supplies in an EX6200 Switch*
- *DC Power Supply in an EX6200 Switch*
- *AC Power Supply in an EX8200 Switch*
- *DC Power Supply in an EX8200 Switch*
- *AC Power Supply in an EX9204 Switch*
- *DC Power Supply in an EX9204 Switch*
- *AC Power Supply in an EX9208 Switch*
- *DC Power Supply in an EX9208 Switch*
- *AC Power Supply in an EX9214 Switch*
- *DC Power Supply in an EX9214 Switch*
- *Power Supply in an EX Series Redundant Power System*
- *AC Power Supply in OCX1100 Switches*
- *DC Power Supply in OCX1100 Switches*
- *AC Power Supply in a QFX3100 Director Device*
- *AC Power Supply in a QFX3008-I Interconnect Device*
- *Wiring Tray in a QFX3008-I Interconnect Device*
- *AC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device*
- *DC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device*
- *AC Power Supply for a QFX5100 Device*
- *DC Power Supply in a QFX5100 Device*

Environmental Requirements and Specifications for EX Series Switches

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 might overheat, leading to the switch temperature monitor shutting down the switch to protect the hardware components.

Table 29 on page 82 provides the required environmental conditions for normal switch operation.

Table 29: EX Series Switch Environmental Tolerances

Switch or device	Environment Tolerance			
	Altitude	Relative Humidity	Temperature	Seismic
EX2200-C	No performance degradation up to 5,000 feet (1524 meters)	Normal operation ensured in relative humidity range of 10% through 85% (noncondensing)	Normal operation ensured in the temperature range 32° F through 104° F (0° C through 40° C) at altitudes up to 5,000 ft (1,524 m). For information about extended temperature SFPs, see *Pluggable Transceivers Supported on EX2200 Switches*.	Complies with Zone 4 earthquake requirements as per GR-63, Issue 4.
EX2200 (except EX2200-C switches)	No performance degradation up to 10,000 feet (3048 meters)	Normal operation ensured in relative humidity range of 10% through 85% (noncondensing)	Normal operation ensured in the temperature range 32° F through 113° F (0° C through 45° C)	Complies with Zone 4 earthquake requirements as per GR-63, Issue 4.
EX3200	No performance degradation up to 10,000 feet (3048 meters)	Normal operation ensured in relative humidity range of 10% through 85% (noncondensing)	Normal operation ensured in the temperature range 32° F through 113° F (0° C through 45° C)	Complies with Zone 4 earthquake requirements as per GR-63, Issue 4.
EX3300	No performance degradation up to 10,000 feet (3048 meters)	Normal operation ensured in relative humidity range of 10% through 85% (noncondensing)	Normal operation ensured in the temperature range 32° F through 113° F (0° C through 45° C)	Complies with Zone 4 earthquake requirements as per GR-63, Issue 4.
EX4200	No performance degradation up to 10,000 feet (3048 meters)	Normal operation ensured in relative humidity range of 10% through 85% (noncondensing)	Normal operation ensured in the temperature range 32° F through 113° F (0° C through 45° C)	Complies with Zone 4 earthquake requirements as per GR-63, Issue 4.
EX4300	No performance degradation up to 10,000 feet (3048 meters)	Normal operation ensured in relative humidity range of 10% through 85% (noncondensing)	Normal operation ensured in the temperature range 32° F through 113° F (0° C through 45° C)	Complies with Zone 4 earthquake requirements as per GR-63, Issue 4.
EX4500	No performance degradation up to 10,000 feet (3048 meters)	Normal operation ensured in relative humidity range of 10% through 85% (noncondensing)	Normal operation ensured in the temperature range 32° F through 113° F (0° C through 45° C)	Complies with Zone 4 earthquake requirements as per GR-63, Issue 4.
EX4550	No performance degradation up to 10,000 feet (3048 meters)	Normal operation ensured in relative humidity range of 10% through 85% (noncondensing)	• EX4550-32F switches—Normal operation ensured in the temperature range 32° F through 113° F (0° C through 45° C) • EX4550-32T switches—Normal operation is ensured in the temperature range 32° F through 104° F (0° C through 40° C)	Complies with Zone 4 earthquake requirements as per GR-63, Issue 4.

Table 29: EX Series Switch Environmental Tolerances *(continued)*

Switch or device	Environment Tolerance			
	Altitude	Relative Humidity	Temperature	Seismic
EX4600	No performance degradation to 6,562 feet (2000 meters)	Normal operation ensured in relative humidity range of 5% through 90%, noncondensing • Short-term operation ensured in relative humidity range of 5% through 93%, noncondensing NOTE: As defined in NEBS GR-63-CORE, Issue 4, short-term events can be up to 96 hours in duration but not more than 15 days per year.	• Normal operation ensured in temperature range of 32° F through 104° F (0° C through 40° C) • Nonoperating storage temperature in shipping container: –40° F through 158° F (–40° C through 70° C)	Designed to comply with Zone 4 earthquake requirements per NEBS GR-63-CORE, Issue 4.
EX6210	No performance degradation up to 10,000 feet (3048 meters)	Normal operation ensured in relative humidity range of 10% through 85% (noncondensing)	Normal operation ensured in the temperature range 32° F through 104° F (0° C through 40° C)	Complies with Zone 4 earthquake requirements as per GR-63, Issue 4.
EX8208	No performance degradation up to 10,000 feet (3048 meters)	Normal operation ensured in relative humidity range of 10% through 85% (noncondensing)	Normal operation ensured in the temperature range 32° F through 104° F (0° C through 40° C)	Complies with Zone 4 earthquake requirements as per GR-63, Issue 4.
EX8216	No performance degradation up to 10,000 feet (3048 meters)	Normal operation ensured in relative humidity range of 10% through 85% (noncondensing)	Normal operation ensured in the temperature range 32° F through 104° F (0° C through 40° C)	Complies with Zone 4 earthquake requirements as per GR-63, Issue 4.
EX9204	No performance degradation up to 10,000 feet (3048 meters)	Normal operation ensured in relative humidity range of 5% through 90% (noncondensing)	Normal operation ensured in the temperature range 32° F through 104° F (0° C through 40° C) Nonoperating storage temperature in shipping container: –40° F (–40° C) to 158° F (70° C)	Complies with Zone 4 earthquake requirements as per GR-63.
EX9208	No performance degradation up to 10,000 feet (3048 meters)	Normal operation ensured in relative humidity range of 5% through 90% (noncondensing)	Normal operation ensured in the temperature range 32° F through 104° F (0° C through 40° C) Nonoperating storage temperature in shipping container: –40° F (–40° C) to 158° F (70° C)	Complies with Zone 4 earthquake requirements as per GR-63.

Table 29: EX Series Switch Environmental Tolerances *(continued)*

Switch or device	Environment Tolerance			
	Altitude	Relative Humidity	Temperature	Seismic
EX9214	No performance degradation up to 10,000 feet (3048 meters)	Normal operation ensured in relative humidity range of 5% through 90% (noncondensing)	Normal operation ensured in the temperature range 32° F through 104° F (0° C through 40° C) Nonoperating storage temperature in shipping container: –40° F (–40° C) to 158° F (70° C)	Complies with Zone 4 earthquake requirements as per GR-63.
XRE200	No performance degradation up to 10,000 feet (3048 meters)	Normal operation ensured in relative humidity range of 10% through 85% (noncondensing)	Normal operation ensured in the temperature range 41° F through 104° F (5° C through 40° C)	Complies with Zone 4 earthquake requirements as per GR-63, Issue 4.

NOTE: Install EX Series switches only in restricted areas, such as dedicated equipment rooms and equipment closets, in accordance with Articles 110–16, 110–17, and 110–18 of the National Electrical Code, ANSI/NFPA 70.

Related Documentation

- *Clearance Requirements for Airflow and Hardware Maintenance for EX2200 Switches*
- *Clearance Requirements for Airflow and Hardware Maintenance for EX3200 Switches*
- *Clearance Requirements for Airflow and Hardware Maintenance for EX3300 Switches*
- *Clearance Requirements for Airflow and Hardware Maintenance for EX4200 Switches*
- *Clearance Requirements for Airflow and Hardware Maintenance for EX4300 Switches*
- *Clearance Requirements for Airflow and Hardware Maintenance for an EX4600 Switch*
- *Clearance Requirements for Airflow and Hardware Maintenance for an EX Series Redundant Power System*
- Clearance Requirements for Airflow and Hardware Maintenance for EX4500 Switches on page 87
- *Clearance Requirements for Airflow and Hardware Maintenance for EX4550 Switches*
- *Clearance Requirements for Airflow and Hardware Maintenance for an EX6210 Switch*
- *Clearance Requirements for Airflow and Hardware Maintenance for an EX8208 Switch*
- *Clearance Requirements for Airflow and Hardware Maintenance for an EX8216 Switch*
- *Clearance Requirements for Airflow and Hardware Maintenance for an EX9204 Switch*
- *Clearance Requirements for Airflow and Hardware Maintenance for an EX9208 Switch*
- *Clearance Requirements for Airflow and Hardware Maintenance for an EX9214 Switch*

CHAPTER 5

Rack and Cabinet Requirements

Rack Requirements for EX4500 Switches

You can mount the switch on two-post racks or four-post racks.

Rack requirements consist of:

- Rack type
- Mounting bracket hole spacing
- Rack size and strength
- Rack connection to the building structure

Table 30 on page 85 provides the rack requirements and specifications for the switch.

Table 30: Rack Requirements and Specifications for the Switch

Rack Requirement	Guidelines
Rack type	Use a two-post rack or a four-post rack. You can mount the switch on any two-post or four-post rack that provides bracket holes or hole patterns spaced at 1 U (1.75 in. or 4.45 cm) increments and that meets the size and strength requirements to support the weight. A U is the standard rack unit defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310–D) published by the Electronics Industry Association (http://www.eia.org) .
Mounting bracket hole spacing	The holes in the mounting brackets are spaced at 1 U (1.75 in. or 4.45 cm), so that the switch can be mounted in any rack that provides holes spaced at that distance.

Table 30: Rack Requirements and Specifications for the Switch *(continued)*

Rack Requirement	Guidelines
Rack size and strength	• Ensure that the rack complies with the size and strength standards of 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) . • Ensure that the rack rails are spaced widely enough to accommodate the external dimensions of the switch chassis. The outer edges of the front mount brackets extend the width of the chassis to 19 in. (48.2 cm). • The rack must be strong enough to support the weight of the switch. • Ensure that the spacing of rails and adjacent racks provides for proper clearance around the switch and rack.
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 for maximum stability.

One pair of mounting brackets for mounting the switch on two posts of a rack is supplied with each switch. For mounting the switch on four posts of a rack or cabinet, you can order a four-post rack-mount kit separately.

Related Documentation

- Chassis Physical Specifications for EX4500 Switches on page 11
- Clearance Requirements for Airflow and Hardware Maintenance for EX4500 Switches on page 87
- Rack-Mounting and Cabinet-Mounting Warnings on page 236
- Mounting an EX4500 Switch on page 114

Cabinet Requirements for EX4500 Switches

You can mount the switch in a cabinet that contains a 19-in. rack.

Cabinet requirements consist of:

- Cabinet size
- Clearance requirements
- Cabinet airflow requirements

Table 31 on page 87 provides the cabinet requirements and specifications for the switch.

Table 31: Cabinet Requirements and Specifications for the Switch

Cabinet Requirement	Guidelines
Cabinet size	• You can mount the switch in a cabinet that contains 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.ecianow.org/standards-practices/standards/) . • The minimum cabinet size must be able to accommodate the maximum external dimensions of the switch.
Cabinet clearance	• The outer edges of the mounting brackets extend the width of the chassis to 19 in. (48.2 cm). • The minimum total clearance inside the cabinet is 30 in. (76.2 cm) between the inside of the front door and the inside of the rear door.
Cabinet airflow requirements	When you mount the switch in a cabinet, ensure that ventilation through the cabinet is sufficient to prevent overheating. • Ensure adequate cool air supply to dissipate the thermal output of the switch or switches. • Ensure that the hot air exhaust of the chassis exits the cabinet without recirculating into the switch. An open cabinet (without a top or doors) that employs hot air exhaust extraction from the top ensures the best airflow through the chassis. If the cabinet contains a top or doors, perforations in these elements assist with removing the hot air exhaust. • Install the switch in the cabinet in a way that maximizes the open space on the side of the chassis that has the hot air exhaust. • Route and dress all cables to minimize the blockage of airflow to and from the chassis. • Ensure that the spacing of rails and adjacent cabinets is such that there is proper clearance around the switch and cabinet. • A cabinet larger than the minimum required provides better airflow and reduces the chance of overheating.

Related Documentation

- Chassis Physical Specifications for EX4500 Switches on page 11
- Clearance Requirements for Airflow and Hardware Maintenance for EX4500 Switches on page 87
- Rack-Mounting and Cabinet-Mounting Warnings on page 236
- Mounting an EX4500 Switch on page 114

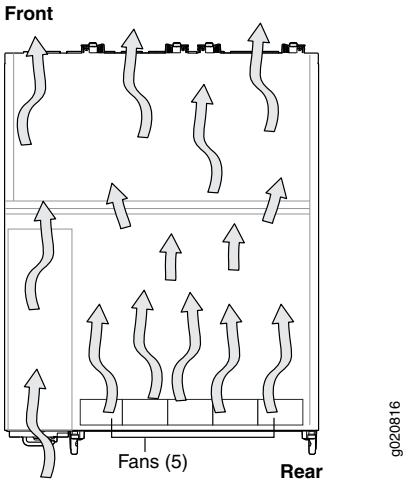
Clearance Requirements for Airflow and Hardware Maintenance for EX4500 Switches

When planning the site for installing an EX4500 switch, you must allow sufficient clearance around the switch.

Follow these clearance requirements:

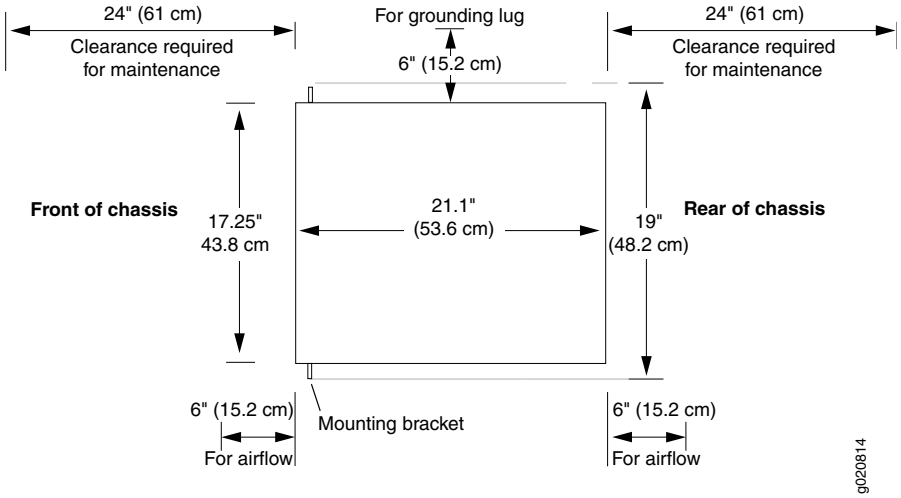
- For the cooling system to function properly, the airflow around the chassis must be unrestricted. See Figure 27 on page 88 and Figure 28 on page 88.

Figure 28: Back-to-Front Airflow Through the EX4500-40F-BF Switch Chassis



- If you are mounting the switch on a rack or cabinet along with other equipment, ensure that the exhaust from other equipment does not blow into the intake vents of the chassis.
- Leave at least 6 in. (15.2 cm) clearance in the front of and behind the chassis for airflow.
- Leave at least 6 in. (15.2 cm) clearance on the left of the chassis for installing the grounding lug.
- Leave at least 24 in. (61 cm) clearance in front of and behind the switch for service personnel to remove and install hardware components. See Figure 29 on page 88.

Figure 29: Clearance Requirements for Airflow and Hardware Maintenance for an EX4500 Switch Chassis



Related Documentation

- Rack Requirements for EX4500 Switches on page 85
- Cabinet Requirements for EX4500 Switches on page 86
- General Site Guidelines on page 78
- Rack-Mounting and Cabinet-Mounting Warnings on page 236
- Cooling System and Airflow in an EX4500 Switch on page 32

CHAPTER 6

Cable Requirements

Network Cable Specifications for EX4500 Switches

EX4500 switches have interfaces that use various types of network cables.

For instructions on connecting the switch to a network for out-of-band management using an Ethernet cable with an RJ-45 connector, see "Connecting a Switch to a Network for Out-of-Band Management" on page 149.

For instructions on connecting the switch to a management console using an Ethernet cable with an RJ-45 connector, see "Connecting a Switch to a Management Console" on page 150.

Related Documentation

- Planning EX4200, EX4500, and EX4550 Virtual Chassis on page 106
- Virtual Chassis Ports Connector Pinout Information for EX4500 Switches on page 46
- Management Port Connector Pinout Information for an EX4500 Switch on page 44
- Console Port Connector Pinout Information for an EX Series Switch on page 42
- Front Panel of an EX4500 Switch on page 12

Understanding EX Series Switches Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion

To determine the power budget and power margin needed for fiber-optic connections, you need to understand how signal loss, attenuation, and dispersion affect transmission. EX Series Switches use various types of network cable, including multimode and single-mode fiber-optic cable.

- Signal Loss in Multimode and Single-Mode Fiber-Optic Cable on page 92
- Attenuation and Dispersion in Fiber-Optic Cable on page 92

Signal Loss in Multimode and Single-Mode Fiber-Optic Cable

Multimode fiber is large enough in diameter to allow rays of light to reflect internally (bounce off the walls of the fiber). Interfaces with multimode optics typically use LEDs as light sources. However, LEDs are not coherent light sources. They spray varying wavelengths of light into the multimode fiber, which reflects the light at different angles. Light rays travel in jagged lines through a multimode fiber, causing signal dispersion. When light traveling in the fiber core radiates into the fiber cladding (layers of lower refractive index material in close contact with a core material of higher refractive index), higher-order mode loss (HOL) occurs. Together, these factors reduce the transmission distance of multimode fiber compared to that of single-mode fiber.

Single-mode fiber is so small in diameter that rays of light reflect internally through one layer only. Interfaces with single-mode optics use lasers as light sources. Lasers generate a single wavelength of light, which travels in a straight line through the single-mode fiber. Compared to multimode fiber, single-mode fiber has a higher bandwidth and can carry signals for longer distances. It is consequently more expensive.

Exceeding the maximum transmission distances can result in significant signal loss, which causes unreliable transmission. For information about the maximum transmission distance and supported wavelength range for the types of single-mode and multimode fiber-optic cables that are used on different EX Series switches see *Pluggable Transceivers Supported on EX Series Switches*.

Attenuation and Dispersion in Fiber-Optic Cable

An optical data link functions correctly provided that modulated light reaching the receiver has enough power to be demodulated correctly. *Attenuation* is the reduction in strength of the light signal during transmission. Passive media components such as cables, cable splices, and connectors cause attenuation. Although attenuation is significantly lower for optical fiber than for other media, it still occurs in both multimode and single-mode transmission. An efficient optical data link must transmit enough light to overcome attenuation.

Dispersion is the spreading of the signal over time. The following two types of dispersion can affect signal transmission through an optical data link:

- Chromatic dispersion, which is the spreading of the signal over time caused by the different speeds of light rays.
- Modal dispersion, which is the spreading of the signal over time caused by the different propagation modes in the fiber.

For multimode transmission, modal dispersion, rather than chromatic dispersion or attenuation, usually limits the maximum bit rate and link length. For single-mode transmission, modal dispersion is not a factor. However, at higher bit rates and over longer distances, chromatic dispersion limits the maximum link length.

An efficient optical data link must have enough light to exceed the minimum power that the receiver requires to operate within its specifications. In addition, the total dispersion must be within the limits specified for the type of link in Telcordia Technologies document

GR-253-CORE (Section 4.3) and International Telecommunications Union (ITU) document G.957.

When chromatic dispersion is at the maximum allowed, its effect can be considered as a power penalty in the power budget. The optical power budget must allow for the sum of component attenuation, power penalties (including those from dispersion), and a safety margin for unexpected losses.

Related Documentation

- Calculating the EX Series Switch Fiber-Optic Cable Power Budget on page 100
- Calculating the EX Series Switch Fiber-Optic Cable Power Margin on page 100

CHAPTER 7

Planning Power Requirements

AC Power Supply Specifications for EX4500 Switches

Table 32 on page 95 lists the power supply specifications for an AC power supply used in EX4500 switches.

Table 32: AC Power Supply Specifications for an EX4500 Switch

Item	Specifications
AC input voltage	Operating range: • Low-voltage line—100–120 VAC • High-voltage line—200–240 VAC
AC input line frequency	50–60 Hz
AC input current rating	• Low-voltage line—12 A • High-voltage line—6 A
AC output power	• Low-voltage line—1000 W • High-voltage line—1200 W
Power required by fans	

Related Documentation

- AC Power Supply in EX4500 Switches on page 27
- AC Power Supply LEDs in EX4500 Switches on page 29
- AC Power Cord Specifications for an EX4500 Switch on page 96

DC Power Specifications for EX4500 Switches

Table 33 on page 96 lists the power specifications for the DC power supply used in EX4500 switches.

Table 33: Power Specifications for the DC Power Supply Used in an EX4500 Switch

Item	Specifications
DC input voltage	• Minimum operating voltage: –42 VDC • Nominal operating voltage: –48 VDC • Operating voltage range: –42 VDC through –60 VDC
DC input current rating	30 A maximum at nominal operating voltage (–48 VDC).
Output power	1200 W
Power required by fans	

Related Documentation

- DC Power Supply in EX4500 Switches on page 30
- DC Power Supply LEDs in EX4500 Switches on page 32

AC Power Cord Specifications for an EX4500 Switch

Each AC power supply for the EX4500 switch has a single AC appliance inlet located on the power supply that requires a dedicated AC power feed. Most sites distribute power through a main conduit that leads to frame-mounted power distribution panels, one of which can be located at the top of the rack that houses the switch. An AC power cord connects each power supply to the power distribution panel.

Each detachable AC power cord is 2.5 meters (approximately 8 feet) long. The appliance coupler at the female end of the cord inserts into the AC appliance inlet on the faceplate of the AC power supply. The coupler type is C19 as described by the International Electrotechnical Commission (IEC) standard 60320. The plug at the male end of the power cord fits into the power source outlet that is standard for your geographical location.

NOTE: In North America, AC power cords must not exceed 4.5 meters (approximately 15 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) standards. The cords shipped with the switch are in compliance with these standards.

Table 34 on page 97 lists the AC power cord specifications for an EX4500 switch for the countries and regions listed in the table.

Table 34: AC Power Cord Specifications for an EX4500 Switch

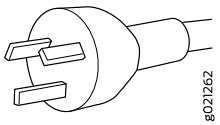
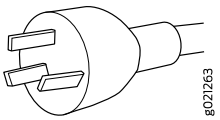
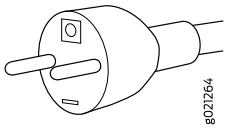
Country/Region	Electrical Specifications	Plug Standards	Juniper Model Number	Graphic
Argentina	250 VAC, 16 A, 50 Hz	IRAM Type RA/3/20	CBL-EX-PWR-C19-AR	No graphic available
Australia	250 VAC, 15 A, 50 Hz	AS/NZS 3112 Type SAA/3/15	CBL-EX-PWR-C19-AU	 g021262
Brazil	250 VAC, 16 A, 50 Hz	NBR 14136: 2002 Type BR/3/20	CBL-EX-PWR-C19-BR	No graphic available
China	250 VAC, 16 A, 50 Hz	GB 1002 Type PRC/3/16	CBL-EX-PWR-C19-CH	 g021263
Europe (except Italy, Switzerland, and United Kingdom)	250 VAC, 16 A, 50 Hz	CEE (7) VII Type VIIG	CBL-EX-PWR-C19-EU	 g021264
India	250 VAC, 16 A, 50 Hz	SABS 164/1:1992 Type ZA/3	CBL-EX-PWR-C19-IN	No graphic available

Table 34: AC Power Cord Specifications for an EX4500 Switch *(continued)*

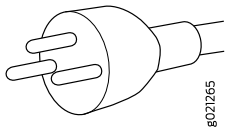
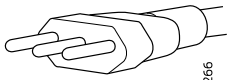
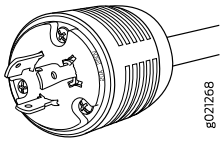
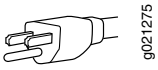
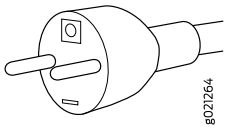
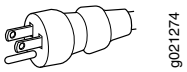
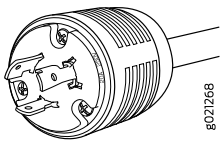
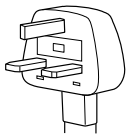
Country/Region	Electrical Specifications	Plug Standards	Juniper Model Number	Graphic
Israel	250 VAC, 16 A, 50 Hz	SI 32/1971 Type IL/3	CBL-EX-PWR-C19-IL	 g021265
Italy	250 VAC, 16 A, 50 Hz	CEI 23-16 Type I/3/16	CBL-EX-PWR-C19-IT	 g021266
Japan	250 VAC, 16 A, 50 Hz	NEMA L6–20 Type NEMA Locking	CBL-EX-PWR-C19-JPL (default)	 g021268
	125 VAC, 15 A, 50 Hz	NEMA 5-15 Type N5/15	CBL-EX-PWR-C19-JP110V	 g021275
Korea	250 VAC, 16 A, 50 Hz	CEE (7) VII Type VIIG	CBL-EX-PWR-C19-KR	 g021264
North America	125 VAC, 15 A, 50 Hz	NEMA 5–15 Type N5/15	CBL-EX-PWR-C19-US110V	 g021274
South Africa	250 VAC, 16 A, 50 Hz	SABS 164/1:1992 Type ZA/3	CBL-EX-PWR-C19-SA	 g021270
Switzerland	250 VAC, 16 A, 50 Hz	SEV 5934/2 Type 23G	CBL-EX-PWR-C19-SZ	No graphic available

Table 34: AC Power Cord Specifications for an EX4500 Switch *(continued)*

Country/Region	Electrical Specifications	Plug Standards	Juniper Model Number	Graphic
Taiwan	250 VAC, 16 A, 50 Hz	NEMA L6-20P Type NEMA LOCKING	CBL-EX-PWR-C19-TW	 g021268
United Kingdom	250 VAC, 13 A, 50 Hz	BS 1363/A Type BS89/13	CBL-EX-PWR-C19-UK	 g021271

CAUTION: The AC power cord for the EX4500 switch is intended for use with this switch only and not for any other use.

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。

g017253

CAUTION: Power cords must not block access to switch components.

WARNING: The switch is pluggable type A equipment installed in a restricted-access location. It has a separate protective earthing terminal provided on the chassis in addition to the grounding pin of the power supply cord. This separate protective earthing terminal must be permanently connected to earth ground. See "Connecting Earth Ground to an EX Series Switch" on page 137.

Related Documentation

- AC Power Supply in EX4500 Switches on page 27
- AC Power Electrical Safety Guidelines on page 252
- AC Power Disconnection Warning on page 254
- General Electrical Safety Guidelines and Warnings on page 249

- Connecting AC Power to an EX4500 Switch on page 143

Calculating the EX Series Switch Fiber-Optic Cable Power Budget

Calculate the link's power budget when planning fiber-optic cable layout and distances to ensure that fiber-optic connections have sufficient power for correct operation. The power budget is the maximum amount of power the link can transmit. When you calculate the power budget, you use a worst-case analysis to provide a margin of error, even though all the parts of an actual system do not operate at the worst-case levels.

To calculate the worst-case estimate for fiber-optic cable power budget (P_B) for the link:

1. Determine values for the link's minimum transmitter power (P_T) and minimum receiver sensitivity (P_R). For example, here, (P_T) and (P_R) are measured in decibels, and decibels are referred to one milliwatt (dBm).

   P_T = –15 dBm

   P_R = –28 dBm

   NOTE: **See the specifications for your transmitter and receiver to find the minimum transmitter power and minimum receiver sensitivity.**

2. Calculate the power budget (P_B) by subtracting (P_R) from (P_T):

   –15 dBm – (–28 dBm) = 13 dBm

Related Documentation

- Calculating the EX Series Switch Fiber-Optic Cable Power Margin on page 100
- Understanding EX Series Switches Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion on page 91
- *Pluggable Transceivers Supported on EX Series Switches*

Calculating the EX Series Switch Fiber-Optic Cable Power Margin

Calculate the link's power margin when planning fiber-optic cable layout and distances to ensure that fiber-optic connections have sufficient signal power to overcome system losses and still satisfy the minimum input requirements of the receiver for the required performance level. The power margin (P_M) is the amount of power available after attenuation or link loss (LL) has been subtracted from the power budget (P_B).

When you calculate the power margin, you use a worst-case analysis to provide a margin of error, even though all the parts of an actual system do not operate at worst-case levels. A power margin (P_M) greater than zero indicates that the power budget is sufficient to operate the receiver and that it does not exceed the maximum receiver input power. This means the link will work. A (P_M) that is zero or negative indicates insufficient power

to operate the receiver. See the specification for your receiver to find the maximum receiver input power.

Before you begin to calculate the power margin:

- Calculate the power budget. See "Calculating the EX Series Switch Fiber-Optic Cable Power Budget" on page 100.

To calculate the worst-case estimate for the power margin (P_M) for the link:

1. Determine the maximum value for link loss (LL) by adding estimated values for applicable link-loss factors—for example, use the sample values for various factors as provided in Table 35 on page 101 (here, the link is 2 km long and multimode, and the (P_B) is 13 dBm):

Table 35: Estimated Values for Factors Causing Link Loss

Link-Loss Factor	Estimated Link-Loss Value	Sample (LL) Calculation Values
Higher-order mode losses (HOL)	• Multimode—0.5 dBm • Single mode—None	• 0.5 dBm • 0 dBm
Modal and chromatic dispersion	• Multimode—None, if product of bandwidth and distance is less than 500 MHz/km • Single mode—None	• 0 dBm • 0 dBm
Connector	0.5 dBm	This example assumes 5 connectors. Loss for 5 connectors: (5) * (0.5 dBm) = 2.5 dBm
Splice	0.5 dBm	This example assumes 2 splices. Loss for two splices: (2) * (0.5 dBm) = 1 dBm
Fiber attenuation	• Multimode—1 dBm/km • Single mode—0.5 dBm/km	This example assumes the link is 2 km long. Fiber attenuation for 2 km: • (2 km) * (1.0 dBm/km) = 2 dBm • (2 km) * (0.5 dBm/km) = 1 dBm
Clock Recovery Module (CRM)	1 dBm	1 dBm

NOTE: For information about the actual amount of signal loss caused by equipment and other factors, see your vendor documentation for that equipment.

2. Calculate the (P_M) by subtracting (LL) from (P_B):

   $P_B - LL = P_M$

(13 dBm) – (0.5 dBm [HOL]) – ((5) * (0.5 dBm)) – ((2) * (0.5 dBm)) – ((2 km) * (1.0 dBm/km)) – (1 dB [CRM]) = P_M

13 dBm – 0.5 dBm – 2.5 dBm – 1 dBm – 2 dBm – 1 dBm = P_M

13 dBm – 0.5 dBm – 2.5 dBm – 1 dBm – 2 dBm – 1 dBm = P_M

P_M = 6 dBm

The calculated power margin is greater than zero, indicating that the link has sufficient power for transmission. Also, the power margin value does not exceed the maximum receiver input power. Refer to the specification for your receiver to find the maximum receiver input power.

Related Documentation

- Calculating the EX Series Switch Fiber-Optic Cable Power Budget on page 100
- Understanding EX Series Switches Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion on page 91
- *Pluggable Transceivers Supported on EX Series Switches*

CHAPTER 8

Planning the Virtual Chassis

Understanding EX4200, EX4500, and EX4550 Virtual Chassis Hardware Configurations

You can interconnect EX4200 switches together to form a Virtual Chassis composed exclusively of EX4200 switches. You can interconnect EX4500 switches together to form a Virtual Chassis composed exclusively of EX4500 switches. You can interconnect EX4550 switches together to form a Virtual Chassis composed exclusively of EX4550 switches. You can also interconnect EX4200 switches with EX4500 switches or with EX4550 switches or with both switches to form a mixed Virtual Chassis.

This topic covers:

Ports Used to Interconnect Virtual Chassis Members

You can use the following ports to connect Virtual Chassis members:

- On EX4200 switches:
  - The dedicated Virtual Chassis ports (VCPs) on each switch
  - SFP, SFP+, or XFP uplink module ports configured as VCPs
  - SFP network ports on EX4200-24F switches configured as VCPs
- On EX4500 switches:
  - The dedicated VCPs on the Virtual Chassis module
  - SFP+ network ports configured as VCPs
  - SFP+ uplink module ports configured as VCPs

- On EX4550 switches:
  - The dedicated VCPs on the Virtual Chassis module
  - SFP+ network ports configured as VCPs
  - SFP+ expansion module ports configured as VCPs
  - 10GBASE-T network ports configured as VCPs
  - 10GBASE-T expansion module ports configured as VCPs
  - 40G QSFP+ expansion module ports configured as VCPs

NOTE: You can use the 10GBASE-T Ethernet network ports, 10GBASE-T expansion module ports, and QSFP+ expansion module ports configured as VCPs to interconnect only EX4550 switches in a Virtual Chassis. These ports cannot be used to connect an EX4550 switch with an EX4200 switch or an EX4500 switch in a Virtual Chassis.

Number of Switches, Required Software Releases, and Member Roles That You Configure in the Virtual Chassis

A Virtual Chassis must have one member designated as the master switch and one member designated as the backup switch. All other switches in the configuration are designated as being in the linecard role. You manage Virtual Chassis operation through the master switch.

The number of switches that you can configure in a Virtual Chassis and the role that can be assigned to each switch in a Virtual Chassis depend on the Juniper Networks Junos operating system (Junos OS) release that is running on the switches.

See the following tables:

- Table 36 on page 104—EX4200 Virtual Chassis
- Table 37 on page 105—EX4500 Virtual Chassis
- Table 38 on page 105—EX4550 Virtual Chassis
- Table 39 on page 105—Mixed EX4200, EX4500, and EX4550 Virtual Chassis

Table 36: Number of Switches and Switch Roles for an EX4200 Virtual Chassis, per Junos OS Release

Junos OS Release	Number of Switches	Role
9.0 or later	Up to 10 EX4200 switches	There must be a master and a backup; the remaining switches must be in the linecard role.

Table 37: Number of Switches and Switch Roles for an EX4500 Virtual Chassis, per Junos OS Release

Junos OS Release	Number of Switches	Role
11.1—11.3	Up to 2 EX4500 switches	There must be a master and a backup.
11.4 or later	Up to 10 EX4500 switches	There must be a master and a backup; the remaining switches must be in the linecard role.

Table 38: Number of Switches and Switch Roles for an EX4550 Virtual Chassis, per Junos OS Release

Junos OS Release	Number of Switches	Role
12.2 or later	Up to 10 EX4550 switches	There must be a master and a backup; the remaining switches must be in the linecard role.

Table 39: Number of Switches and Switch Roles for a Mixed EX4200, EX4500, and EX4550 Virtual Chassis, per Junos OS Release

Junos OS Release	Number of Switches	Role
11.1	Up to 2 EX4500 switches and up to 8 EX4200 switches	EX4500 switches must be in the master and backup roles and EX4200 switches in the linecard role.
11.2, 11.3	Up to 2 EX4500 switches and up to 8 EX4200 switches	Master and backup must be of the same switch type—either both EX4200 or both EX4500 switches. The remaining switches must be in the linecard role.
11.4 or later	Up to 10 total of both EX4200 and EX4500 switches	Any switch type in any role. There must be a master and a backup and the remaining switches must be in the linecard role.
12.2 or later	Up to 10 total of EX4200, EX4500, and EX4550 switches	Any switch type in any role. There must be a master and a backup and the remaining switches must be in the linecard role.

Virtual Chassis Module

Virtual Chassis modules are available for EX4500 and EX4550 switches. However, installing a Victual Chassis module is not mandatory for using these switches in a Virtual Chassis configuration.

NOTE: On EX4500 switches that are running Junos OS releases earlier than Release 11.4R1, you must install a Virtual Chassis module for using the switch in a Virtual Chassis configuration. Starting with Release 11.4R1, you can use uplink port connections to interconnect EX4500 member switches into a Virtual Chassis.

Switch Role and Member ID on the LCD Panel

For each switch in the Virtual Chassis, the LCD panel of the switch displays:

- Role of the switch—**RE** for master, **BK** for backup, and **LC** for linecard member
- Member ID for the Virtual Chassis member—A number in the range 0 through 9

Related Documentation

- *Understanding EX Series Virtual Chassis Components*
- Planning EX4200, EX4500, and EX4550 Virtual Chassis on page 106
- *EX Series Virtual Chassis Overview*

Planning EX4200, EX4500, and EX4550 Virtual Chassis

Before interconnecting EX4200, EX4500, and EX4550 switches in a Virtual Chassis configuration:

- Verify that the rack in which you will install the switches meets the requirements described in *Rack Requirements for EX4200 Switches*, "Rack Requirements for EX4500 Switches" on page 85, and *Rack Requirements for EX4550 Switches*. You can mount the switches in a Virtual Chassis on a single rack or on multiple racks.
- Verify that the installation site meets the power requirements of the switches in a Virtual Chassis.
- Verify that you have installed a Virtual Chassis module in an EX4500 switch running Junos OS releases earlier than Release 11.4R1. The Virtual Chassis module must be installed in an EX4500 switch to form a Virtual Chassis.

Table 40 on page 106 describes the Virtual Chassis components and the Junos OS release running on switches that you need to consider when you plan your EX4200, EX4500, and EX4550 Virtual Chassis configuration.

Table 40: Virtual Chassis Components to Consider When Planning an EX4200, EX4500, and EX4550 Virtual Chassis

Virtual Chassis Components	Junos OS Release Running on the Member Switches	Virtual Chassis Details
EX4200 switches only	Junos OS Release 9.0 and later	You can interconnect two to ten EX4200 switches to form a Virtual Chassis composed exclusively of EX4200 switches.
EX4500 switches only	Junos OS Releases 11.1, 11.2, and 11.3	You can interconnect two EX4500 switches into a Virtual Chassis composed exclusively of EX4500 switches.
	Junos OS Release 11.4 or later	You can interconnect up to ten EX4500 switches into a Virtual Chassis composed exclusively of EX4500 switches.
EX4550 switches only	Junos OS Release 12.2 or later	You can interconnect up to ten EX4550 switches into a Virtual Chassis composed exclusively of EX4550 switches.

Table 40: Virtual Chassis Components to Consider When Planning an EX4200, EX4500, and EX4550 Virtual Chassis *(continued)*

Virtual Chassis Components	Junos OS Release Running on the Member Switches	Virtual Chassis Details
EX4200, EX4500, and EX4550 switches	Junos OS Release 11.1	You can interconnect up to two EX4500 switches and up to eight EX4200 switches into a mixed Virtual Chassis. EX4500 switches must always be configured in the master and backup roles.
	Junos OS Releases 11.2 and 11.3	You can interconnect up to two EX4500 switches and up to eight EX4200 switches into a mixed Virtual Chassis. The same type of switch must act in the master and backup roles.
	Junos OS Release 11.4 or later	You can interconnect up to ten total EX4200 and EX4500 switches into a mixed Virtual Chassis . Any switch can be configured in any role in any configuration.
	Junos OS Release 12.2 or later	You can interconnect up to ten total EX4200, EX4500, and EX4550 switches into a mixed Virtual Chassis. Any switch can be configured in any role in any configuration.

Table 41 on page 107 describes the cabling requirements for a Virtual Chassis.

Table 41: Cabling Requirements for a Virtual Chassis

Distance Between Virtual Chassis Members	Virtual Chassis Cable Lengths Supported	Details
Up to 0.5 m	0.5 m	You can interconnect EX4200, EX4500, and EX4550 switches into a Virtual Chassis through Virtual Chassis ports (VCPs) using the 0.5-meter Virtual Chassis cable. • This Virtual Chassis cable is supplied with an EX4200 switch. • You must order this cable separately for EX4500 and EX4550 switches, including EX4500 switches that are shipped with a preinstalled Virtual Chassis module.
0.5 m through 5 m	1 m, 3 m, and 5 m	You must order these cables separately for EX4200, EX4500, and EX4550 switches, including EX4500 switches that are shipped with a preinstalled Virtual Chassis module.

Table 41: Cabling Requirements for a Virtual Chassis *(continued)*

Distance Between Virtual Chassis Members	Virtual Chassis Cable Lengths Supported	Details
Greater than 5 m	–	• To interconnect EX4200 switches that are installed farther apart than 5 m, you must configure the SFP, SPF+, or XFP uplink module ports or the SFP network ports in the EX4200-24F switch as VCPs and use them to interconnect the switches. • To interconnect EX4500 switches that are installed farther apart than 5 m, you must configure either the uplink module ports or the SFP+ network ports as VCPs and use them to interconnect the switches. • To interconnect EX4550 switches that are installed farther apart than 5 m, you must configure either the expansion module ports or the network ports as VCPs and use them to interconnect the switches.

NOTE: With separately ordered Virtual Chassis cables, you can use the cable connector retainers provided with the original cable; you can also use separately ordered Virtual Chassis cable connector retainers.

Related Documentation

- *Understanding EX Series Virtual Chassis Components*
- Understanding EX4200, EX4500, and EX4550 Virtual Chassis Hardware Configurations on page 103
- *Virtual Chassis Cabling Configuration Examples for EX4200 Switches*
- *Clearance Requirements for Airflow and Hardware Maintenance for EX4200 Switches*
- Clearance Requirements for Airflow and Hardware Maintenance for EX4500 Switches on page 87

PART 3

Installing and Connecting the Switch and Switch Components

CHAPTER 9

Installing the Switch

Installing and Connecting an EX4500 Switch

To install and connect an EX4500 switch:

1. Follow instructions in "Unpacking an EX4500 Switch" on page 112.
2. Mount the switch by following instructions appropriate for your site:
   - "Mounting an EX4500 Switch on Two Posts in a Rack or Cabinet" on page 114 (using the mounting brackets provided)
   - "Mounting an EX4500 Switch on Four Posts in a Rack or Cabinet" on page 116 (using the separately orderable four-post rack-mount kit)
3. Follow instructions in "Connecting Earth Ground to an EX Series Switch" on page 137.
4. Follow instructions for connecting power as appropriate for your site:
   - Connecting AC Power to an EX4500 Switch on page 143
5. Perform initial configuration of the switch by following instructions in "Connecting and Configuring an EX Series Switch (CLI Procedure)" on page 161 or "Connecting and Configuring an EX Series Switch (J-Web Procedure)" on page 164.
6. Set the switch's management options by following the appropriate instructions:
   - Connecting a Switch to a Network for Out-of-Band Management on page 149
   - Connecting a Switch to a Management Console on page 150

Related Documentation

- Rack Requirements for EX4500 Switches on page 85
- Cabinet Requirements for EX4500 Switches on page 86
- Clearance Requirements for Airflow and Hardware Maintenance for EX4500 Switches on page 87

Unpacking an EX4500 Switch

The EX4500 switches are shipped in a cardboard carton, secured with foam packing material. The carton has an accessory compartment and contains the quick start instructions.

CAUTION: **EX4500 switches are maximally protected inside the shipping carton. Do not unpack the switches until you are ready to begin installation.**

To unpack the switch:

1. Open the carton.
2. Pull out the packing material holding the switch in place.
3. Verify the parts received against the inventory on the label attached to the carton. See "Parts Inventory (Packing List) for an EX4500 Switch" on page 112.
4. Save the shipping carton and packing materials in case you need to move or ship the switch later.

Related Documentation

- Installing and Connecting an EX4500 Switch on page 111
- Connecting and Configuring an EX Series Switch (CLI Procedure) on page 161
- Connecting and Configuring an EX Series Switch (J-Web Procedure) on page 164

Parts Inventory (Packing List) for an EX4500 Switch

The switch shipment includes a packing list. Check the parts you receive with the switch against the items on the packing list. The packing list specifies the part number and description of each part in your order. The parts shipped depend on the switch model you order. See "EX4500 Switch Models" on page 7 for more information.

If any part on the packing list is missing, contact your customer service representative or contact Juniper customer care from within the U.S. or Canada by telephone at 1–800–638–8296. For international-dial or direct-dial options in countries without toll-free numbers, see http://www.juniper.net/support/requesting-support.html .

Table 42 on page 113 lists the parts and their quantities in the packing list for an EX4500 switch.

Table 42: Inventory of Components Provided with an EX4500 Switch

Component	Quantity
Switch	1
Intraconnect module or Virtual Chassis module (preinstalled)	1
Fan tray (preinstalled)	1
Power supply (preinstalled)	1 AC or DC
AC power cord appropriate for your geographical location (only for AC switch models)	1
Power cord retainer clip (only for AC switch models)	1
Cover panels for slots without installed components (preinstalled)	• Power supply cover panel: 1 • Uplink module cover panels: 2
Dust covers for ports	40
Mounting brackets	2
Mounting screws	20
Rubber feet	4
Accessory kit box	1
Quick Start installation instructions	1
Pub, Juniper Product ROHS and Warranty Document	1
End User License Agreement	1
Ethernet cable, RJ-45/RJ-45, 4-pair stranded UTP, category #5	1
RJ-45 to DB-9 serial port adapter	1

NOTE: You must provide mounting screws that are appropriate for your rack to mount the chassis on a rack or a cabinet.

Related Documentation

- Unpacking an EX4500 Switch on page 112
- EX4500 Switches Hardware Overview on page 3

Mounting an EX4500 Switch

You can mount an EX4500 switch:

- On two posts in a 19-in. rack or cabinet by using the mounting brackets provided with the switch.
- On four posts in a 19-in. rack or cabinet by using the separately orderable four-post rack-mount kit.
- In a position recessed 2 in. from the front of a 19-in. rack or cabinet by using the separately orderable four-post rack-mount kit. You can mount the switch in this recessed position on four-post racks and cabinets.

The holes in the mounting brackets are placed at 1 U (1.75 in. or 4.45 cm) apart so that the switch can be mounted in any rack or cabinet that provides holes spaced at that distance.

See the Related Documentation for detailed descriptions of the various rack or cabinet mounting options.

Related Documentation

- Mounting an EX4500 Switch on Two Posts in a Rack or Cabinet on page 114
- Mounting an EX4500 Switch on Four Posts in a Rack or Cabinet on page 116
- Mounting an EX4500 Switch in a Recessed Position in a Rack or Cabinet on page 120
- Connecting Earth Ground to an EX Series Switch on page 137

Mounting an EX4500 Switch on Two Posts in a Rack or Cabinet

You can mount an EX4500 switch on two posts of a 19-in. rack (either a two-post or a four-post rack) or a 19-in. cabinet by using the mounting brackets provided with the switch. (The remainder of this topic uses “rack” to mean “rack or cabinet.”)

You can mount the switch on four posts of a four-post rack by using the mounting brackets provided with the separately orderable four-post rack-mount kit. See “Mounting an EX4500 Switch on Four Posts in a Rack or Cabinet” on page 116.

Before mounting the switch on two posts in a rack:

- Verify that the site meets the requirements described in “Site Preparation Checklist for EX4500 Switches” on page 77.
- Place the rack in its permanent location, allowing adequate clearance for airflow and maintenance, and secure it to the building structure.
- Read “General Safety Guidelines and Warnings” on page 221, with particular attention to “Chassis Lifting Guidelines for EX4500 Switches” on page 235.
- Remove the switch from the shipping carton (see “Unpacking an EX4500 Switch” on page 112).

Ensure that you have the following parts and tools available:

- Phillips (+) screwdriver, number 2
- 2 mounting brackets and 20 mounting screws (provided in the accessory box shipped with the switch)
- Screws to secure the chassis to the rack (not provided)
- Dust covers for ports

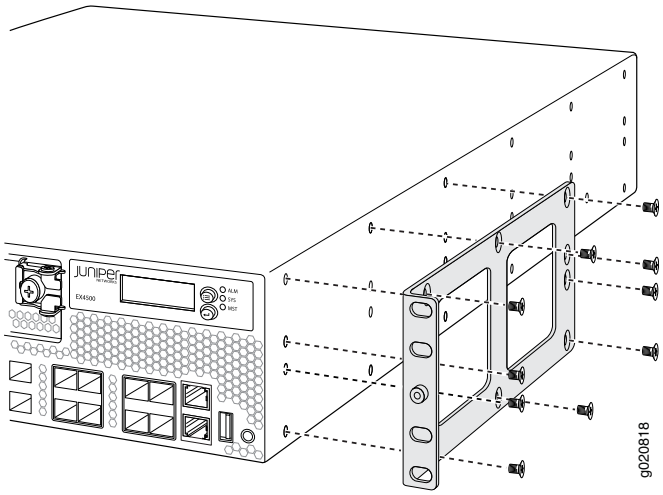
NOTE: One person must be available to lift the switch while another secures the switch to the rack.

CAUTION: If you are mounting multiple units on the rack, mount the heaviest unit at the bottom and mount the others from bottom to top in order of decreasing weight.

To mount the switch on two posts in a rack:

1. Place the switch on a flat, stable surface.
2. Align the mounting brackets along the front or rear of the side panels of the switch chassis depending on whether you are front-mounting or rear-mounting the switch. See Figure 30 on page 115.

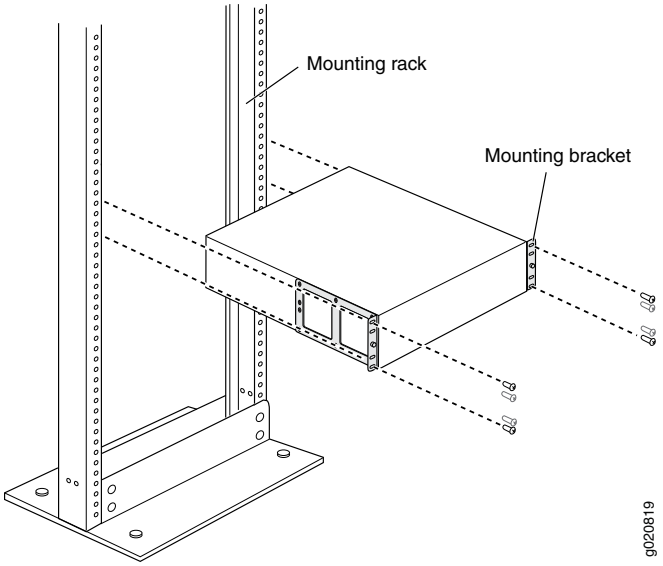
Figure 30: Attaching the Mounting Bracket Along the Front of the Switch



3. Align the bottom holes in the mounting brackets with holes on the side panels of the switch chassis.
4. Insert mounting screws into the aligned holes. Tighten the screws.
5. Ensure that the other holes in the mounting brackets are aligned with the holes in the side panels. Insert a screw in each hole and tighten the screws.

6. Have one person grasp both sides of the switch, lift the switch, and position it in the rack, aligning the mounting bracket holes with the threaded holes in the rack or cabinet rail. Align the bottom hole in both the mounting brackets with a hole in each rack rail, making sure the chassis is level. See Figure 31 on page 116.

Figure 31: Mounting the Switch on Two Posts in a Rack



7. Have a second person secure the switch to the rack by using the appropriate screws. Tighten the screws.
8. Ensure that the switch chassis is level by verifying that all screws on one side of the rack are aligned with the screws on the other side.
9. We recommend that you insert dust covers in any unused ports.

Related Documentation

- Connecting Earth Ground to an EX Series Switch on page 137
- Connecting AC Power to an EX4500 Switch on page 143
- Connecting DC Power to an EX4500 Switch on page 145
- Connecting and Configuring an EX Series Switch (CLI Procedure) on page 161
- Connecting and Configuring an EX Series Switch (J-Web Procedure) on page 164
- Rack-Mounting and Cabinet-Mounting Warnings on page 236

Mounting an EX4500 Switch on Four Posts in a Rack or Cabinet

You can mount an EX4500 switch on four posts of a 19-in. rack or cabinet by using the separately orderable four-post rack-mount kit. (The remainder of this topic uses “rack” to mean “rack or cabinet.”)

You can mount the switch on two posts in either a two-post rack or a four-post rack by using the mounting brackets provided with the switch. See "Mounting an EX4500 Switch on Two Posts in a Rack or Cabinet" on page 114.

NOTE: If you are mounting the switch on four posts, ensure that the rack is 21.5 in. through 31.5 in. deep if you will mount the switch flush with the rack front and that the rack is 23.5 in. through 32.5 in. deep if you will mount the switch 2 in. recessed from the rack front, thus ensuring that the protective earthing terminal is accessible through the opening in the rear mounting-blade.

Before mounting the switch on four posts in a rack:

- Verify that the site meets the requirements described in "Site Preparation Checklist for EX4500 Switches" on page 77.
- Place the rack in its permanent location, allowing adequate clearance for airflow and maintenance, and secure it to the building structure.
- Read "General Safety Guidelines and Warnings" on page 221, with particular attention to "Chassis Lifting Guidelines for EX4500 Switches" on page 235.
- Remove the switch from the shipping carton (see "Unpacking an EX4500 Switch" on page 112).
- Have two persons available to mount the switch. One person will support the switch in a level position, and the second person will secure the switch to the rack.

Ensure that you have the following parts and tools available:

- Phillips (+) screwdriver, number 2
- 12 flat-head M4x6-mm Phillips mounting screws (provided with the four-post rack-mount kit)
- One pair of front-mounting brackets
- One pair of rear mounting-blades
- Screws to secure the front-mounting brackets and the rear mounting-blades to the rack (not provided)

CAUTION: If you are mounting multiple units on a rack, mount the heaviest unit at the bottom of the rack and mount the other units from the bottom of the rack to the top in decreasing order of the weight of the units.

To mount the switch on four posts in a rack:

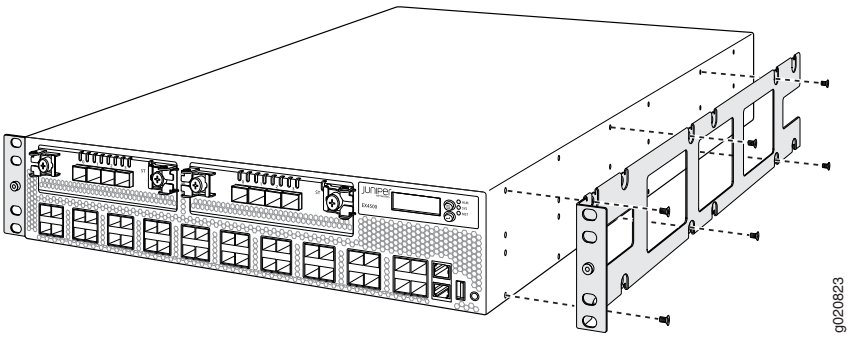
1. Place the switch on a flat, stable surface.
2. Align a front bracket (either flush with the front of the chassis or 2-in.-recessed from the front of the chassis) along the side panel of the switch chassis. Align the two holes in the front of the brackets with the two holes on the front of the side panel.

   NOTE: Each side of the chassis has twelve holes for attaching the front-mounting brackets to the switch.

   Six holes on the chassis side align with six holes in the front bracket when the front bracket is mounted flush with the chassis front or recessed 2 in. from the front of the chassis.

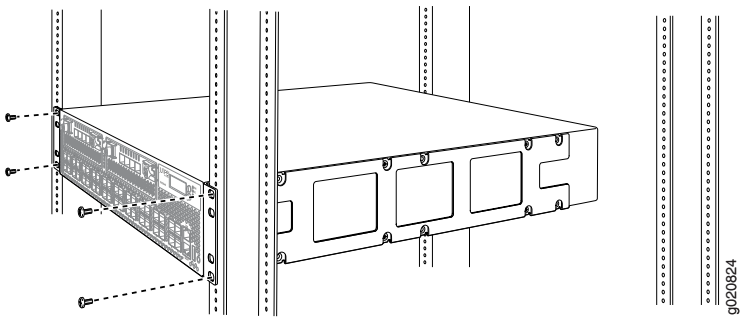
3. Insert M4x6-mm Phillips flat-head mounting screws into the two aligned holes and tighten the screws. Ensure that the remaining four holes in the front bracket are aligned with the four holes in the side panel. See Figure 32 on page 118.

Figure 32: Attaching the Front-Mounting Bracket to the Switch Chassis



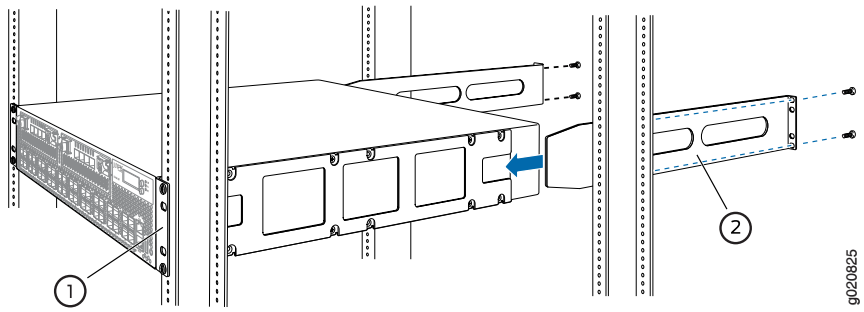
4. Insert M4x6-mm Phillips flat-head mounting screws into the remaining four holes in the front bracket and tighten the screws.
5. Repeat steps 2 through 4 for attaching the front bracket to the other side of the chassis.
6. Have one person grasp both sides of the switch, lift the switch, and position it in the rack, aligning the front bracket holes with the threaded holes in the front post of the rack. Align the bottom hole in both the front-mounting brackets with a hole in each rack rail, making sure the chassis is level. See Figure 33 on page 119.

Figure 33: Mounting the Switch on the Front Posts in a Rack



7. Have a second person secure the front of the switch to the rack by using the appropriate screws for your rack.
8. Slide the rear mounting-blades into the front-mounting brackets. See Figure 34 on page 119.

Figure 34: Sliding the Rear Mounting-Blades to the Rear of a Four-Post Rack



1—Front-mounting brackets	2—Rear mounting-blades

9. Attach the rear mounting-blades to the rear post by using the appropriate screws for your rack. Tighten the screws.
10. Ensure that the switch chassis is level by verifying that all the screws on the front of the rack are aligned with the screws at the back of the rack.

Related Documentation

- Connecting Earth Ground to an EX Series Switch on page 137
- Connecting AC Power to an EX4500 Switch on page 143
- Connecting DC Power to an EX4500 Switch on page 145
- Connecting and Configuring an EX Series Switch (CLI Procedure) on page 161
- Connecting and Configuring an EX Series Switch (J-Web Procedure) on page 164
- Mounting an EX4500 Switch in a Recessed Position in a Rack or Cabinet on page 120
- Rack-Mounting and Cabinet-Mounting Warnings on page 236

Mounting an EX4500 Switch in a Recessed Position in a Rack or Cabinet

You can mount an EX4500 switch in a rack or cabinet such that the switch is recessed inside the rack from the rack front by 2 inches. Use the front brackets provided in the separately orderable four-post rack-mount kit to mount the switch in a recessed position.

Reasons to mount the switch in a recessed position include:

- You are mounting the switch in a cabinet and the cabinet doors will not close completely unless the switch is recessed.
- The switch you are mounting has an uplink module with transceivers installed in it—the transceivers in the uplink module ports protrude from the front of the switch.

To mount the switch in a recessed position on four posts, follow the instructions in "Mounting an EX4500 Switch on Four Posts in a Rack or Cabinet" on page 116.

NOTE: **You cannot mount the EX4500 switch in a recessed position in a two-post rack or cabinet.**

Related Documentation

- Connecting Earth Ground to an EX Series Switch on page 137
- Rack-Mounting and Cabinet-Mounting Warnings on page 236

CHAPTER 10

Installing Switch Components

Installing and Removing EX4500 Switch Hardware Components

The EX4500 switch chassis is a rigid sheet-metal structure that houses the hardware components. The field-replaceable units (FRUs) in EX4500 switches are:

- Power supply
- Fan tray
- Uplink module
- Intraconnect module
- Virtual Chassis module
- SFP transceiver
- SFP+ transceiver

The power supply, fan tray, uplink module, and transceivers are hot-removable and hot-insertable: You can remove and replace them without powering off the switch or disrupting switch functions.

The Intraconnect module and Virtual Chassis module are offline field–replaceable: You can remove and replace these components, but the switch must be powered off to replace the component.

See these topics for instructions for installing and removing components:

- Installing an AC Power Supply in an EX4500 Switch on page 122
- Removing an AC Power Supply from an EX4500 Switch on page 176
- Installing a DC Power Supply in an EX4500 Switch on page 124
- Removing a DC Power Supply from an EX4500 Switch on page 183
- Installing a Fan Tray in an EX4500 Switch on page 125
- Removing a Fan Tray from an EX4500 Switch on page 184
- Installing an Uplink Module in an EX4500 Switch on page 127
- Removing an Uplink Module from an EX4500 Switch on page 186
- Installing an Intraconnect Module in an EX4500 Switch on page 129
- Removing an Intraconnect Module from an EX4500 Switch on page 188
- Installing a Virtual Chassis Module in an EX4500 Switch on page 131
- Removing a Virtual Chassis Module from an EX4500 Switch on page 190
- Installing a Transceiver in an EX Series Switch on page 134
- Removing a Transceiver from a Switch on page 195

Related Documentation

- Cooling System and Airflow in an EX4500 Switch on page 32
- AC Power Supply in EX4500 Switches on page 27
- DC Power Supply in EX4500 Switches on page 30
- Uplink Modules in EX4500 Switches on page 36
- Intraconnect Module in EX4500 Switches on page 38
- Virtual Chassis Module in EX4500 Switches on page 39
- Pluggable Transceivers Supported on EX4500 Switches on page 49

Installing an AC Power Supply in an EX4500 Switch

The power supply in EX4500 switches is a hot-removable and hot-insertable field-replaceable unit (FRU): You can remove and replace it without powering off the switch or disrupting switch functions.

Before you install an AC power supply in the switch:

- Ensure you understand how to prevent ESD damage. See "Prevention of Electrostatic Discharge Damage" on page 250.

NOTE: **Each power supply must be connected to a dedicated power source outlet.**

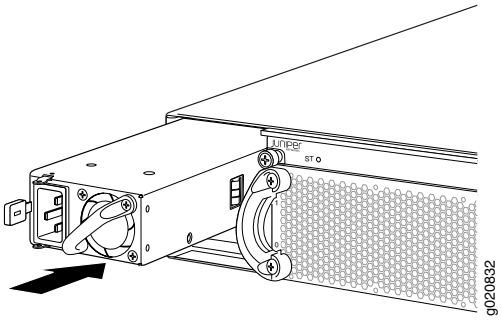
To install a power supply in the switch (see Figure 35 on page 123):

1. Ensure that you have the correct power supply. The color of the power supply's ejector lever must match the color of the intake or exhaust labels visible through the fan tray vents. See "AC Power Supply in EX4500 Switches" on page 27.

   CAUTION: Operating the switch with an incorrect power supply might cause the chassis to overheat.

2. Attach the electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
3. If the power supply slot has a cover panel on it, pull the handle of the cover panel outwards and remove it. Save the cover panel for later use.
4. Taking care not to touch power supply pins, leads, or solder connections, remove the power supply from the bag.
5. Using both hands, place the power supply in the power supply slot on the rear panel of the switch and slide it in until it is fully seated. You will hear a distinct click sound when the power supply is fully seated in the chassis.

Figure 35: Installing a Power Supply in an EX4500 Switch



NOTE: If you have a Juniper J-Care service contract, register any addition, change, or upgrade of hardware components at https://www.juniper.net/customers/csc/management/updateinstallbase.jsp . Failure to do so can result in significant delays if you need replacement parts. This note applies if you change the type of power supply or add a new type of uplink module. It does not apply if you replace these components with the same type of component.

Related Documentation

- Removing an AC Power Supply from an EX4500 Switch on page 176
- AC Power Supply in EX4500 Switches on page 27
- Connecting AC Power to an EX4500 Switch on page 143
- AC Power Cord Specifications for an EX4500 Switch on page 96

- Rear Panel of an EX4500 Switch on page 13

Installing a DC Power Supply in an EX4500 Switch

The DC power supply in EX4500 switches is a hot-removable and hot-insertable field-replaceable unit (FRU): You can remove and replace it without powering off the switch or disrupting switch functions.

Before you install a DC power supply in the switch:

- Ensure you understand how to prevent ESD damage. See "Prevention of Electrostatic Discharge Damage" on page 250.

Ensure that you have the following parts and tools available to install a DC power supply in the switch chassis:

- Electrostatic discharge (ESD) grounding strap

NOTE: **Each power supply must be connected to a dedicated power source outlet.**

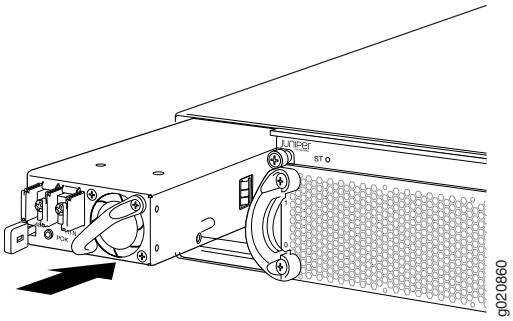
To install a DC power supply in the switch (see Figure 36 on page 125):

1. Ensure that you have the correct power supply. The color of the power supply's ejector lever must match the color of the exhaust labels visible through the fan tray vents. See "DC Power Supply in EX4500 Switches" on page 30.

   CAUTION: **Operating the switch with an incorrect power supply might cause the chassis to overheat.**

2. Attach the electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
3. If the power supply slot has a cover panel on it, pull the handle of the cover panel outwards and remove it. Save the cover panel for later use.
4. Taking care not to touch power supply pins, leads, or solder connections, remove the power supply from the bag.
5. Using both hands, place the power supply in the power supply slot on the rear panel of the switch and slide it in until it is fully seated. You will hear a distinct click sound when the power supply is fully seated in the chassis.

Figure 36: Installing a DC Power Supply in an EX4500 Switch



NOTE: If you have a Juniper J-Care service contract, register any addition, change, or upgrade of hardware components at https://www.juniper.net/customers/csc/management/updateinstallbase.jsp . Failure to do so can result in significant delays if you need replacement parts. This note applies if you change the type of power supply or add a new type of uplink module. It does not apply if you replace these components with the same type of component.

Related Documentation

- Removing a DC Power Supply from an EX4500 Switch on page 183
- Connecting DC Power to an EX4500 Switch on page 145
- DC Power Supply in EX4500 Switches on page 30
- Rear Panel of an EX4500 Switch on page 13

Installing a Fan Tray in an EX4500 Switch

An EX4500 switch has a single fan tray. The fan tray is a hot-insertable and hot-removable field-replaceable unit (FRU); you can remove and replace the fan tray while the switch is running without turning off power to the switch or disrupting switching functions.

The fan tray installs horizontally on the rear of the chassis. Handles on each side of the front faceplate facilitate handling of the fan tray.

Before you begin to install a fan tray:

- Ensure you understand how to prevent ESD damage. See "Prevention of Electrostatic Discharge Damage" on page 250.

Ensure that you have the following parts and tools available to install a fan tray in the switch:

- Electrostatic discharge (ESD) grounding strap

CAUTION: The fan tray can be removed and replaced while the switch is operating. However, the fan tray must be replaced within 30 seconds of removing the fan tray to prevent the chassis from overheating.

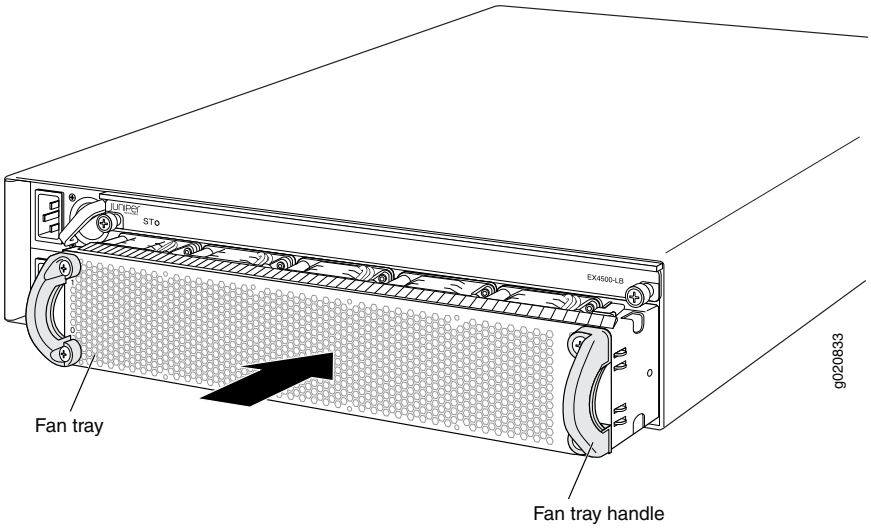
To install a fan tray in an EX4500 switch (see Figure 37 on page 126):

1. Attach the electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Hold the handles of the fan tray and align the tray with the fan tray guides on the fan tray slot.

NOTE: Ensure that the power supply labels, 1 and 0, are on the left side corners of the fan tray.

3. Slide in the fan tray until it is fully seated in the chassis.

Figure 37: Installing a Fan Tray in an EX4500 Switch



Related Documentation

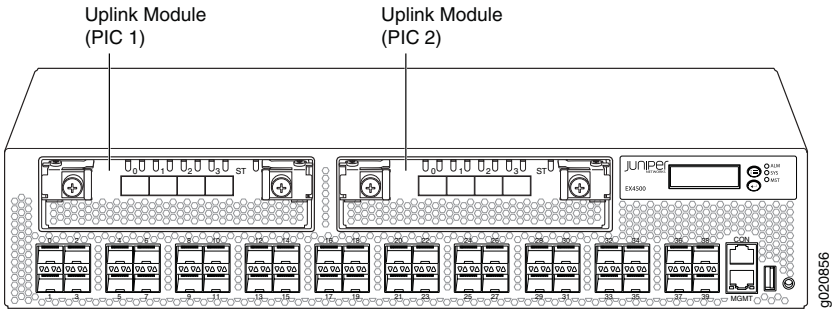
- Removing a Fan Tray from an EX4500 Switch on page 184
- Cooling System and Airflow in an EX4500 Switch on page 32
- Field-Replaceable Units in EX4500 Switches on page 23

Installing an Uplink Module in an EX4500 Switch

The uplink module in EX4500 switches is a hot-removable and hot-insertable field-replaceable unit (FRU): You can remove and replace it without powering off the switch or disrupting switch functions.

You can install up to two SFP+ uplink modules in an EX4500 switch. Both uplink modules install horizontally on the front of the chassis. The uplink module slot on the left is PIC 1. The uplink module slot on the right is PIC 2. See Figure 38 on page 127.

Figure 38: Uplink Module Slots in an EX4500 Switch



Each SFP+ uplink module provides four ports. Each module can house four 10-gigabit small form-factor pluggable (SFP+) transceivers or four 1-gigabit small form-factor pluggable (SFP) transceivers.

NOTE: When a new uplink module is installed in the switch or an existing uplink module is replaced with another uplink module, the switch detects the newly installed uplink module. The switch creates the required interfaces when new transceivers are installed in those ports.

Before you begin installing an uplink module in the switch, ensure that you have taken the necessary precautions to prevent ESD damage (see "Prevention of Electrostatic Discharge Damage" on page 250).

Ensure that you have the following parts and tools available:

- Electrostatic discharge (ESD) grounding strap (If a grounding strap is not available, follow the alternative grounding method described in Step 1 of the following procedure.)
- Phillips (+) screwdriver, number 2

To install an uplink module in an EX4500 switch (see Figure 39 on page 128):

1. Attach the electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.

   If a grounding strap is not available, hold the uplink module in its antistatic bag in one hand and touch the exposed, bare metal of the switch with the other hand to ground yourself and the component.

2. If the uplink module slot has a cover panel on it, pull one of the ejector levers on the cover panel inward, to unseat the cover panel. Use this ejector lever to slide the cover panel out. Save the cover panel for later use.

3. Taking care not to touch module components, pins, leads, or solder connections, remove the uplink module from its bag.

4. Loosen the captive screws in the ejector levers using the Phillips screwdriver, number 2. Pull the ejector levers outward until they are fully open.

   NOTE: If you are removing an uplink module and installing another uplink module, wait for at least 10 seconds after removing the uplink module before installing the new or the same uplink module. If you do not wait for at least 10 seconds, the interfaces on the uplink module might not come up.

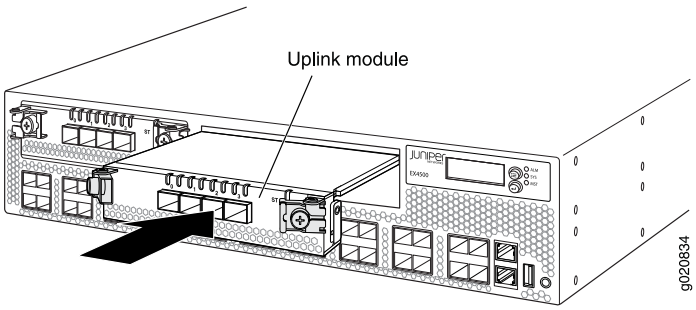
   CAUTION: Before you slide the uplink module into the slot on the switch chassis, ensure the uplink module is aligned correctly. Misalignment might cause the pins to bend, making the uplink module unusable.

5. Using both hands, place the uplink module in the empty slot and slide it in gently until it is fully seated.

6. Push both ejector levers towards the uplink module's faceplate to latch the module in place.

7. Tighten the captive screws in both ejector levers using the Phillips screwdriver, number 2. When the **ST** LED turns green, the uplink module is ready for use.

Figure 39: Installing an Uplink Module in an EX4500 Switch



NOTE: If you have a Juniper J-Care service contract, register any addition, change, or upgrade of hardware components at https://www.juniper.net/customers/csc/management/updateinstallbase.jsp . Failure to do so can result in significant delays if you need replacement parts. This note applies if you change the type of power supply or add a new type of uplink module. It does not apply if you replace these components with the same type of component.

Related Documentation

- Removing an Uplink Module from an EX4500 Switch on page 186
- Installing a Transceiver in an EX Series Switch on page 134
- Installing and Removing EX4500 Switch Hardware Components on page 121
- Front Panel of an EX4500 Switch on page 12

Installing an Intraconnect Module in an EX4500 Switch

The intraconnect module is installed horizontally on the rear panel of the switch. See "Rear Panel of an EX4500 Switch" on page 13. Use the procedure described in this topic to install the intraconnect module.

CAUTION: Operating an EX4500 switch without the intraconnect module or the Virtual Chassis module is not supported.
EX4500 switches running Junos OS Release 10.4R2 or later 10.4 releases will not boot if you do not install the intraconnect module in the switch.
EX4500 switches running Junos OS Release 11.1R1 or later releases will not boot if you install neither the intraconnect module nor the Virtual Chassis module in the switch.

Before you begin installing the intraconnect module in an EX4500 switch:

- Ensure that you have taken the necessary precautions to prevent ESD damage (see "Prevention of Electrostatic Discharge Damage" on page 250).
- Have instructions and tools available for removing and installing the fan tray. If the fan tray is installed, you must remove it as part of the procedure for installing the intraconnect module. After you install the module, you must install the fan tray. See "Removing a Fan Tray from an EX4500 Switch" on page 184 and "Installing a Fan Tray in an EX4500 Switch" on page 125.

Ensure that you have the following parts and tools available:

- Electrostatic discharge (ESD) grounding strap
- Phillips (+) screwdriver, number 2
- A replacement intraconnect module

NOTE: You must remove the fan tray from the EX4500 switch before installing the intraconnect module. See "Removing a Fan Tray from an EX4500 Switch" on page 184.

To install an intraconnect module in the switch (see Figure 40 on page 131):

1. Ensure that the power is disconnected from the switch:

   If you are using AC power:

   - If the AC power source outlet has a power switch, set it to the OFF (0) position.
   - If the AC power source outlet does not have a power switch, gently pull out the male end of the power cord connected to the power source outlet.

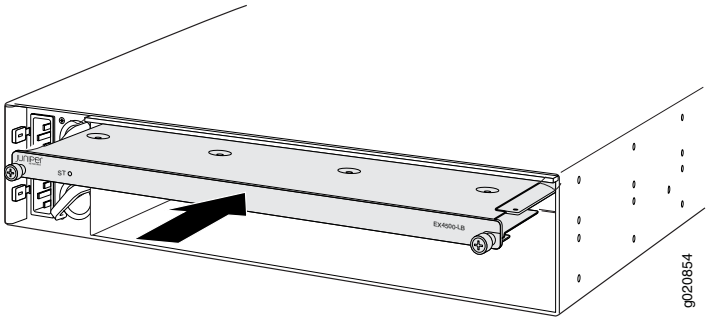
   If you are using DC power:

   - Open the input circuit breaker so that the cables will not become active during the installation process.
2. If the fan tray has not been removed from the switch, remove it. See "Removing a Fan Tray from an EX4500 Switch" on page 184. Set it aside so that you can install it after you install the replacement intraconnect module.
3. Attach the electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
4. Taking care not to touch module components, pins, leads, or solder connections, remove the intraconnect module from its bag.
5. Loosen the captive screws on the front faceplate of the module using the screwdriver.

   CAUTION: Before you slide the intraconnect module into the slot on the switch chassis, ensure the module is aligned correctly. Misalignment might cause the pins to bend, making the module unusable.
6. Using both hands, place the intraconnect module in the empty slot and slide it in until it is fully seated.
7. Tighten the captive screws using the screwdriver.
8. Reinstall the fan tray in the switch chassis. See "Installing a Fan Tray in an EX4500 Switch" on page 125.
9. Connect power to the switch. See "Connecting AC Power to an EX4500 Switch" on page 143 or "Connecting DC Power to an EX4500 Switch" on page 145.

When the status (**ST**) LED on the intraconnect module turns green, the module is ready for use.

Figure 40: Installing an Intraconnect Module in an EX4500 Switch



NOTE: If you have a Juniper J-Care service contract, register any addition, change, or upgrade of hardware components at https://www.juniper.net/customers/csc/management/updateinstallbase.jsp . Failure to do so can result in significant delays if you need replacement parts. This note applies if you change the type of power supply or add a new type of uplink module. It does not apply if you replace these components with the same type of component.

Related Documentation

- Removing an Intraconnect Module from an EX4500 Switch on page 188
- Installing and Removing EX4500 Switch Hardware Components on page 121

Installing a Virtual Chassis Module in an EX4500 Switch

The Virtual Chassis module is installed horizontally on the rear panel of the switch. See "Rear Panel of an EX4500 Switch" on page 13. Use the procedure described in this topic to install the Virtual Chassis module.

NOTE: The Virtual Chassis module is supported on EX4500 switches in Junos OS Releases 11.1 and later.

CAUTION: Operating an EX4500 switch without the intraconnect module or the Virtual Chassis module is not supported.
EX4500 switches running Junos OS Release 10.4R2 or later 10.4 releases will not boot if you do not install the intraconnect module in the switch.
EX4500 switches running Junos OS Release 11.1R1 or later releases will not boot if you install neither the intraconnect module nor the Virtual Chassis module in the switch.

Before you begin installing the Virtual Chassis module in the switch:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see "Prevention of Electrostatic Discharge Damage" on page 250).

- Have instructions and tools available for removing and installing the fan tray. If the fan tray is installed, you must remove it as part of the procedure for installing the Virtual Chassis module. After you install the module, you must install the fan tray. See "Removing a Fan Tray from an EX4500 Switch" on page 184 and "Installing a Fan Tray in an EX4500 Switch" on page 125.

Ensure that you have the following parts and tools available:

- ESD grounding strap
- Phillips (+) screwdriver, number 2
- A replacement Virtual Chassis module

NOTE: **You must remove the fan tray from the EX4500 switch before installing the Virtual Chassis module. See** "Removing a Fan Tray from an EX4500 Switch" on page 184.

To install a Virtual Chassis module in the switch (see Figure 41 on page 133):

1. Ensure that the switch is powered off:

   If you are using AC power:

   - If the AC power source outlet has a power switch, set it to the OFF (0) position.
   - If the AC power source outlet does not have a power switch, gently pull out the male end of the power cord connected to the power source outlet.

   If you are using DC power:

   - Open the input circuit breaker so that the cables will not become active during the installation process.
2. If the fan tray has not been removed from the switch, remove it. See "Removing a Fan Tray from an EX4500 Switch" on page 184. Set it aside so that you can install it after you install the replacement Virtual Chassis module.
3. Attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
4. Taking care not to touch module components, pins, leads, or solder connections, remove the Virtual Chassis module from its bag.
5. Loosen the captive screws on the front faceplate of the module using the screwdriver.

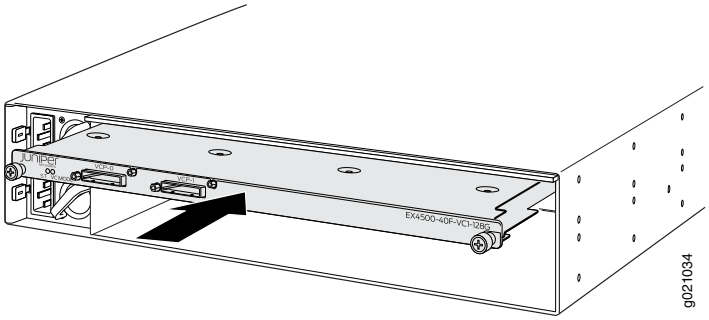
CAUTION: **Before you slide the Virtual Chassis module into the slot on the switch chassis, ensure the module is aligned correctly. Misalignment might cause the pins to bend, making the module unusable.**

6. Using both hands, place the Virtual Chassis module in the empty slot and slide it in until it is fully seated.

7. Tighten the captive screws using the screwdriver.
8. Reinstall the fan tray in the switch chassis. See "Installing a Fan Tray in an EX4500 Switch" on page 125.
9. Connect power to the switch. See "Connecting AC Power to an EX4500 Switch" on page 143 or "Connecting DC Power to an EX4500 Switch" on page 145.

When the status (**ST**) LED on the Virtual Chassis module turns green, the module is ready for use.

Figure 41: Installing the Virtual Chassis Module in an EX4500 Switch



NOTE: If you have a Juniper J-Care service contract, register any addition, change, or upgrade of hardware components at https://www.juniper.net/customers/csc/management/updateinstallbase.jsp. Failure to do so can result in significant delays if you need replacement parts. This note applies if you change the type of power supply or add a new type of uplink module. It does not apply if you replace these components with the same type of component.

Related Documentation

- Removing a Virtual Chassis Module from an EX4500 Switch on page 190
- Installing and Removing EX4500 Switch Hardware Components on page 121

Connecting a Virtual Chassis Cable to an EX4500 Switch

The Virtual Chassis module has two dedicated Virtual Chassis ports (VCPs) that can be used to interconnect the EX4500 switch with EX4200 switches or EX4500 switches to form a Virtual Chassis. The Virtual Chassis module is installed on the rear side of the switch chassis. Use the procedure described in this topic to connect a Virtual Chassis cable to a dedicated VCP port on a Virtual Chassis module.

Ensure that you have the following parts and tools available:

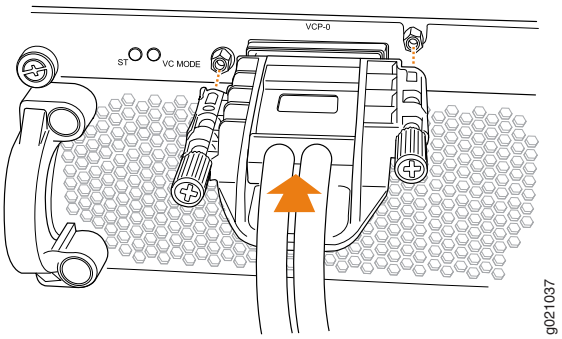
- Phillips (+) screwdriver, number 2

NOTE: **Virtual Chassis cables and Virtual Chassis cable connector retainers are not part of the EX4500 switch's shipping configuration. If you want to purchase these, you must order them separately.**

To connect a Virtual Chassis cable to a dedicated VCP on an EX4500 switch (see Figure 42 on page 134) :

1. Taking care not to touch module components, pins, leads, or solder connections, remove the Virtual Chassis cable from its bag.
2. Using both hands, place the Virtual Chassis cable connector in the empty VCP and slide it in gently until it is fully seated.
3. Slide the cable connector retainer over the Virtual Chassis cable connector.
4. Tighten the screws on the cable connector retainer by using the screwdriver.

Figure 42: Connecting a Virtual Chassis Cable to a Dedicated VCP on a Virtual Chassis Module



Related Documentation

- Disconnecting a Virtual Chassis Cable from an EX4500 Switch on page 192
- Understanding EX4200, EX4500, and EX4550 Virtual Chassis Hardware Configurations on page 103
- Planning EX4200, EX4500, and EX4550 Virtual Chassis on page 106
- Virtual Chassis Ports Connector Pinout Information for EX4500 Switches on page 46

Installing a Transceiver in an EX Series Switch

The transceivers for EX Series switches are hot-removable and hot-insertable field-replaceable units (FRUs): You can remove and replace them without powering off the switch or disrupting switch functions.

NOTE: After you insert a transceiver or after you change the media-type configuration, wait for 6 seconds for the interface to display operational commands.

NOTE: We recommend that you use only optical transceivers and optical connectors purchased from Juniper Networks with your Juniper Networks device.

CAUTION: If you are having a problem running a Juniper Networks device that is using a third-party optic or cable, the Juniper Networks Technical Assistance Center (JTAC) can help you diagnose the source of the problem. Your JTAC engineer might recommend that you check the third-party optic or cable and potentially replace it with an equivalent Juniper Networks optic or cable that is qualified for the device.

NOTE: On an EX3200 switch, if you install a transceiver in a 1-Gigabit Ethernet uplink module port, a corresponding network port from the last four built-in ports is disabled. For example, if you install a transceiver in the uplink module port 3 (ge-0/1/2), then the built-in port 23 (ge-0/0/22) is disabled. The disabled port is not listed in the output of **show interface** commands.

Before you begin installing a transceiver in an EX Series switch, ensure that you have taken the necessary precautions for safe handling of lasers (see "Laser and LED Safety Guidelines and Warnings for Switches" on page 227).

Ensure that you have a rubber safety cap available to cover the transceiver.

Figure 43 on page 136 shows how to install a QSFP+ transceiver. The procedure is the same for all types of transceivers.

To install a transceiver in an EX Series switch:

CAUTION: To prevent electrostatic discharge (ESD) damage to the transceiver, do not touch the connector pins at the end of the transceiver.

1. Remove the transceiver from its bag.
2. Check to see whether the transceiver is covered with a rubber safety cap. If it is not, cover the transceiver with a rubber safety cap.

WARNING: Do not leave a fiber-optic transceiver uncovered except when inserting or removing a cable. The rubber safety cap keeps the port clean and prevents accidental exposure to laser light.

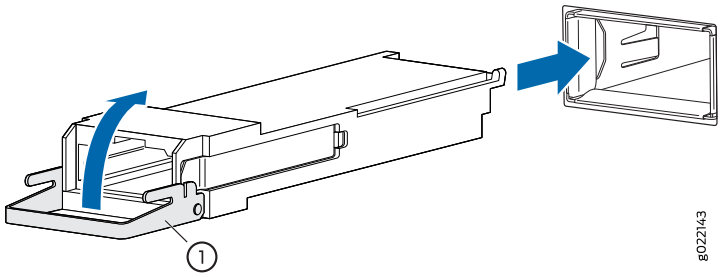
3. If the port in which you want to install the transceiver is covered with a dust cover, remove the dust cover and save it in case you need to cover the port later. If you are hot-swapping a transceiver, wait for at least 10 seconds after removing the transceiver from the port before installing a new transceiver.
4. Using both hands, carefully place the transceiver in the empty port. The connectors must face the switch chassis.

CAUTION: Before you slide the transceiver into the port, ensure that the transceiver is aligned correctly. Misalignment might cause the pins to bend, making the transceiver unusable.

5. Slide the transceiver in gently until it is fully seated. If you are installing a CFP transceiver, tighten the captive screws on the transceiver by using your fingers.
6. Remove the rubber safety cap when you are ready to connect the cable to the transceiver.

WARNING: Do not look directly into a fiber-optic transceiver or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.

Figure 43: Installing a Transceiver in an EX Series Switch



1—Ejector lever	

Related Documentation

- Removing a Transceiver from a Switch on page 195
- Connecting a Fiber-Optic Cable to a Switch on page 152
- *Pluggable Transceivers Supported on EX Series Switches*

CHAPTER 11

Connecting the Switch

Connecting Earth Ground to an EX Series Switch

To ensure proper operation and to meet safety and electromagnetic interference (EMI) requirements, you must connect an EX Series switch to earth ground before you connect power to the switch. You must use the protective earthing terminal on the switch chassis to connect the switch to earth ground (see Figure 45 on page 142).

WARNING: The switch is installed in a restricted-access location. It has a separate protective earthing terminal on the chassis that must be permanently connected to earth ground to adequately ground the chassis and protect the operator from electrical hazards.

CAUTION: Before switch installation begins, ensure that a licensed electrician has attached an appropriate grounding lug to the grounding cable that you supply. Using a grounding cable with an incorrectly attached lug can damage the switch.

This topic describes:

Parts and Tools Required for Connecting an EX Series Switch to Earth Ground

Table 43 on page 138 lists the earthing terminal location, grounding cable requirements, grounding lug specifications, screws and washers required, and the screwdriver needed for connecting a switch to earth ground. Before you begin connecting a switch to earth ground, ensure you have the parts and tools required for your switch.

Table 43: Parts and Tools Required for Connecting an EX Series Switch to Earth Ground

Switch	Earthing Terminal Location	Grounding Cable Requirements	Grounding Lug Specifications	Screws and Washers	Screwdriver	Additional Information
EX2200	Rear panel of chassis	14 AWG (2 mm^2), minimum 90°C wire, or as permitted by the local code	Panduit LCC10-14BWL or equivalent—not provided	• Two 10-32 x .25 in. screws with #10 split-lock washer—not provided • Two #10 flat washers—not provided	Phillips (+) number 2	
EX3200	Rear panel of chassis	14 AWG (2 mm^2), minimum 90°C wire, or as permitted by the local code	Panduit LCC10-14BWL or equivalent—not provided	• Two 10-32 x .25 in. screws with #10 split-lock washer—not provided • Two #10 flat washers—not provided	Phillips (+) number 2	See "Special Instructions to Follow Before Connecting Earth Ground to a Switch" on page 140.
EX3300	Rear panel of chassis	14 AWG (2 mm^2), minimum 90°C wire, or as permitted by the local code	Panduit LCC10-14BWL or equivalent—not provided	• Two 10-32 x .25 in. screws with #10 split-lock washer—not provided • Two #10 flat washers—not provided	Phillips (+) number 2	
EX4200	Left side of chassis	14 WG (2 mm^2), minimum 90°C wire, or as permitted by the local code	Panduit LCC10-14BWL or equivalent—not provided	• Two 10-32 x .25 in. screws with #10 split-lock washer—not provided • Two #10 flat washers—not provided	Phillips (+) number 2	See "Special Instructions to Follow Before Connecting Earth Ground to a Switch" on page 140.

Table 43: Parts and Tools Required for Connecting an EX Series Switch to Earth Ground *(continued)*

Switch	Earthing Terminal Location	Grounding Cable Requirements	Grounding Lug Specifications	Screws and Washers	Screwdriver	Additional Information
EX4300	Left side of chassis	14 AWG (2 mm²), minimum 90°C wire, or as permitted by the local code	Panduit LCC10-14BWL or equivalent—not provided	• Two 10-32 x .25 in. screws with #10 split-lock washer—not provided • Two #10 flat washers—not provided	Phillips (+) number 2	See "Special Instructions to Follow Before Connecting Earth Ground to a Switch" on page 140.
EX4500	Left side of chassis	14 AWG (2 mm²), minimum 90°C wire, or as permitted by the local code	Panduit LCC10-14BWL or equivalent—not provided	• Two 10-32 x .25 in. screws with #10 split-lock washer—not provided • Two #10 flat washers—not provided	Phillips (+) number 2	See "Special Instructions to Follow Before Connecting Earth Ground to a Switch" on page 140.
EX4550	Left side of chassis	14 AWG (2 mm²), minimum 90°C wire, or as permitted by the local code	Panduit LCC10-14BWL or equivalent—not provided	• Two 10-32 x .25 in. screws with #10 split-lock washer—not provided • Two #10 flat washers—not provided	Phillips (+) number 2	See "Special Instructions to Follow Before Connecting Earth Ground to a Switch" on page 140.
EX6210	Rear panel of chassis (on lower left side)	The grounding cable must be the same gage as the power feed cables and as permitted by the local code.	Panduit LCD2-14A-Q or equivalent —provided	• Two ¼-20 x 0.5 in. screws with #¼" split-washer —provided • Two #¼" flat washers—provided	Phillips (+) number 2	
EX8208	Left side of chassis	6 AWG (13.3 mm²), minimum 60°C wire, or as permitted by the local code	Panduit LCD2-14A-Q or equivalent —provided	• Two ¼-20 x 0.5 in. screws with #¼" split-washer —provided • Two #¼" flat washers—provided	Phillips (+) number 2	

Table 43: Parts and Tools Required for Connecting an EX Series Switch to Earth Ground *(continued)*

Switch	Earthing Terminal Location	Grounding Cable Requirements	Grounding Lug Specifications	Screws and Washers	Screwdriver	Additional Information
EX8216	Two earthing terminals: • Left side of chassis • Rear panel of chassis	2 AWG (33.6 mm^2), minimum 60°C wire, or as permitted by the local code	Panduit LCD2-14A-Q or equivalent —provided	• Two ¼-20 x 0.5 in. screws with #¼" split-washer —provided • Two #¼" flat washers—provided	Phillips (+) number 2	See "Special Instructions to Follow Before Connecting Earth Ground to a Switch" on page 140.
EX9204	Rear panel of chassis	One 6 AWG (13.3 mm^2), minimum 60°C wire, or one that complies with the local code	Thomas&Betts LCN6-14 or equivalent—provided	• Two ¼-20 x 0.5 in. screws with #¼" split-washer—provided • Two #¼" flat washers—provided	Phillips (+) number 2	See *Grounding Cable and Lug Specifications for EX9200 Switches*.
EX9208	Rear panel of chassis	One 6 AWG (13.3 mm^2), minimum 60°C wire, or one that complies with the local code	Thomas&Betts LCN6-14 or equivalent—provided	• Two ¼-20 x 0.5 in. screws with #¼" split-washer—provided • Two #¼" flat washers—provided	Phillips (+) number 2	See *Grounding Cable and Lug Specifications for EX9200 Switches*.
EX9214	Rear panel of chassis	One 6 AWG (13.3 mm^2), minimum 60°C wire, or one that complies with the local code	Thomas&Betts LCN6-14 or equivalent—provided	• Two ¼-20 x 0.5 in. screws with #¼" split-washer—provided • Two #¼" flat washers—provided	Phillips (+) number 2	See *Grounding Cable and Lug Specifications for EX9200 Switches*.

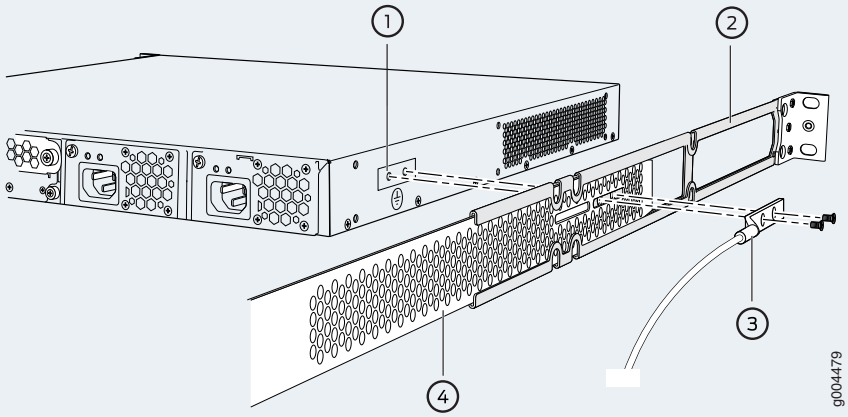
Special Instructions to Follow Before Connecting Earth Ground to a Switch

Table 44 on page 140 lists the special instructions that you might need to follow before connecting earth ground to a switch.

Table 44: Special Instructions to Follow Before Connecting Earth Ground to a Switch

Switch	Special Instructions
EX3200	NOTE: Some early variants of EX3200 switches for which the Juniper Networks model number on the label next to the protective earthing terminal is from 750-021*xxx* through 750-030*xxx* require 10-24x.25 in. screws.

Table 44: Special Instructions to Follow Before Connecting Earth Ground to a Switch *(continued)*

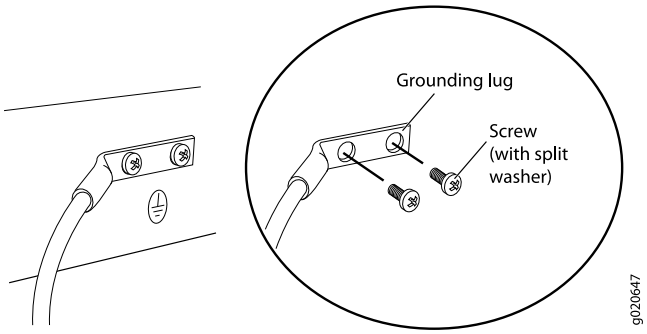
Switch	Special Instructions
EX4200	NOTE: Some early variants of EX4200 switches for which the Juniper Networks model number on the label next to the protective earthing terminal is from 750-021*xxx* through 750-030*xxx* require 10-24x.25 in. screws. NOTE: The protective earthing terminal on an EX4200 switch mounted on four posts of a rack is accessible through the slot on the left rear bracket only if the rack is 27.5 in. through 30.5 in. deep for a switch mounted flush with the rack front and 29.5 in. through 32.5 in. deep for a switch mounted 2 in. recessed from the rack front. See Figure 44 on page 141. **Figure 44: Connecting the Grounding Lug to a Switch Mounted on Four Posts of a Rack**  1—Protective earthing terminal; 3—Grounding lug 2—Side mounting-rail; 4—Rear mounting-blade NOTE: The brackets must be attached to the chassis before the grounding lug is attached. (The brackets are shown pulled away from the chassis so that the protective earthing terminal is seen.)
EX4300	NOTE: The protective earthing terminal on an EX4300 switch mounted on four posts of a rack is accessible through the slot on the left rear bracket only if the rack is 27.5 in. through 30.5 in. deep for a switch mounted flush with the rack front and 29.5 in. through 32.5 in. deep for a switch mounted 2 in. recessed from the rack front.
EX4500	NOTE: If you plan to mount your switch on four posts of a rack or cabinet, mount your switch in the rack or cabinet before attaching the grounding lug to the switch. See "Mounting an EX4500 Switch on Four Posts in a Rack or Cabinet" on page 116. NOTE: The protective earthing terminal on an EX4500 switch mounted on four posts of a rack is accessible through the slot on the left rear bracket only if the rack is 27.5 in. through 30.5 in. deep for a switch mounted flush with the rack front and 29.5 in. through 32.5 in. deep for a switch mounted 2 in. recessed from the rack front.
EX4550	NOTE: The protective earthing terminal on an EX4550 switch mounted on four posts of a rack is accessible through the slot on the left rear bracket only if the rack is 27.5 in. through 30.5 in. deep for a switch mounted flush with the rack front and 29.5 in. through 32.5 in. deep for a switch mounted 2 in. recessed from the rack front.
EX8216	NOTE: Only one of the two protective earthing terminals needs to be permanently connected to earth ground.

Connecting Earth Ground to an EX Series Switch

To connect earth ground to a switch:

1. Connect one end of the grounding cable to a proper earth ground, such as the rack in which the switch is mounted.
2. Place the grounding lug attached to the grounding cable over the protective earthing terminal. See Figure 45 on page 142.

Figure 45: Connecting a Grounding Cable to an EX Series Switch



3. Secure the grounding lug to the protective earthing terminal with the washers and screws.
4. Dress the grounding cable and ensure that it does not touch or block access to other switch components.

WARNING: **Ensure that the cable does not drape where people could trip over it.**

Related Documentation

- *Connecting AC Power to an EX2200 Switch*
- *Connecting DC Power to an EX2200 Switch*
- *Connecting AC Power to an EX3200 Switch*
- *Connecting DC Power to an EX3200 Switch*
- *Connecting AC Power to an EX3300 Switch*
- *Connecting DC Power to an EX3300 Switch*
- *Connecting AC Power to an EX4200 Switch*
- *Connecting DC Power to an EX4200 Switch*
- *Connecting AC Power to an EX4300 Switch*
- *Connecting DC Power to an EX4300 Switch*
- Connecting AC Power to an EX4500 Switch on page 143
- Connecting DC Power to an EX4500 Switch on page 145

- *Connecting AC Power to an EX4550 Switch*
- *Connecting DC Power to an EX4550 Switch*
- *Connecting AC Power to an EX6200 Switch*
- *Connecting DC Power to an EX6200 Switch*
- *Connecting AC Power to an EX8200 Switch*
- *Connecting DC Power to an EX8200 Switch*
- *Connecting AC Power to an EX9204 Switch*
- *Connecting DC Power to an EX9204 Switch*
- *Connecting AC Power to an EX9208 Switch*
- *Connecting DC Power to an EX9208 Switch*
- *Connecting AC Power to an EX9214 Switch*
- *Connecting DC Power to an EX9214 Switch*
- General Safety Guidelines and Warnings on page 221
- Grounded Equipment Warning on page 241

Connecting AC Power to an EX4500 Switch

The AC power supply in an EX4500 switch is a hot-removable and hot-insertable field-replaceable unit (FRU). After you have installed at least one power supply, you can connect power to the switch.

CAUTION: Operating the switch with an incorrect power supply might cause the chassis to overheat. See "Installing an AC Power Supply in an EX4500 Switch" on page 122.

CAUTION: To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the switch to earth ground before you connect it to power.

For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the switch chassis to connect to the earth ground. For instructions on connecting the switch to ground using a separate grounding conductor, see "Connecting Earth Ground to an EX Series Switch" on page 137.

The switch gets 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 Cord Specifications for an EX4500 Switch" on page 96.

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

Before you begin to connect power to the switch:

- Ensure you understand how to prevent ESD damage. See "Prevention of Electrostatic Discharge Damage" on page 250.
- Install power supplies in the switch. See "Installing an AC Power Supply in an EX4500 Switch" on page 122.

Ensure that you have the following parts and tools available to connect power to the switch:

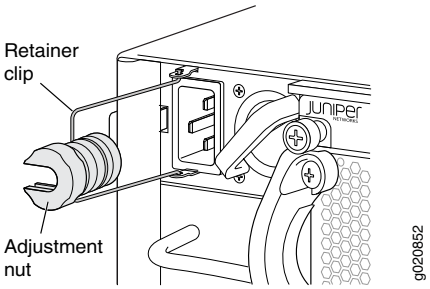
- Electrostatic discharge (ESD) grounding strap
- Power cords appropriate for your geographical location. See "AC Power Cord Specifications for an EX4500 Switch" on page 96.

WARNING: Ensure that the power cords do not block access to switch components or drape where people can trip on them.

To connect AC power to the switch:

1. Attach the electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Ensure that the power supply is fully inserted in the chassis. See "Installing an AC Power Supply in an EX4500 Switch" on page 122.
3. Squeeze the two sides of the power cord retainer clip, and insert the L-shaped ends of the clip into the holes in the bracket on each side of the AC appliance inlet. See Figure 46 on page 144.

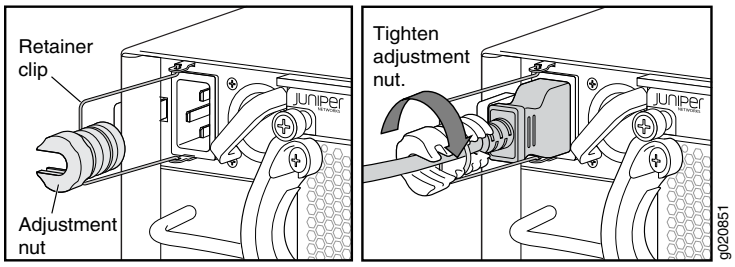
Figure 46: Power Cord Retainer in an AC Power Supply



4. Locate the power cord or cords shipped with the switch; the cords have plugs appropriate for your geographical location.
5. Insert the coupler end of the power cord into the AC appliance inlet.

6. Push the retainer clip toward the cord until the cord slides into the slot in the adjustment nut. Turn the nut until it is tight against the base of the coupler and the slot in the nut is turned 90° from the top of the switch. See Figure 47 on page 145.
7. If the AC power source outlet has a power switch, set it to the OFF (0) position.
8. Insert the power cord plug into an AC power source outlet.
9. If the AC power source outlet has a power switch, set it to the ON (|) position.
10. Verify that the LED on the power supply faceplate is lit and is on steadily.
11. Repeat steps 2 through 10 for the remaining power supplies.

Figure 47: Connecting the Power Supply Cord to an EX4500 Switch



Related Documentation

- AC Power Supply in EX4500 Switches on page 27
- AC Power Supply LEDs in EX4500 Switches on page 29

Connecting DC Power to an EX4500 Switch

You can install two DC power supplies in an EX4500 switch. After you have installed at least one power supply, you can connect power to the switch.

WARNING: Before performing DC power procedures, ensure that power is removed from the DC circuit. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the OFF position, and tape the switch handle of the circuit breaker in the OFF position.

CAUTION: Before you connect power to the switch, a licensed electrician must attach a cable lug to the grounding and power cables that you supply. A cable with an incorrectly attached lug can damage the switch (for example, by causing a short circuit).

CAUTION: Mixing different types (AC and DC) of power supplies or power supplies with front-to-back or back-to-front airflow in the same chassis is not supported.

NOTE: A 1200 W DC power supply requires a dedicated 30 A circuit breaker for each input DC feed.

NOTE: Each power supply input feed must be connected to a dedicated DC power source outlet.

Before you begin connecting DC power to the switch:

- Ensure that you have taken the necessary precautions to prevent ESD damage (see "Prevention of Electrostatic Discharge Damage" on page 250).
- Ensure that you have connected the switch chassis to earth ground.

CAUTION: To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect EX4500 switches to earth ground before you connect them to power. For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the switch chassis to connect to earth ground. For instructions on connecting an EX4500 switch to ground using a separate grounding conductor, see "Connecting Earth Ground to an EX Series Switch" on page 137.

- Install the power supply in the chassis. See "Installing a DC Power Supply in an EX4500 Switch" on page 124.

Ensure that you have the following parts and tools available to connect DC power to the switch:

- Electrostatic discharge (ESD) grounding strap
- DC power source cables (not provided) with the cable lugs (Molex 190410014 or equivalent) (not provided) attached
- Phillips (+) screwdriver, number 2
- Multimeter

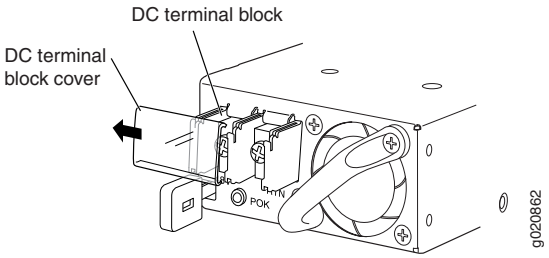
WARNING: Ensure that the power cords do not block access to switch components or drape where people can trip on them.

To connect DC power to the switch:

1. Attach the electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Remove the plastic cover from the DC power input terminal block by sliding it off either to the left or right. Save this cover for future use. See Figure 48 on page 147.

NOTE: It might be necessary to slide each power supply partially out of the chassis to easily connect the DC power source cables to the DC power input terminals. See "Removing a DC Power Supply from an EX4500 Switch" on page 183.

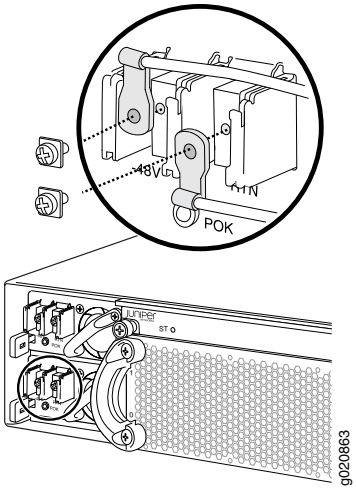
Figure 48: Remove Plastic Cover from Terminal Block



3. Remove the locking screws from each DC power input terminal, using the screwdriver.
4. Ensure that the power source circuit breaker is open so that the voltage across the DC power source cable leads is 0 V and that the cable leads do not become active while you are connecting DC power.
5. Verify that the DC power cables are correctly labeled before making connections to the power supply. In a typical power distribution scheme where the return is connected to chassis ground at the battery plant, you can use a multimeter to verify the resistance of the **–48V** and **RTN** DC cables to chassis ground:
   - The cable with very high resistance (indicating an open circuit) to chassis ground is negative (–) and will be installed on the **–48V** (input) DC power input terminal.
   - The cable with very low resistance (indicating a closed circuit) to chassis ground is positive (+) and will be installed on the **RTN** (return) DC power input terminal.

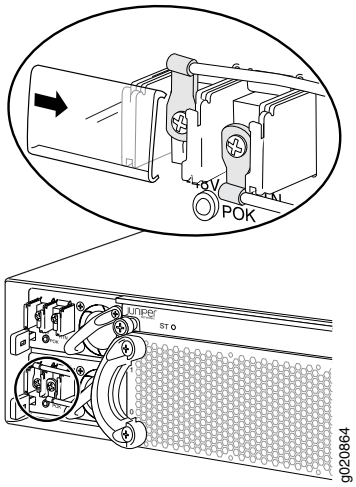
   CAUTION: You must ensure that power connections maintain the proper polarity. The power source cables might be labeled (+) and (–) to indicate their polarity. There is no standard color coding for DC power cables. The color coding used by the external DC power source at your site determines the color coding for the leads on the power cables that attach to the DC power input terminals on each power supply.
6. Install each power cable lug on the DC power input terminal, securing it with the locking screw, (see Figure 49 on page 148). Apply between 9 in.-lb (1.1 Nm) and 12 in.-lb (1.3 Nm) of torque to tighten each locking screw.

Figure 49: Connecting the Power Supply Cables to an EX4500 Switch



7. Slide the plastic cover over the input terminal block. See Figure 50 on page 148 .

Figure 50: Install Plastic Cover on Terminal Block



8. Ensure that the power supply is fully inserted and latched securely in the chassis. See "Installing a DC Power Supply in an EX4500 Switch" on page 124.
9. Repeat Steps 2 through 8 for any remaining power supply.

Related Documentation

- DC Power Supply in EX4500 Switches on page 30
- DC Power Supply LEDs in EX4500 Switches on page 32

Connecting a Switch to a Network for Out-of-Band Management

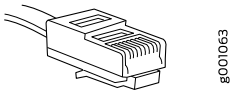
This topic applies to multiple hardware devices in the EX Series product family, which includes EX Series switches and the XRE200 External Routing Engine.

This topic also applies to OCX1100 switches.

You can monitor and manage these devices by using a dedicated management channel. Each device has a management port with an RJ-45 connector for out-of-band management. Use the management port to connect the switch or external Routing Engine to the management device.

Ensure that you have an Ethernet cable with an RJ-45 connector available. One such cable is provided with the device. Figure 51 on page 149 shows the RJ-45 connector of the Ethernet cable supplied with the device.

Figure 51: Ethernet Cable Connector



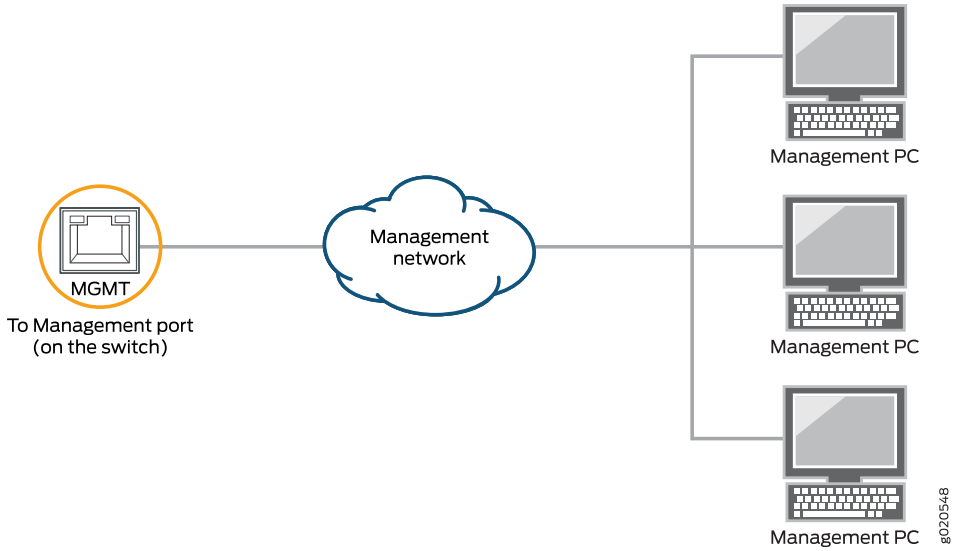
To connect a device to a network for out-of-band management (see Figure 52 on page 150):

1. Connect one end of the Ethernet cable to the management port (labeled **MGMT** or **ETHERNET**) on the device.

   For the location of the **MGMT** or **ETHERNET** port on different devices:

   - See *EX2200 Switches Hardware Overview*.
   - See *Rear Panel of an EX3200 Switch*.
   - See *Rear Panel of an EX3300 Switch*.
   - See *Rear Panel of an EX4200 Switch*.
   - See *EX4300 Switches Hardware Overview*
   - See "Front Panel of an EX4500 Switch" on page 12.
   - See *EX4550 Switches Hardware Overview*
   - See *Switch Fabric and Routing Engine (SRE) Module in an EX6200 Switch*.
   - See *Switch Fabric and Routing Engine (SRE) Module in an EX8208 Switch*.
   - See *Routing Engine (RE) Module in an EX8216 Switch*.
   - See *Front Panel of an XRE200 External Routing Engine*.
   - See *OCX1100 Switches Hardware Overview*.
2. Connect the other end of the Ethernet cable to the management device.

Figure 52: Connecting a Switch to a Network for Out-of-Band Management



Related Documentation

- Connecting a Switch to a Management Console on page 150
- *Management Port Connector Pinout Information for an EX2200 Switch*
- *Management Port Connector Pinout Information for an EX3200 Switch*
- *Management Port Connector Pinout Information for an EX3300 Switch*
- *Management Port Connector Pinout Information for an EX4200 Switch*
- *Management Port Connector Pinout Information for an EX4300 Switch*
- Management Port Connector Pinout Information for an EX4500 Switch on page 44
- *Management Port Connector Pinout Information for an EX4550 Switch*
- *Management Port Connector Pinout Information for an EX6200 Switch*
- *Management Port Connector Pinout Information for an EX8200 Switch*
- *Management Port Connector Pinout Information for an XRE200 External Routing Engine*
- *Cables Connecting the EX6200 Switch to Management Devices*
- *Cables Connecting the EX8200 Switch to Management Devices*
- *Management Port Connector Pinout Information for an OCX1100 Switch*

Connecting a Switch to a Management Console

This topic applies to multiple hardware devices in the EX Series product family, which includes EX Series switches and the XRE200 External Routing Engine.

This topic also applies to OCX1100 switches.

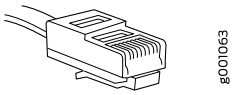
You can configure and manage these devices by using a dedicated console. Every device has a console port with an RJ-45 connector. Use the console port to connect the device

to the management console or to a console server. The console port accepts a cable with an RJ-45 connector.

Ensure that you have an Ethernet cable with an RJ-45 connector available. An RJ-45 cable and an RJ-45 to DB-9 serial port adapter are supplied with the device.

Figure 53 on page 151 shows the RJ-45 connector of the Ethernet cable supplied with the device.

Figure 53: Ethernet Cable Connector



NOTE: If your laptop or PC does not have a DB-9 male connector pin and you want to connect your laptop or PC directly to the device, use a combination of the RJ-45 to DB-9 female adapter supplied with the device and a USB to DB-9 male adapter. You must provide the USB to DB-9 male adapter.

To connect the device to a management console (see Figure 54 on page 152 and Figure 55 on page 152):

1. Connect one end of the Ethernet cable into the console port (labeled **CON**, **CONSOLE**, or **CON1**) on the device.

   For the location of the **CON/CONSOLE** port on different devices:

   - See *EX2200 Switches Hardware Overview*.
   - See *Rear Panel of an EX3200 Switch*.
   - See *Rear Panel of an EX3300 Switch*.
   - See *Rear Panel of an EX4200 Switch*.
   - See *EX4300 Switches Hardware Overview*
   - See "Front Panel of an EX4500 Switch" on page 12.
   - See *EX4550 Switches Hardware Overview*
   - See *Switch Fabric and Routing Engine (SRE) Module in an EX6200 Switch*.
   - See *Switch Fabric and Routing Engine (SRE) Module in an EX8208 Switch*.
   - See *Routing Engine (RE) Module in an EX8216 Switch*.
   - See *Front Panel of an XRE200 External Routing Engine*.
   - See *Management Panel of an EX4600 Switch*
   - *OCX1100 Switches Hardware Overview*

2. Connect the other end of the Ethernet cable into the console server (see Figure 54 on page 152) or management console (see Figure 55 on page 152).

To configure the device from the management console, see "Connecting and Configuring an EX Series Switch (CLI Procedure)" on page 161 or "Connecting and Configuring an EX Series Switch (J-Web Procedure)" on page 164 or *Connecting and Configuring an OCX1100 Switch (CLI Procedure)*.

NOTE: EX2200-24T-4G-DC and OCX1100 switches do not support switch connection and configuration through the J-Web interface.

Figure 54: Connecting a Switch to a Management Console Through a Console Server

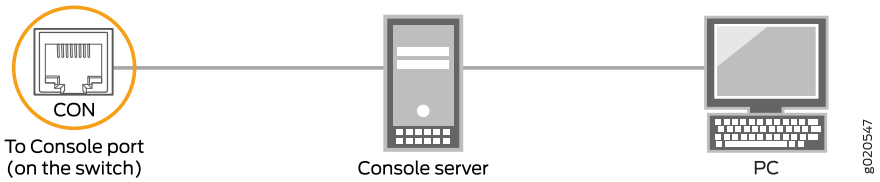


Figure 55: Connecting a Switch Directly to a Management Console

Related Documentation

- *Configuring the Console Port Type (CLI Procedure)*
- Connecting a Switch to a Network for Out-of-Band Management on page 149
- Console Port Connector Pinout Information for an EX Series Switch on page 42
- *Cables Connecting the EX6200 Switch to Management Devices*
- *Cables Connecting the EX8200 Switch to Management Devices*
- *Console Port Connector Pinout Information for an OCX1100 Switch*

Connecting a Fiber-Optic Cable to a Switch

EX Series and OCX1100 switches support optical transceivers, which are field-replaceable units (FRUs). You can connect fiber-optic cables to these transceivers.

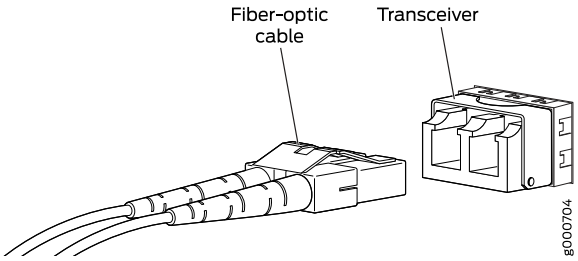
Before you begin connecting a fiber-optic cable to an optical transceiver installed in a switch, ensure that you have taken the necessary precautions for safe handling of lasers (see "Laser and LED Safety Guidelines and Warnings for Switches" on page 227).

To connect a fiber-optic cable to an optical transceiver installed in a switch:

WARNING: Do not look directly into a fiber-optic transceiver or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.

1. If the fiber-optic cable connector is covered with a rubber safety cap, remove the cap. Save the cap.
2. Remove the rubber safety cap from the optical transceiver. Save the cap.
3. Insert the cable connector into the optical transceiver (see Figure 56 on page 153).

Figure 56: Connecting a Fiber-Optic Cable to an Optical Transceiver Installed in a Switch



4. Secure the cables so that they are not supporting their own weight. Place excess cable out of the way in a neatly coiled loop. Placing fasteners on a loop helps cables maintain their shape.

CAUTION: Do not bend fiber-optic cables beyond their minimum bend radius. An arc smaller than a few inches in diameter can damage the cables and cause problems that are difficult to diagnose.

Do not let fiber-optic cables hang free from the connector. Do not allow fastened loops of cables to dangle, which stresses the cables at the fastening point.

Related Documentation

- Disconnecting a Fiber-Optic Cable from a Switch on page 194
- Installing a Transceiver in an EX Series Switch on page 134
- Maintaining Fiber-Optic Cables in Switches on page 201
- *Pluggable Transceivers Supported on EX Series Switches*
- *Installing a Transceiver in an OCX1100 Switch*
- *Pluggable Transceivers Supported on OCX1100 Switches*

CHAPTER 12

Performing Initial Configuration

EX4500 Default Configuration

Each EX Series switch is programmed with a factory default configuration that contains the values set for each configuration parameter when a switch is shipped. The default configuration file sets values for system parameters such as **syslog** and **commit**, configures Ethernet switching on all interfaces, enables IGMP snooping, and enables the LLDP and RSTP protocols.

NOTE: Interfaces xe-0/0/0 through xe-0/0/39 are the network interface ports. Optional uplink modules provide four 10-gigabit small form-factor pluggable (SFP+) transceivers (xe-0/1/0 through xe-0/1/3) or four 1-gigabit small form-factor pluggable (SFP) transceivers (xe-0/2/0 through xe-0/2/3). Although you can install only one uplink module, the interfaces for both are shown below.

When you commit changes to the configuration, a new configuration file is created, which becomes the active configuration. You can always revert to the factory default configuration. See *Reverting to the Default Factory Configuration for the EX Series Switch*.

This topic shows the factory default configuration file of an EX4500 switch:

```
system {
    syslog {
        user * {
            any emergency;
        }
        file messages {
            any notice;
            authorization info;
        }
        file interactive-commands {
            interactive-commands any;
        }
```

```
    }
    commit {
      factory-settings {
        reset-chassis-lcd-menu;
        reset-virtual-chassis-configuration;
      }
    }
}
    interfaces {
      xe-0/0/0 {
        unit 0 {
          family ethernet-switching;
        }
      }
      xe-0/0/1 {
        unit 0 {
          family ethernet-switching;
        }
      }
      xe-0/0/2 {
        unit 0 {
          family ethernet-switching;
        }
      }
      xe-0/0/3 {
        unit 0 {
          family ethernet-switching;
        }
      }
      xe-0/0/4 {
        unit 0 {
          family ethernet-switching;
        }
      }
      xe-0/0/5 {
        unit 0 {
          family ethernet-switching;
        }
      }
      xe-0/0/6 {
        unit 0 {
          family ethernet-switching;
        }
      }
      xe-0/0/7 {
        unit 0 {
          family ethernet-switching;
        }
      }
      xe-0/0/8 {
        unit 0 {
          family ethernet-switching;
        }
      }
      xe-0/0/9 {
        unit 0 {
```

```
        family ethernet-switching;
    }
}
xe-0/0/10 {
    unit 0 {
        family ethernet-switching;
    }
}
xe-0/0/11 {
    unit 0 {
        family ethernet-switching;
    }
}
xe-0/0/12 {
    unit 0 {
        family ethernet-switching;
    }
}
xe-0/0/13 {
    unit 0 {
        family ethernet-switching;
    }
}
xe-0/0/14 {
    unit 0 {
        family ethernet-switching;
    }
}
xe-0/0/15 {
    unit 0 {
        family ethernet-switching;
    }
}
xe-0/0/16 {
    unit 0 {
        family ethernet-switching;
    }
}
xe-0/0/17 {
    unit 0 {
        family ethernet-switching;
    }
}
xe-0/0/18 {
    unit 0 {
        family ethernet-switching;
    }
}
xe-0/0/19 {
    unit 0 {
        family ethernet-switching;
    }
}
xe-0/0/20 {
    unit 0 {
        family ethernet-switching;
```

```
    }
  }
  xe-0/0/21 {
    unit 0 {
      family ethernet-switching;
    }
  }
  xe-0/0/22 {
    unit 0 {
      family ethernet-switching;
    }
  }
  xe-0/0/23 {
    unit 0 {
      family ethernet-switching;
    }
  }
  xe-0/0/24 {
    unit 0 {
      family ethernet-switching;
    }
  }
  xe-0/0/25 {
    unit 0 {
      family ethernet-switching;
    }
  }
  xe-0/0/26 {
    unit 0 {
      family ethernet-switching;
    }
  }
  xe-0/0/27 {
    unit 0 {
      family ethernet-switching;
    }
  }
  xe-0/0/28 {
    unit 0 {
      family ethernet-switching;
    }
  }
  xe-0/0/29 {
    unit 0 {
      family ethernet-switching;
    }
  }
  xe-0/0/30 {
    unit 0 {
      family ethernet-switching;
    }
  }
  xe-0/0/31 {
    unit 0 {
      family ethernet-switching;
    }
```

```
}
xe-0/0/32 {
  unit 0 {
    family ethernet-switching;
  }
}
xe-0/0/33 {
  unit 0 {
    family ethernet-switching;
  }
}
xe-0/0/34 {
  unit 0 {
    family ethernet-switching;
  }
}
xe-0/0/35 {
  unit 0 {
    family ethernet-switching;
  }
}
xe-0/0/36 {
  unit 0 {
    family ethernet-switching;
  }
}
xe-0/0/37 {
  unit 0 {
    family ethernet-switching;
  }
}
xe-0/0/38 {
  unit 0 {
    family ethernet-switching;
  }
}
xe-0/0/39 {
  unit 0 {
    family ethernet-switching;
  }
}
xe-0/1/0 {
  unit 0 {
    family ethernet-switching;
  }
}
xe-0/1/1 {
  unit 0 {
    family ethernet-switching;
  }
}
xe-0/1/2 {
  unit 0 {
    family ethernet-switching;
  }
}
```

```
    xe-0/1/3 {
      unit 0 {
        family ethernet-switching;
      }
    }
    xe-0/2/0 {
      unit 0 {
        family ethernet-switching;
      }
    }
    xe-0/2/1 {
      unit 0 {
        family ethernet-switching;
      }
    }
    xe-0/2/2 {
      unit 0 {
        family ethernet-switching;
      }
    }
    xe-0/2/3 {
      unit 0 {
        family ethernet-switching;
      }
    }
  }
  protocols {
    igmp-snooping {
      vlan all;
    }
    rstp;
    lldp {
      interface all;
    }
    lldp-med {
      interface all;
    }
  }
  ethernet-switching-options {
    storm-control {
      interface all;
    }
  }
```

Related Documentation

- *Reverting to the Default Factory Configuration for the EX Series Switch*
- Connecting and Configuring an EX Series Switch (CLI Procedure) on page 161
- Connecting and Configuring an EX Series Switch (J-Web Procedure) on page 164
- *Understanding Configuration Files for EX Series Switches*
- *EX Series Switches Interfaces Overview*

Connecting and Configuring an EX Series Switch (CLI Procedure)

There are two ways to connect and configure an EX Series switch: one method is through the console by using the CLI and the other is by using the J-Web interface.

NOTE: EX2200-24T-4G-DC switches do not support switch connection and configuration through the J-Web interface.

This topic describes the CLI procedure.

NOTE: To run the ezsetup script, the switch must have the factory default configuration as the active configuration. If you have configured anything on the switch and want to run ezsetup, revert to the factory default configuration. See *Reverting to the Default Factory Configuration for the EX Series Switch*.

Using the CLI, set the following parameter values in the console server or PC:

- Baud rate—9600
- Flow control—None
- Data—8
- Parity—None
- Stop bits—1
- DCD state—Disregard

To connect and configure the switch from the console by using the CLI:

1. Connect the console port to a laptop or PC by using the RJ-45 to DB-9 serial port adapter. The RJ-45 cable and RJ-45 to DB-9 serial port adapter are supplied with the switch.

   For the location of the console port on different EX Series switches:

   - See *EX2200 Switches Hardware Overview*.
   - See *Rear Panel of an EX3200 Switch*.
   - See *Rear Panel of an EX3300 Switch*.
   - See *Rear Panel of an EX4200 Switch*.
   - See *EX4300 Switches Hardware Overview*
   - See "Front Panel of an EX4500 Switch" on page 12.
   - See *EX4550 Switches Hardware Overview*
   - See *Switch Fabric and Routing Engine (SRE) Module in an EX6200 Switch*.
   - See *Switch Fabric and Routing Engine (SRE) Module in an EX8208 Switch*.
   - See *Routing Engine (RE) Module in an EX8216 Switch*.

   NOTE: In EX2200-C, EX4300, and EX4550 switches, you can also use the Mini-USB Type-B console port to connect to a laptop or PC.

   - For EX2200-C switches, see *Connecting an EX2200 Switch to a Management Console Using Mini-USB Type-B Console Port*.
   - For EX4300 switches, see *Connecting an EX4300 Switch to a Management Console Using the Mini-USB Type-B Console Port*.
   - For EX4550 switches, see *Connecting an EX4550 Switch to a Management Console Using the Mini-USB Type-B Console Port*.

2. At the Junos OS shell prompt **root%**, type **ezsetup**.
3. Enter the hostname. This is optional.
4. Enter the root password you plan to use for this device. You are prompted to re-enter the root password.
5. Enter **yes** to enable services like Telnet and SSH. By default, Telnet is not enabled and SSH is enabled.

   NOTE: When Telnet is enabled, you will not be able to log in to an EX Series switch through Telnet by using root credentials. Root login is supported only for SSH access.

6. Use the Management Options page to select the management scenario:

NOTE: On EX4500, EX6200, and EX8200 switches, only the out-of-band management option is available.

- *Configure in-band management*. In in-band management, you configure a network interface or an uplink module (expansion module) interface as the management interface and connect it to the management device.
  In this scenario, you have the following two options:
  - Use the default VLAN.
  - Create a new VLAN—If you select this option, you are prompted to specify the VLAN name, VLAN ID, management IP address, and default gateway. Select the ports that must be part of this VLAN.
- *Configure out-of-band management*. In out-of-band management, you use a dedicated management channel (MGMT port) to connect to the management device. Specify the IP address and gateway of the management interface. Use this IP address to connect to the switch.

7. Specify the SNMP read community, location, and contact to configure SNMP parameters. These parameters are optional.
8. Specify the system date and time. Select the time zone from the list. These options are optional.
9. The configured parameters are displayed. Enter **yes** to commit the configuration. The configuration is committed as the active configuration for the switch.
10. (For EX4500 switches only) Enter the operational mode command **request chassis pic-mode intraconnect** to set the PIC mode to intraconnect.

You can now log in with the CLI or the J-Web interface to continue configuring the switch. If you use the J-Web interface to continue configuring the switch, the Web session is redirected to the new management IP address. If the connection cannot be made, the J-Web interface displays instructions for starting a J-Web session.

Related Documentation

- Connecting and Configuring an EX Series Switch (J-Web Procedure) on page 164
- *Installing and Connecting an EX2200 Switch*
- *Installing and Connecting an EX3200 Switch*
- *Installing and Connecting an EX3300 Switch*
- *Installing and Connecting an EX4200 Switch*
- *Installing and Connecting an EX4300 Switch*
- *Installing and Connecting an EX4550 Switch*
- Installing and Connecting an EX4500 Switch on page 111
- *Installing and Connecting an EX6210 Switch*
- *Installing and Connecting an EX8208 Switch*

- *Installing and Connecting an EX8216 Switch*

Connecting and Configuring an EX Series Switch (J-Web Procedure)

There are two ways to connect and configure an EX Series switch: one method is through the console by using the CLI and the other is by using the J-Web interface.

NOTE: EX2200-24T-4G-DC switches do not support switch connection and configuration through J-Web procedure.

This topic describes the J-Web procedure.

NOTE: Before you begin the configuration, enable a DHCP client on the management PC that you will connect to the switch so that the PC can obtain an IP address dynamically.

NOTE: Read the following steps before you begin the configuration. You must complete the initial configuration by using EZSetup within 10 minutes. The switch exits EZSetup after 10 minutes and reverts to the factory default configuration, and the PC loses connectivity to the switch.

- EX2200 and EX2200-C switch—The LEDs on the network ports on the front panel blink when the switch is in the initial setup mode.
- EX3200, EX3300, EX4200, EX4300, EX4500, EX4550, EX6200, or EX8200 switch—The LCD panel displays a count-down timer when the switch is in initial setup mode.

To connect and configure the switch by using the J-Web interface:

1. Transition the switch into initial setup mode:
   - EX2200 and EX2200-C switch—Press the mode button located on the lower right corner of the front panel for 10 seconds.
   - EX3200, EX3300, EX4200, EX4300, EX4500, EX4550, EX6200, or EX8200 switch—Use the **Menu** and **Enter** buttons located to the right of the LCD panel (see Figure 57 on page 165 or Figure 58 on page 165):

Figure 57: LCD Panel in an EX3200, EX4200, EX4500, EX4550, or EX8200 Switch

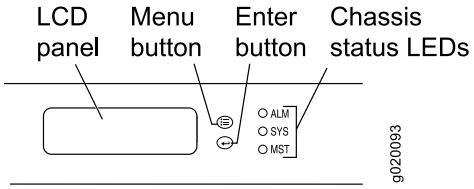
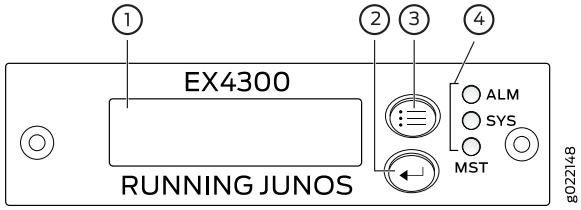


Figure 58: LCD Panel in an EX4300 Switch



1—LCD panel	3—LCD panel Menu button
2—LCD panel Enter button	4—Chassis status LEDs

   1. Press the **Menu** button until you see **MAINTENANCE MENU**. Then press the **Enter** button.
   2. Press **Menu** until you see **ENTER EZSetup**. Then press **Enter**.

      If EZSetup does not appear as an option in the menu, select **Factory Default** to return the switch to the factory default configuration. EZSetup is displayed in the menu of standalone switches only when a switch is set to the factory default configuration.
   3. Press **Enter** to confirm setup and continue with EZSetup.

2. Connect the Ethernet cable from the Ethernet port on the PC to the switch.
   - EX2200, EX3200, or EX4200 switch—Connect the cable to port 0 (ge-0/0/0) on the front panel of the switch.
   - EX3300, EX4500, or EX4550 switch—Connect the cable to the port labeled **MGMT** on the front panel (LCD panel side) of the switch.
   - EX4300 switch—Connect the cable to the port labeled **MGMT** on the rear panel of the switch.

- EX6200 switch—Connect the cable to one of the ports labeled **MGMT** on the Switch Fabric and Routing Engine (SRE) module in slot 4 or 5 in an EX6210 switch.
- EX8200 switch—Connect the cable to the port labeled **MGMT** on the Switch Fabric and Routing Engine (SRE) module in slot SRE0 in an EX8208 switch or on the Routing Engine (RE) module in slot RE0 in an EX8216 switch.

These ports are configured as the DHCP server with the default IP address, 192.168.1.1. The switch can assign an IP address to the management PC in the IP address range 192.168.1.2 through 192.168.1.253.

3. From the PC, open a Web browser, type **http://192.168.1.1** in the address field, and press **Enter**.
4. On the J-Web login page, type **root** as the username, leave the password field blank, and click **Login**.
5. On the Introduction page, click **Next**.
6. On the Basic Settings page, modify the hostname, the root password, and date and time settings:
   - Enter the hostname. This is optional.
   - Enter a password and reenter the password.
   - Specify the time zone.
   - Synchronize the date and time settings of the switch with the management PC or set them manually by selecting the appropriate option button. This is optional.

   Click **Next**.
7. Use the Management Options page to select the management scenario:

   NOTE: **On EX4500, EX6210, and EX8200 switches, only the out-of-band management option is available.**

   - **In-band Management—Use VLAN 'default' for management**.

     Select this option to configure all data interfaces as members of the default VLAN. Click **Next**. Specify the management IP address and the default gateway for the default VLAN.
   - **In-band Management—Create new VLAN for management**.

     Select this option to create a management VLAN. Click **Next**. Specify the VLAN name, VLAN ID, member interfaces, management IP address, and default gateway for the new VLAN.
   - **Out-of-band Management—Configure management port**.

     Select this option to configure only the management interface. Click **Next**. Specify the IP address and default gateway for the management interface.
8. Click **Next**.

9. On the Manage Access page, you can select options to enable Telnet, SSH, and SNMP services. For SNMP, you can configure the read community, location, and contact.
10. Click **Next**. The Summary screen displays the configured settings.
11. Click **Finish**. The configuration is committed as the active switch configuration.

NOTE: After the configuration is committed, the connectivity between the PC and the switch might be lost. To renew the connection, release and renew the IP address by executing the appropriate commands on the management PC or by removing and reinserting the Ethernet cable.

12. (For EX4500 switches only) In the CLI, enter the **request chassis pic-mode intraconnect** operational mode command to set the PIC mode to intraconnect.

You can now log in by using the CLI or the J-Web interface to continue configuring the switch.

If you use the J-Web interface to continue configuring the switch, the Web session is redirected to the new management IP address. If the connection cannot be made, the J-Web interface displays instructions for starting a J-Web session.

Related Documentation

- Connecting and Configuring an EX Series Switch (CLI Procedure) on page 161
- *Installing and Connecting an EX2200 Switch*
- *Installing and Connecting an EX3200 Switch*
- *Installing and Connecting an EX3300 Switch*
- *Installing and Connecting an EX4200 Switch*
- *Installing and Connecting an EX4300 Switch*
- Installing and Connecting an EX4500 Switch on page 111
- *Installing and Connecting an EX4550 Switch*
- *Installing and Connecting an EX6210 Switch*
- *Installing and Connecting an EX8208 Switch*
- *Installing and Connecting an EX8216 Switch*

PART 4

Removing the Switch and Switch Components

CHAPTER 13

Removing the Switch

Powering Off an EX4500 Switch

If you need to power off the EX4500 switch, follow the procedure in this topic.

Before you power off the switch:

- Ensure that you understand how to prevent electrostatic discharge damage. See "Prevention of Electrostatic Discharge Damage" on page 250.
- Ensure that you do not need to forward traffic through the switch.

Ensure that you have the following parts and tools available to power off the switch:

- An electrostatic discharge (ESD) grounding strap
- An external management device such as a PC
- A cable to connect the external management device to the console port (CON) or management port (MGMT) on the switch

To power off the switch:

1. Connect the management device (such as a PC) to the console (CON) port or the management (MGMT) port on the switch:
   - For connecting a management device to the console port, see "Connecting a Switch to a Management Console" on page 150.
   - For connecting a management device to the management port, see "Connecting a Switch to a Network for Out-of-Band Management" on page 149
2. From the PC connected to the switch, issue the following operational mode CLI command:

   user@switch> **request system halt**

   This command shuts down the switch gracefully and preserves system state information. A message displays on the console confirming that the operating system has halted.

You will see the following output (or something similar, depending on the hardware being shut down):

```
user@switch> request system halt
warning: This command will halt all the members.
If planning to halt only one member use the member option
Halt the system ? [yes,no] (no) yes

*** FINAL System shutdown message from user@switch ***
System going down IMMEDIATELY



Shutdown NOW!
[pid 14102]
message sent

{master:0}
user@switch> Waiting (max 300 seconds) for system process `vnlru' to stop...done
Waiting (max 300 seconds) for system process `vnlru_mem' to stop...done
Waiting (max 300 seconds) for system process `bufdaemon' to stop...done
Waiting (max 300 seconds) for system process `syncer' to stop...
Syncing disks, vnodes remaining...3 3 1 2 2 0 0 0 0 done

syncing disks... All buffers synced.
Uptime: 38d18h0m6s
recorded reboot as normal shutdown

The operating system has halted.
Please press any key to reboot
```

CAUTION: The final output of any version of this command is the “The operating system has halted. Please press any key to reboot” message. Wait at least 60 seconds after first seeing this message before following the instructions in Steps 3 and 4 to power off the switch.

CAUTION: If you have only one power supply in your switch, ensure that you have halted your system safely before turning off the power supply.

3. Attach the ESD grounding strap to your bare wrist and connect the strap to the ESD point on the chassis.
4. Disconnect power from the switch by performing one of the following tasks:

   For AC power supplies:

   - If the AC power source outlet has a power switch. set it to the OFF (0) position.
   - If the AC power source outlet does not have a power switch, gently pull out the male end of the power cord connected to the power source outlet.

For DC power supplies:

- Make sure that the voltage across the DC power source cable leads is 0 V and that the cables do not become active.

5. Observe the power supply LEDs and verify that the power supply LEDs turn off (appear unlit).
6. Repeat Steps 4 and 5 for all installed power supplies.

Related Documentation

- Connecting AC Power to an EX4500 Switch on page 143
- Connecting DC Power to an EX4500 Switch on page 145

Removing an EX4500 Switch from a Rack or Cabinet

If you need to relocate an installed EX4500 switch, use the procedure described in this topic. (The remainder of this topic uses “rack” to mean “rack or cabinet.”)

NOTE: When you remove multiple switches from a rack, remove the switch in the top of the rack first and proceed to remove the rest of the switches from top to bottom.

CAUTION: At least two people must be available to lift a switch chassis out of a rack—one person to unscrew the mounting screws from the brackets and the second person to hold the chassis.

Before removing the switch from a rack:

- Ensure that the rack or cabinet is stable and secured to the building.
- Ensure that there is enough space to place the removed switch in its new location and along the path to the new location.
- Read “General Safety Guidelines and Warnings” on page 221, with particular attention to “Chassis Lifting Guidelines for EX4500 Switches” on page 235.
- Ensure that the switch has been safely powered off and that you have unplugged (disconnected) the power cords.
- Ensure that you have disconnected any cables or wires attached to the switch.

Ensure that you have the following parts and tools available to remove the switch:

- A Phillips (+) screwdriver, number 2 or number 3, depending on the size of your rack mounting screws.
- A labeled bag to hold the removed screws.

To remove an EX4500 switch from a rack:

1. Use the appropriate Phillips (+) screwdriver to remove the mounting screws that attach the chassis front-mounting brackets to the rack.
2. Place the removed screws in a labeled bag. You will need them when you reinstall the chassis.
3. Lift the chassis from the rack and carefully move the chassis to its new location.

Related Documentation

- Mounting an EX4500 Switch on page 114

CHAPTER 14

Removing Switch Components

Installing and Removing EX4500 Switch Hardware Components

The EX4500 switch chassis is a rigid sheet-metal structure that houses the hardware components. The field-replaceable units (FRUs) in EX4500 switches are:

- Power supply
- Fan tray
- Uplink module
- Intraconnect module
- Virtual Chassis module
- SFP transceiver
- SFP+ transceiver

The power supply, fan tray, uplink module, and transceivers are hot-removable and hot-insertable: You can remove and replace them without powering off the switch or disrupting switch functions.

The Intraconnect module and Virtual Chassis module are offline field–replaceable: You can remove and replace these components, but the switch must be powered off to replace the component.

See these topics for instructions for installing and removing components:

- Installing an AC Power Supply in an EX4500 Switch on page 122
- Removing an AC Power Supply from an EX4500 Switch on page 176
- Installing a DC Power Supply in an EX4500 Switch on page 124
- Removing a DC Power Supply from an EX4500 Switch on page 183
- Installing a Fan Tray in an EX4500 Switch on page 125
- Removing a Fan Tray from an EX4500 Switch on page 184
- Installing an Uplink Module in an EX4500 Switch on page 127
- Removing an Uplink Module from an EX4500 Switch on page 186
- Installing an Intraconnect Module in an EX4500 Switch on page 129
- Removing an Intraconnect Module from an EX4500 Switch on page 188
- Installing a Virtual Chassis Module in an EX4500 Switch on page 131
- Removing a Virtual Chassis Module from an EX4500 Switch on page 190
- Installing a Transceiver in an EX Series Switch on page 134
- Removing a Transceiver from a Switch on page 195

Related Documentation

- Cooling System and Airflow in an EX4500 Switch on page 32
- AC Power Supply in EX4500 Switches on page 27
- DC Power Supply in EX4500 Switches on page 30
- Uplink Modules in EX4500 Switches on page 36
- Intraconnect Module in EX4500 Switches on page 38
- Virtual Chassis Module in EX4500 Switches on page 39
- Pluggable Transceivers Supported on EX4500 Switches on page 49

Removing an AC Power Supply from an EX4500 Switch

The power supply in EX4500 switches is a hot-removable and hot-insertable field-replaceable unit (FRU): You can remove and replace it without powering off the switch or disrupting switch functions.

Before you begin removing a power supply from the switch:

- Ensure you understand how to prevent ESD damage. See "Prevention of Electrostatic Discharge Damage" on page 250.

Ensure that you have the following parts and tools available to remove the power supply from the switch chassis:

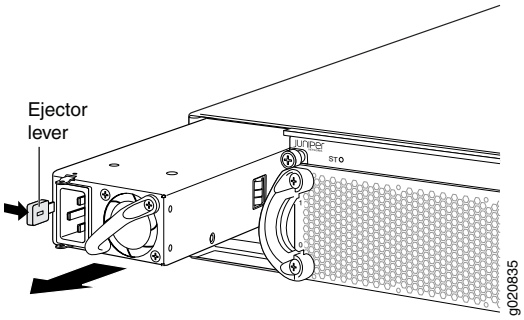
- An antistatic bag or an antistatic mat
- Replacement power supply or a cover panel for the power supply slot

CAUTION: **Do not leave the power supply slot empty for a long time while the switch is operational. Either replace the power supply promptly or install a cover panel over the empty slot.**

To remove a power supply from the switch (see Figure 59 on page 178):

1. Place the antistatic bag or the antistatic mat on a flat, stable surface.
2. Attach the electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
3. Disconnect power from the switch by performing one of the following tasks:
   - If the AC power source outlet has a power switch, set it to the OFF (0) position.
   - If the AC power source outlet does not have a power switch, gently pull out the male end of the power cord connected to the power source outlet.
4. Turn the adjustment nut of the power cord retainer counterclockwise till you can see the power cord. Pull the power cord from the slot in the adjustment nut.
5. Remove the female end of the power cord from the AC appliance inlet on the power supply faceplate.
6. Push the power cord retainer clip to one side of the appliance inlet. Squeeze the two sides of the power cord retainer clip, and pull the L-shaped ends of the clip from the holes on each side of the AC appliance inlet to completely remove the power retainer clip.
7. Push the ejector lever until the power supply is unseated.
8. Grasp the power supply handle and pull firmly to slide the power supply halfway out of the chassis.
9. Taking care not to touch power supply pins, leads, or solder connections, place one hand under the power supply to support it. Grasp the power supply handle with your other hand and pull the power supply completely out of the chassis.
10. Place the power supply in the antistatic bag or on the antistatic mat placed on a flat, stable surface.
11. If you are not replacing the power supply, install the cover panel over the slot.

Figure 59: Removing a Power Supply from an EX4500 Switch



Related Documentation

- Installing an AC Power Supply in an EX4500 Switch on page 122
- Installing and Removing EX4500 Switch Hardware Components on page 121
- AC Power Supply in EX4500 Switches on page 27
- Field-Replaceable Units in EX4500 Switches on page 23
- AC Power Cord Specifications for an EX4500 Switch on page 96
- Rear Panel of an EX4500 Switch on page 13

Replacing Redundant AC Power Supplies in an EX4500 Switch Without Disrupting Switch Functions

The power supplies in an EX4500 switch are field-replaceable units (FRUs) and are designed to be hot-swapped while the switch is operating. You can remove and replace the power supply in the top slot and the power supply in the bottom slot, one at a time, without disrupting switch functions.

Before replacing the power supplies in the switch:

- Ensure that you have the correct replacement power supplies for your EX4500 switch model. The color of the ejector lever on each power supply must match the color of the labels visible through the fan tray vents.
  - Orange for Intake—The back-to-front model has an orange ejector lever on the power supplies and an orange INTAKE label visible through the fan tray vents.
  - Green for Exhaust—The front-to-back model has a green ejector lever on the power supplies and a green EXHAUST label visible through the fan tray vents.

  CAUTION: **Operating the switch with an incorrect power supply might cause the chassis to overheat.**

- Ensure that you understand how to prevent electrostatic discharge (ESD) damage (see "Prevention of Electrostatic Discharge Damage" on page 250).
- If a grounding strap is not available, take these equivalent precautions:

- Before removing a component, touch the exposed, bare metal of the switch to ground yourself before handling the component.
- Before installing a component, hold the component in its antistatic bag in one hand and touch the exposed, bare metal of the switch with the other hand.

Ensure that you have the following parts and tools available to remove and replace the power supplies in the switch chassis:

- ESD grounding strap (not provided)
- Two antistatic bags or mats (not provided)
- Power supply cover panel to cover the empty power supply slot, if you do not plan to install a replacement power supply immediately (provided)

To replace both power supplies in an EX4500 switch while the switch is operational, remove and replace the power supply in the top slot first, and then repeat the procedure for the power supply in the bottom slot.

NOTE: **Each power supply must be connected to a dedicated AC power source outlet.**

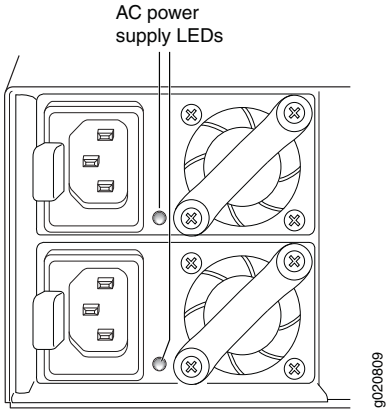
- Replacing the Power Supply in the Top Slot on page 180
- Replacing the Power Supply in the Bottom Slot on page 182

Replacing the Power Supply in the Top Slot

To replace the power supply in the top slot of the switch:

1. Ensure that the EX4500 switch you are working on is operating normally, with both power supplies turned on, by verifying that the LED on each power supply is lit steadily green. See Figure 60 on page 180.

Figure 60: Verify Green Power Supply LEDs for Normal Operation

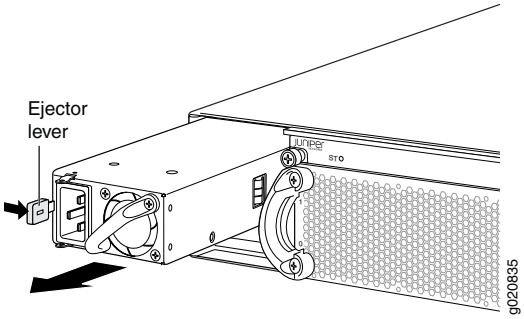


2. Attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the lower right front of the chassis—or touch the exposed, bare metal of the switch to ground yourself before handling a component.
3. To remove AC power from the old power supply:
   a. Identify the AC power source outlet that is powering the old power supply.
   b. If the AC power source outlet has an on/off switch, set it to the OFF (0) position.
   c. Gently pull the male end of the power cord for the old power supply out of the AC power source outlet.
4. To remove the power supply cord from the old power supply:
   a. On the power supply, turn the adjustment nut of the power cord retainer clockwise until you can see the power cord.
   b. Pull the power cord out of the slot in the adjustment nut.
   c. Unplug the power cord from the AC appliance inlet on the power supply. Save the cord.
   d. Remove the power cord retainer clip by pushing it to one side, squeezing both sides of the clip, and pulling it completely out of the power supply. Save the clip.
5. To remove the old power supply from the switch (see Figure 61 on page 181):
   a. Unseat the power supply by pressing the orange or green ejector lever next to the AC appliance inlet.
   b. Grasp the power supply handle and pull firmly, keeping one hand under the power supply to support it as you slide it out of the chassis.

CAUTION: Do not leave the power supply slot empty for a long time while the switch is operational. Either replace the power supply promptly or install a cover panel over the empty slot.

c. Place the old power supply in an antistatic bag or on an antistatic mat.

Figure 61: Removing an AC Power Supply from an EX4500 Switch



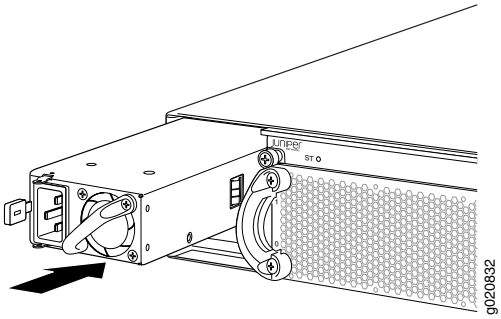
6. To install the replacement power supply in the switch (see Figure 62 on page 181):

   a. If you have not already done so, attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the lower right front of the chassis—or hold the component in its antistatic bag in one hand and touch the exposed, bare metal of the switch with the other hand.

   b. Taking care not to touch power supply pins, leads, or solder connections, remove the replacement power supply from its antistatic bag.

   c. Using both hands, place the replacement power supply in the empty power supply slot in the switch and slide it in until you hear a distinct click sound, indicating that the power supply is fully seated in the chassis.

Figure 62: Sliding a Replacement Power Supply into the EX4500 Switch



7. To connect AC power to the replacement power supply (see Figure 63 on page 182):

   a. Ensure that you have the power cord retainer clip and the power cord from the old power supply you removed in Step 4.

   b. Squeeze the sides of the retainer clip, and insert the L-shaped ends into the holes in the bracket on either side of the appliance inlet on the replacement power supply.

c. Insert the female end of the power cord into the AC appliance inlet on the replacement power supply.

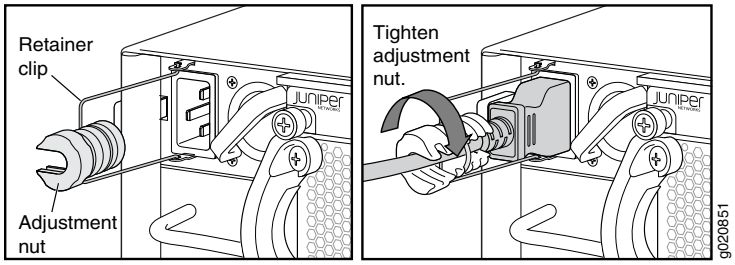
d. Push the retainer clip toward the cord until the cord slides into the slot on the adjustment nut.

e. Turn the adjustment nut clockwise until it is tight against the base of the coupler and the slot in the nut is turned 90º from the top of the switch.

f. If the AC power source outlet you are using has an on/off switch, ensure that it is set to the OFF (0) position.

g. Gently insert the male end of the power cord plug into the AC power source outlet, and set the on/off switch on the outlet (if any) to the ON (|) position

Figure 63: Connecting the Replacement Power Supply Cord



8. To ensure that the replacement power supply is operating normally and both power supplies are providing redundant power to the switch, verify that both power supply LEDs (see Figure 60 on page 180) are lit steadily green

9. To replace the power supply in the bottom slot, go on to "Replacing the Power Supply in the Bottom Slot" on page 182.

Replacing the Power Supply in the Bottom Slot

To replace the power supply in the bottom slot of the switch:

1. If you have not already done so, ensure that the EX4500 switch you are working on is operating normally, with both power supplies turned on, by verifying that the LED on each power supply is lit steadily green (see Figure 60 on page 180).

2. If you have not already done so, attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the lower right front of the chassis—or touch the exposed, bare metal of the switch to ground yourself before handling a component.

3. Remove power from the old power supply in the bottom slot (see Step 3 in "Replacing the Power Supply in the Top Slot" on page 180).

4. Remove the power cord from the old power supply in the bottom slot (see Step 4 in "Replacing the Power Supply in the Top Slot" on page 180).

5. Remove the bottom old power supply from the switch (see Step 5 in "Replacing the Power Supply in the Top Slot" on page 180).

CAUTION: Do not leave the power supply slot empty for a long time while the switch is operational. Either replace the power supply promptly or install a cover panel over the empty slot.

6. Install the bottom replacement power supply (see Step 6 in "Replacing the Power Supply in the Top Slot" on page 180).
7. Connect power to the bottom replacement power supply (see Step 7 in "Replacing the Power Supply in the Top Slot" on page 180).
8. To ensure that the replacement power supply is operating normally and both power supplies are providing redundant power to the switch, verify that both power supply LEDs (see Figure 60 on page 180) are lit steadily green.

Related Documentation

- AC Power Supply in EX4500 Switches on page 27
- AC Power Supply LEDs in EX4500 Switches on page 29

Removing a DC Power Supply from an EX4500 Switch

The power supply in EX4500 switches is a hot-removable and hot-insertable field-replaceable unit (FRU): You can remove and replace it without powering off the switch or disrupting switch functions.

Before you begin removing a power supply from the switch:

- Ensure you understand how to prevent ESD damage. See "Prevention of Electrostatic Discharge Damage" on page 250.

Ensure that you have the following parts and tools available to remove the power supply from the switch chassis:

- Electrostatic discharge (ESD) grounding strap
- Phillips (+) screwdriver, number 2
- An antistatic bag or an antistatic mat
- Replacement power supply or a cover panel for the power supply slot

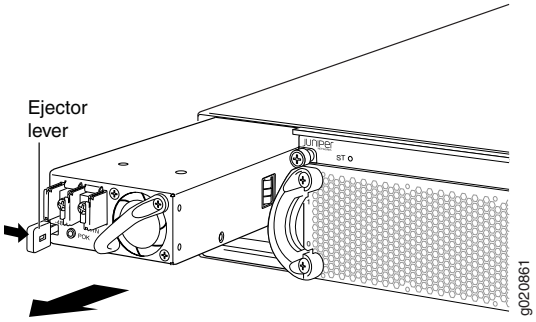
CAUTION: Do not leave the power supply slot empty for a long time while the switch is operational. Either replace the power supply promptly or install a cover panel over the empty slot.

To remove a power supply from the switch (see Figure 64 on page 184):

1. Place the antistatic bag or the antistatic mat on a flat, stable surface.
2. Attach the electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.

3. Make sure that the voltage across the DC power source cables leads is 0 V and that there is no chance that the cables might become active during the removal process.
4. Remove the plastic cover from the input terminals by sliding the cover either to the left or right.
5. Unscrew the locking screws counterclockwise using the screwdriver.
6. Remove the cable lugs from the input DC terminals.
7. Push the ejector lever until the power supply is unseated.
8. Grasp the power supply handle and pull firmly to slide the power supply halfway out of the chassis.
9. Taking care not to touch power supply pins, leads, or solder connections, place one hand under the power supply to support it. Grasp the power supply handle with your other hand and pull the power supply completely out of the chassis.
10. Place the power supply in the antistatic bag or on the antistatic mat placed on a flat, stable surface.
11. If you are not replacing the power supply, install the cover panel over the slot.

Figure 64: Removing a DC Power Supply from an EX4500 Switch



Related Documentation

- Installing a DC Power Supply in an EX4500 Switch on page 124
- DC Power Supply in EX4500 Switches on page 30
- Rear Panel of an EX4500 Switch on page 13

Removing a Fan Tray from an EX4500 Switch

An EX4500 switch has a single fan tray. The fan tray is a hot-removable and hot-insertable field-replaceable unit (FRU); you can remove and replace the fan tray while the switch is running without turning off power to the switch or disrupting switching functions.

CAUTION: Do not remove the fan tray unless you have a replacement fan tray available.

The fan tray is installed horizontally on the rear of the chassis.

Before you remove a fan tray:

- Ensure you understand how to prevent ESD damage. See "Prevention of Electrostatic Discharge Damage" on page 250.

Ensure that you have the following parts and tools available to remove a fan tray from the switch chassis:

- Electrostatic discharge (ESD) grounding strap
- Replacement fan tray
- An antistatic bag or an antistatic mat

CAUTION: **The fan tray can be removed and replaced while the switch is operating. However, the fan tray must be replaced within 30 seconds of removing the fan tray to prevent overheating of the chassis.**

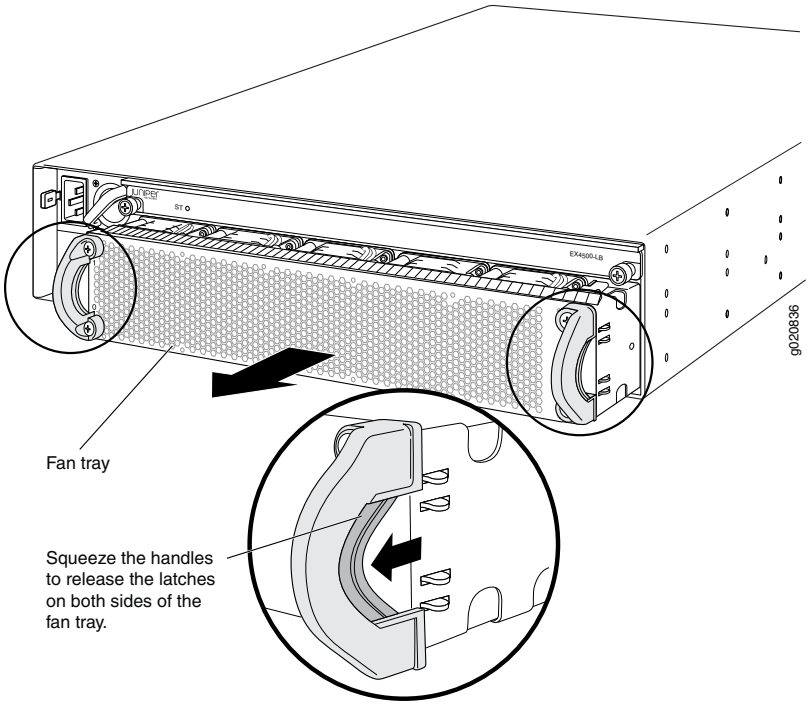
To remove a fan tray from the switch chassis (see Figure 65 on page 186):

1. Place the antistatic bag or the antistatic mat on a flat, stable surface.
2. Attach the electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
3. Squeeze both handles of the fan tray to release the latches that lock the fan tray in the chassis.

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

4. Grasp the handles on the fan tray and pull firmly to slide the fan tray halfway out of the chassis.
5. When the fan stops spinning, slide the fan tray completely out of the chassis.
6. Place the fan tray in the antistatic bag or on the antistatic mat placed on a flat, stable surface.

Figure 65: Removing a Fan Tray from an EX4500 Switch



Related Documentation

- Installing a Fan Tray in an EX4500 Switch on page 125
- Cooling System and Airflow in an EX4500 Switch on page 32
- Field-Replaceable Units in EX4500 Switches on page 23

Removing an Uplink Module from an EX4500 Switch

The uplink module in EX4500 switches is a hot-removable and hot-insertable field-replaceable unit (FRU): You can remove and replace it without powering off the switch or disrupting switch functions.

You can install up to two SFP+ uplink modules in an EX4500 switch. Both uplink modules install horizontally on the front of the chassis. See "Front Panel of an EX4500 Switch" on page 12.

Before you begin removing an uplink module from the switch:

- Ensure that you have taken the necessary precautions to prevent ESD damage (see "Prevention of Electrostatic Discharge Damage" on page 250).
- If there are any transceivers installed in the uplink module, remove them before you remove the uplink module. For instructions on removing transceivers, see "Removing a Transceiver from a Switch" on page 195.

Ensure that you have the following parts and tools available:

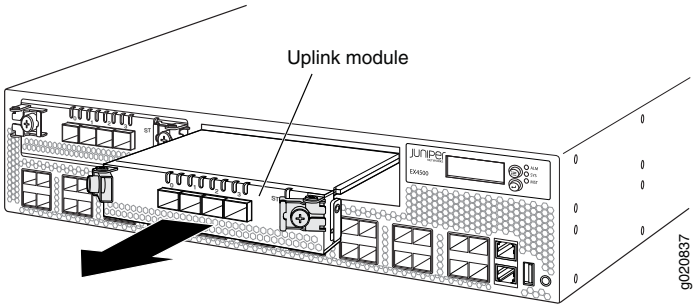
- Electrostatic discharge (ESD) grounding strap
- Phillips screwdriver, number 2
- A replacement uplink module or cover panel
- An antistatic bag or antistatic mat

CAUTION: Do not leave the uplink module slot empty for a long time while the switch is operational. Either replace the uplink module promptly or install a cover panel over the empty slot.

To remove an uplink module from the switch (see Figure 66 on page 187):

1. Attach the 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 in the ejector levers using the Phillips screwdriver, number 2.
3. Pull both the ejector levers outward until they are fully open.
4. Using both hands, gently pull the ejector levers to slide the uplink module halfway out of the chassis.
5. Using both hands, hold the front edge of the uplink module and slide it completely out of the chassis.
6. Place the uplink module in an antistatic bag or on an antistatic mat placed on a flat, stable surface.

Figure 66: Removing an Uplink Module from an EX4500 Switch



Related Documentation

- Installing an Uplink Module in an EX4500 Switch on page 127
- Installing and Removing EX4500 Switch Hardware Components on page 121
- Field-Replaceable Units in EX4500 Switches on page 23
- Front Panel of an EX4500 Switch on page 12

Removing an Intraconnect Module from an EX4500 Switch

The intraconnect module is installed horizontally on the rear of the switch. See "Rear Panel of an EX4500 Switch" on page 13. Use the procedure described in this topic to remove the module.

CAUTION: Operating an EX4500 switch without the intraconnect module or the Virtual Chassis module is not supported.
EX4500 switches running Junos OS Release 10.4R2 or later 10.4 releases will not boot if you do not install the intraconnect module in the switch.
EX4500 switches running Junos OS Release 11.1R1 or later releases will not boot if you install neither the intraconnect module nor the Virtual Chassis module in the switch.

Before you begin removing the intraconnect module from an EX4500 switch:

- Ensure that you have taken the necessary precautions to prevent ESD damage (see "Prevention of Electrostatic Discharge Damage" on page 250).
- Have instructions and tools for removing the fan tray. If the fan tray is installed, you must remove it as part of the procedure for removing the intraconnect module. After you install the replacement module, you must install the fan tray. See "Removing a Fan Tray from an EX4500 Switch" on page 184.

Ensure that you have the following parts and tools available:

- Electrostatic discharge (ESD) grounding strap
- Phillips screwdriver, number 2
- A replacement intraconnect module (Install the replacement module immediately after removing the module. Operating the switch without this module is not supported.)
- An antistatic bag or antistatic mat

NOTE: You must remove the fan tray from the EX4500 switch before removing the intraconnect module. See "Removing a Fan Tray from an EX4500 Switch" on page 184.

To remove the intraconnect module from the switch (see Figure 67 on page 189):

1. Halt the switch:

   ```
   user@switch> request system halt
   ```

   Wait until a message appears confirming that switch operation has halted.
2. Disconnect power to the switch by performing one of the following:

If you are using AC power:

- If the AC power source outlet has a power switch, set it to the OFF (0) position.
- If the AC power source outlet does not have a power switch, gently pull out the male end of the power cord connected to the power source outlet.

If you are using DC power:

- Open the input circuit breaker so that the cables will not become active during the removal process.

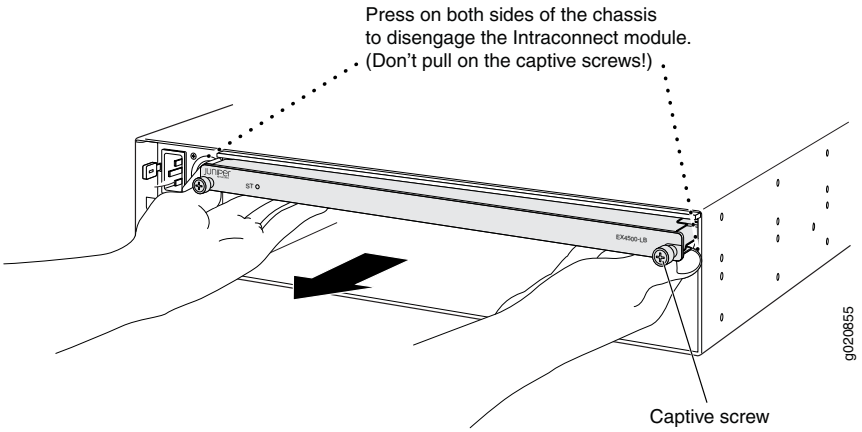
3. Attach the electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
4. Remove the fan tray from the EX4500 switch. See "Removing a Fan Tray from an EX4500 Switch" on page 184. Set it aside so that you can install it after you install the replacement intraconnect module.
5. Loosen the captive screws on the front faceplate of the module using the screwdriver.
6. Position your fingers under the module as shown in Figure 67 on page 189 and pull outwards to unseat and eject the module.

NOTE: **Do not use the captive screws to pull the module out from the chassis. Pull from underneath the front edge of the module.**

7. Using both hands, gently slide the intraconnect module halfway out of the chassis.
8. Place one hand under the module to support it and slide it completely out of the chassis.
9. Place the intraconnect module in an antistatic bag or on an antistatic mat placed on a flat, stable surface.

Promptly install the replacement intraconnect module. See "Installing an Intraconnect Module in an EX4500 Switch" on page 129.

Figure 67: Removing an Intraconnect Module from an EX4500 Switch



NOTE: If you have a Juniper J-Care service contract, register any addition, change, or upgrade of hardware components at https://www.juniper.net/customers/csc/management/updateinstallbase.jsp . Failure to do so can result in significant delays if you need replacement parts. This note applies if you change the type of power supply or add a new type of uplink module. It does not apply if you replace these components with the same type of component.

Related Documentation

- Installing an Intraconnect Module in an EX4500 Switch on page 129
- Installing and Removing EX4500 Switch Hardware Components on page 121

Removing a Virtual Chassis Module from an EX4500 Switch

The Virtual Chassis module is installed horizontally on the rear panel of the switch. See "Rear Panel of an EX4500 Switch" on page 13. Use the procedure described in this topic to remove the module from the switch chassis.

NOTE: The Virtual Chassis module is supported on EX4500 switches in Junos OS Releases 11.1 and later.

CAUTION: Operating an EX4500 switch without the intraconnect module or the Virtual Chassis module is not supported.
EX4500 switches running Junos OS Release 10.4R2 or later 10.4 releases will not boot if you do not install the intraconnect module in the switch.
EX4500 switches running Junos OS Release 11.1R1 or later releases will not boot if you install neither the intraconnect module nor the Virtual Chassis module in the switch.

Before you begin removing the Virtual Chassis module from the switch:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see "Prevention of Electrostatic Discharge Damage" on page 250).
- Have instructions and tools for removing the fan tray. See "Removing a Fan Tray from an EX4500 Switch" on page 184.

Ensure that you have the following parts and tools available:

- ESD grounding strap
- Phillips screwdriver, number 2
- A replacement Virtual Chassis module. (Install the replacement module immediately after removing the module. Operating the switch without this module is not supported.)
- An antistatic bag or antistatic mat

NOTE: You must remove the fan tray from the switch before removing the Virtual Chassis module. See "Removing a Fan Tray from an EX4500 Switch" on page 184.

To remove the Virtual Chassis module from the switch (see Figure 68 on page 192):

1. Halt the switch:

   ```
   user@switch> request system halt
   ```

   Wait until a message appears confirming that switch operation has halted.

2. Power off the switch by performing one of the following:

   If you are using AC power:

   - If the AC power source outlet has a power switch, set it to the OFF (0) position.
   - If the AC power source outlet does not have a power switch, gently pull out the male end of the power cord connected to the power source outlet.

   If you are using DC power:

   - Open the input circuit breaker so that the cables will not become active during the removal process.

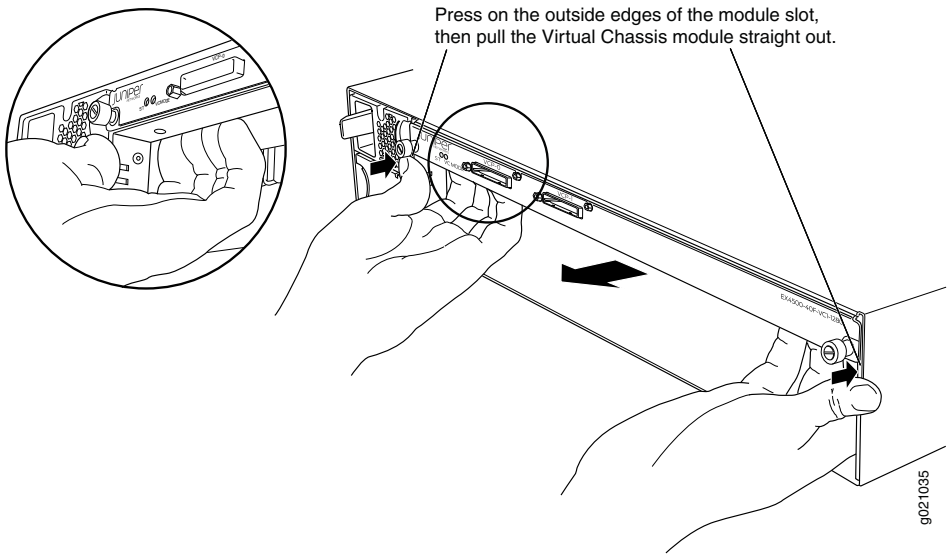
3. Attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
4. Remove the fan tray from the switch. See "Removing a Fan Tray from an EX4500 Switch" on page 184. Set it aside so that you can install it after you install the replacement Virtual Chassis module.
5. Loosen the captive screws on the front faceplate of the module using the screwdriver.
6. Position your fingers under the module as shown in Figure 68 on page 192 and pull outwards to unseat and eject the module.

   NOTE: Do not use the captive screws to pull the module out from the chassis. Pull from underneath the front edge of the module.

7. Using both hands, gently slide the Virtual Chassis module halfway out of the chassis.
8. Place one hand under the module to support it and slide it completely out of the chassis.
9. Place the Virtual Chassis module in an antistatic bag or on an antistatic mat placed on a flat, stable surface.

Promptly install the replacement Virtual Chassis module. See "Installing a Virtual Chassis Module in an EX4500 Switch" on page 131.

Figure 68: Removing the Virtual Chassis Module from an EX4500 Switch



NOTE: If you have a Juniper J-Care service contract, register any addition, change, or upgrade of hardware components at https://www.juniper.net/customers/csc/management/updateinstallbase.jsp. Failure to do so can result in significant delays if you need replacement parts. This note applies if you change the type of power supply or add a new type of uplink module. It does not apply if you replace these components with the same type of component.

Related Documentation

- Installing a Virtual Chassis Module in an EX4500 Switch on page 131
- Installing and Removing EX4500 Switch Hardware Components on page 121

Disconnecting a Virtual Chassis Cable from an EX4500 Switch

The Virtual Chassis module has two dedicated Virtual Chassis ports (VCPs) that can be used to interconnect the EX4500 switch with EX4200 switches or EX4500 switches to form a Virtual Chassis. The Virtual Chassis module is installed on the rear side of the switch chassis. Use the procedure described in this topic to disconnect a Virtual Chassis cable from the dedicated VCP port on a Virtual Chassis module.

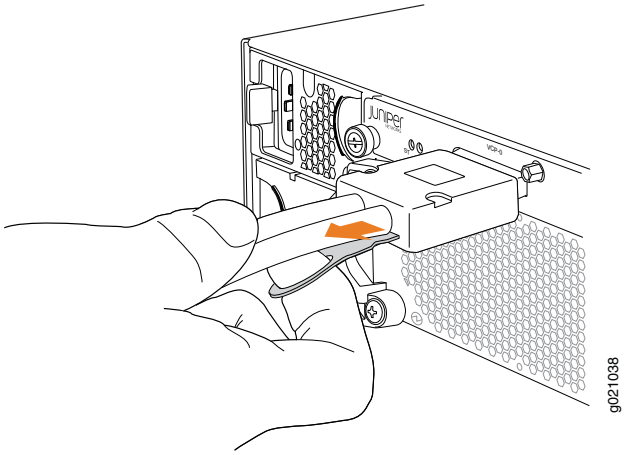
Ensure that you have the following parts and tools available:

- Phillips (+) screwdriver, number 2

To disconnect a Virtual Chassis cable from a dedicated VCP on an EX4500 switch (see Figure 69 on page 193):

1. Loosen the screws on the cable connector retainer by using the screwdriver.
2. Slide the cable connector retainer back.
3. Gently pull the release pull tab on the Virtual Chassis cable connector to release the lock holding the Virtual Chassis cable connector in the Virtual Chassis port.
4. Gently pull the Virtual Chassis cable connector out of the Virtual Chassis port.

Figure 69: Disconnecting a Virtual Chassis Cable from a Dedicated VCP on a Virtual Chassis Module



NOTE: If you order Virtual Chassis cables separately, you must reuse the cable connector retainers provided with the original cable or order Virtual Chassis cable connector retainers also separately.

Related Documentation

- Connecting a Virtual Chassis Cable to an EX4500 Switch on page 133
- Understanding EX4200, EX4500, and EX4550 Virtual Chassis Hardware Configurations on page 103
- *Understanding EX Series Virtual Chassis Components*
- Planning EX4200, EX4500, and EX4550 Virtual Chassis on page 106
- Virtual Chassis Ports Connector Pinout Information for EX4500 Switches on page 46

Disconnecting a Fiber-Optic Cable from a Switch

EX Series switches and OCX1100 switches have field-replaceable unit (FRU) optical transceivers to which you can connect fiber-optic cables.

Before you begin disconnecting a fiber-optic cable from an optical transceiver installed in a switch, ensure that you have taken the necessary precautions for safe handling of lasers. See "Laser and LED Safety Guidelines and Warnings for Switches" on page 227.

Ensure that you have the following parts and tools available:

- A rubber safety cap to cover the transceiver
- A rubber safety cap to cover the fiber-optic cable connector

To disconnect a fiber-optic cable from an optical transceiver installed in the switch:

1. Disable the port in which the transceiver is installed by issuing the following command:

   ```
   [edit interfaces]
   user@switch# set interface-name disable
   ```

   WARNING: **Do not look directly into a fiber-optic transceiver or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.**

2. Carefully unplug the fiber-optic cable connector from the transceiver.
3. Cover the transceiver with a rubber safety cap.

   WARNING: **Do not leave a fiber-optic transceiver uncovered except when inserting or removing a cable. The rubber safety cap keeps the port clean and prevents accidental exposure to laser light.**

4. Cover the fiber-optic cable connector with the rubber safety cap.

Related Documentation

- Connecting a Fiber-Optic Cable to a Switch on page 152
- Removing a Transceiver from a Switch on page 195
- Maintaining Fiber-Optic Cables in Switches on page 201
- *Pluggable Transceivers Supported on EX Series Switches*
- *Pluggable Transceivers Supported on OCX1100 Switches*

Removing a Transceiver from a Switch

The transceivers for EX Series switches and OCX1100 switches are hot-removable and hot-insertable field-replaceable units (FRUs): You can remove and replace them without powering off the switch or disrupting switch functions.

NOTE: **After you remove a transceiver or when you change the media-type configuration, wait for 6 seconds for the interface to display the operational commands.**

Before you begin removing a transceiver from a switch, ensure that you have taken the necessary precautions for safe handling of lasers (see "Laser and LED Safety Guidelines and Warnings for Switches" on page 227).

Ensure that you have the following parts and tools available:

- An antistatic bag or an antistatic mat
- Rubber safety caps to cover the transceiver and fiber-optic cable connector
- A dust cover to cover the port

Figure 70 on page 196 shows how to remove a QSFP+ transceiver. The procedure is the same for all types of transceivers except the CFP transceivers.

To remove a transceiver from a switch:

1. Place the antistatic bag or antistatic mat on a flat, stable surface.
2. Label the cable connected to the transceiver so that you can reconnect it correctly.

   WARNING: **Do not look directly into a fiber-optic transceiver or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.**

   WARNING: **Do not leave a fiber-optic transceiver uncovered except when inserting or removing a cable. The rubber safety cap keeps the port clean and prevents accidental exposure to laser light.**

   CAUTION: **Do not bend fiber-optic cables beyond their minimum bend radius. An arc smaller than a few inches in diameter can damage the cables and cause problems that are difficult to diagnose.**

3. Remove the cable connected to the transceiver (see "Disconnecting a Fiber-Optic Cable from a Switch" on page 194). Cover the transceiver and the end of each fiber-optic

cable connector with a rubber safety cap immediately after disconnecting the fiber-optic cables.

4. To remove an SFP, SFP+, XFP, or QSFP+ transceiver:

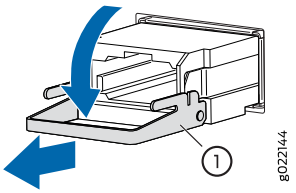
   a. By using your fingers, pull open the ejector lever on the transceiver to unlock the transceiver.

   CAUTION: Before removing the transceiver, make sure you open the ejector lever completely until you hear it click. This prevents damage to the transceiver.

   b. Grasp the transceiver ejector lever and gently slide the transceiver approximately 0.5 in. (1.3 cm) straight out of the port.

   CAUTION: To prevent electrostatic discharge (ESD) damage to the transceiver, do not touch the connector pins at the end of the transceiver.

Figure 70: Removing a Transceiver from a Switch



1— Ejector lever	

5. To remove a CFP transceiver:

   a. Loosen the screws on the transceiver by using your fingers.

   b. Grasp the screws on the transceiver and gently slide the transceiver approximately 0.5 in. (1.3 cm) straight out of the port.

   CAUTION: To prevent electrostatic discharge (ESD) damage to the transceiver, do not touch the connector pins at the end of the transceiver.

6. By using your fingers, grasp the body of the transceiver and pull it straight out of the port.
7. Place the transceiver in the antistatic bag or on the antistatic mat placed on a flat, stable surface.
8. Place the dust cover over the empty port.

Related Documentation

- Installing a Transceiver in an EX Series Switch on page 134
- *Pluggable Transceivers Supported on EX Series Switches*
- *Installing a Transceiver in an OCX1100 Switch*
- *Pluggable Transceivers Supported on OCX1100 Switches*

PART 5

Switch and Component Maintenance

CHAPTER 15

Routine Maintenance

Maintaining Fiber-Optic Cables in Switches

Fiber-optic cables connect to optical transceivers that are installed in EX Series switches and OCX1100 switches.

To maintain fiber-optic cables:

- When you unplug a fiber-optic cable from a transceiver, place rubber safety caps over the transceiver and on the end of the cable.
- Anchor fiber-optic cables to prevent stress on the connectors. When attaching a fiber-optic cable to a transceiver, be sure to secure the fiber-optic cable so that it is not supporting its own weight as it hangs to the floor. Never let a fiber-optic cable hang free from the connector.
- Avoid bending fiber-optic cables beyond their minimum bend radius. Bending fiber-optic cables into arcs smaller than a few inches in diameter can damage the cables and cause problems that are difficult to diagnose.
- Frequent plugging and unplugging of fiber-optic cables in and out of optical instruments can damage the instruments, which are expensive to repair. Attach a short fiber extension to the optical equipment. Any wear and tear due to frequent plugging and unplugging is then absorbed by the short fiber extension, which is easier and less expensive to replace than the instruments.
- Keep fiber-optic cable connections clean. Micro-deposits of oil and dust in the canal of the transceiver or cable connector can cause loss of light, reduction in signal power, and possibly intermittent problems with the optical connection.
  - To clean the transceiver canal, use an appropriate fiber-cleaning device such as RIFOCS Fiber Optic Adaptor Cleaning Wands (part number 946). Follow the directions in the cleaning kit you use.
  - After cleaning the transceiver, make sure that the connector tip of the fiber-optic cable is clean. Use only an approved alcohol-free fiber-optic cable cleaning kit such as the Opptex Cletop-S® Fiber Cleaner. Follow the directions in the cleaning kit you use.

Related Documentation

- Connecting a Fiber-Optic Cable to a Switch on page 152
- Laser and LED Safety Guidelines and Warnings for Switches on page 227
- *Pluggable Transceivers Supported on EX Series Switches*
- *Pluggable Transceivers Supported on OCX1100 Switches*

PART 6

Troubleshooting Switch Issues

CHAPTER 16

Troubleshooting Switch Issues

Troubleshooting the Boot Process on EX4500 Switches

Problem **Description:** For EX4500 switches running Junos OS 10.4R2 or later, the switch halts during the boot-up process.

Cause The Intraconnect module or the Virtual Chassis module is not installed in the switch.

Solution

1. Disconnect power from the switch by performing one of the following tasks:
   - For each installed AC power supply:
     - If the AC power source outlet has a power switch, set it to the OFF (0) position.
     - If the AC power source outlet does not have a power switch, gently pull out the male end of the power cord connected to the power source outlet.
   - For each installed DC power supply:
     - Open the input circuit breaker so that the cable leads will not become active while you are installing the Intraconnect module or the Virtual Chassis module.
2. Install either the Intraconnect module or the Virtual Chassis module in the switch. See "Installing an Intraconnect Module in an EX4500 Switch" on page 129 or "Installing a Virtual Chassis Module in an EX4500 Switch" on page 131.
3. Connect power to the switch by performing one of the following tasks:
   - For each installed AC power supply:
     - If the AC power source outlet has a power switch, set it to the ON (I) position.
     - If the AC power source outlet does not have a power switch, plug in the male end of the power cord connected to the power source outlet.
   - For each installed DC power supply:
     - Close the input circuit breaker so that the cables are active again.
4. Verify that a working Intraconnect module or Virtual Chassis module is installed in the switch using the CLI command **show chassis hardware**. You should see either the

Intraconnect module or the Virtual Chassis module listed in the description for the hardware item **PIC 3**.

Related Documentation

- Intraconnect Module in EX4500 Switches on page 38
- Virtual Chassis Module in EX4500 Switches on page 39

PART 7

Returning Hardware

CHAPTER 17

Returning the Switch or Switch Components

Returning an EX4500 Switch or Component for Repair or Replacement

If you need to return an EX4500 switch or hardware component to Juniper Networks for repair or replacement, follow this procedure:

1. Determine the serial number of the component. For instructions, see "Locating the Serial Number on an EX4500 Switch or Component" on page 210.
2. Obtain an RMA number from JTAC as described in "Contacting Customer Support to Obtain Return Materials Authorization for Switches" on page 213.

   NOTE: **Do not return any component to Juniper Networks unless you have first obtained an RMA number. Juniper Networks reserves the right to refuse shipments that do not have an RMA. Refused shipments are returned to the customer through collect freight.**

3. Pack the switch or component for shipping as described in "Packing an EX4500 Switch or Component for Shipping" on page 215.

For more information about return and repair policies, see the customer support page at http://www.juniper.net/support/guidelines.html .

Related Documentation

- EX4500 Switches Hardware Overview on page 3

Locating the Serial Number on an EX4500 Switch or Component

If you are returning a switch or hardware component to Juniper Networks for repair or replacement, you must locate the serial number of the switch or component. You must provide the serial number to the Juniper Networks Technical Assistance Center (JTAC) when you contact them to obtain Return Materials Authorization (RMA).

If the switch is operational and you can access the CLI, you can list serial numbers for the switch and for some components with a CLI command. If you do not have access to the CLI or if the serial number for the component does not appear in the command output, you can locate the serial number ID label on the physical switch or component.

NOTE: If you want to find the serial number on the physical switch component, you will need to remove the component from the switch chassis, for which you must have the required parts and tools available. See "Installing and Removing EX4500 Switch Hardware Components" on page 121.

Listing the Switch and Components Details with the CLI

To list the switch and switch components and their serial numbers, enter the following CLI command:

The following output lists the switch components and serial numbers for an EX4500 switch:

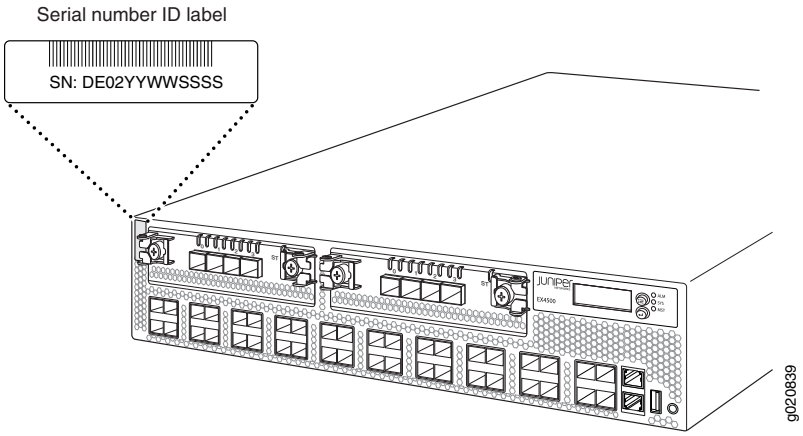
```
user@switch> show chassis hardware
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                DE0210067262      EX4500-40F
Routing Engine 0 REV 00D  750-026816   DE0210067262      EX4500-40F
FPC 0            REV 00D  750-026816   DE0210067262      EX4500-40F
  CPU                     BUILTIN      BUILTIN           FPC CPU
  PIC 0                   BUILTIN      BUILTIN           40x 1/10GE
    Xcvr 0       REV 01   740-030128   J09J24144         SFP+-10G-ER
    Xcvr 3       REV 01   740-030128   J09J24151         SFP+-10G-ER
  PIC 1          REV 02   711-028852   DJ0210102094      4x 1/10GE
    Xcvr 0       REV 02   740-011613   PH262X4           SFP-SX
  PIC 3          REV 01   711-030220   DL0210020902      Intraconnect module
(EX4500 LB)
Power Supply 0   REV 01   740-029654   EK0710120015      PS 1000W/1200W AC Front
 to back airflow
Fan Tray                                                 Fan Tray, Front to back
 Airflow
```

For information about the **show chassis hardware** command, see the *Junos OS System Basics and Services Command Reference* at http://www.juniper.net/techpubs/software/junos/index.html .

Locating the Chassis Serial Number ID Label on an EX4500 Switch

The serial number ID label is located on the front left corner of the chassis on an EX4500 switch. See Figure 71 on page 211.

Figure 71: Location of the Serial Number ID Label on an EX4500 Switch



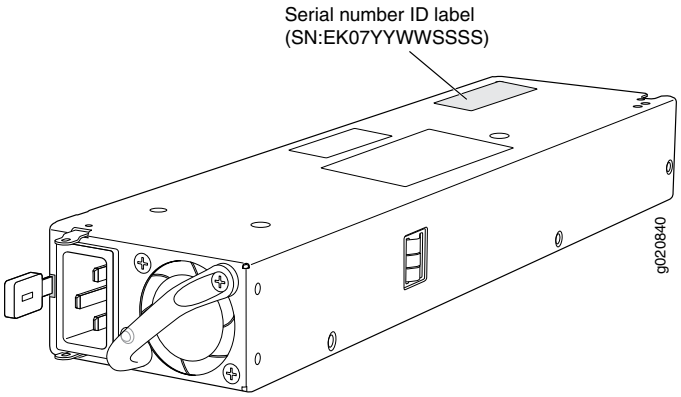
Locating the Serial Number ID Labels on FRUs in an EX4500 Switch

The power supplies, fan tray, uplink modules, intraconnect module, and the Virtual Chassis module installed in EX4500 switches are field-replaceable units (FRUs).

For each of these FRUs, you must remove the FRU from the switch chassis to see the FRU's serial number ID label.

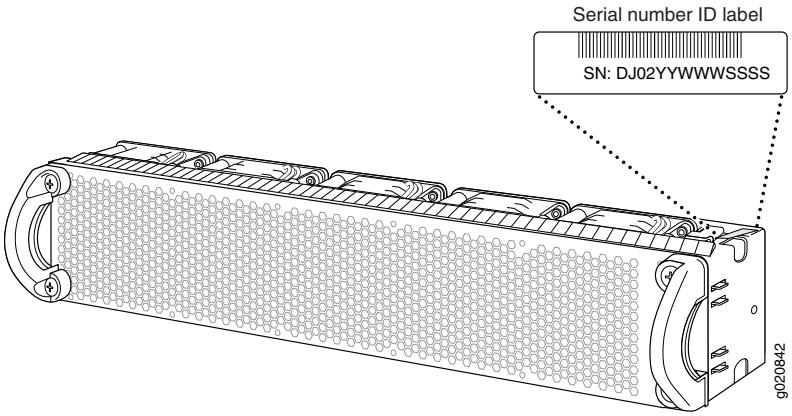
- **Power Supply**—The serial number ID label is on the top of the power supply. Figure 72 on page 212 shows the location of the serial number ID label. See "Removing an AC Power Supply from an EX4500 Switch" on page 176 or "Removing a DC Power Supply from an EX4500 Switch" on page 183.

Figure 72: Location of the Serial Number ID Label on an AC Power Supply Used in an EX4500 Switch



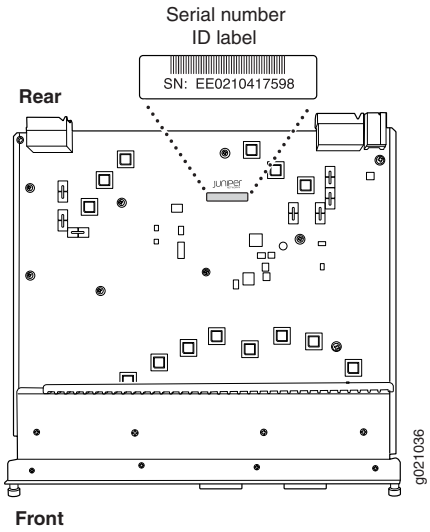
- **Fan tray**—The serial number ID label is on the top right corner of the fan tray. Figure 73 on page 212 shows the location of the serial number ID label. See "Removing a Fan Tray from an EX4500 Switch" on page 184.

Figure 73: Location of the Serial Number ID Label on the Fan Tray Used in an EX4500 Switch



- **Uplink module**—The serial number ID label is on the circuit board. See "Removing an Uplink Module from an EX4500 Switch" on page 186.
- **Intraconnect module**—The serial number ID label is on the circuit board. See "Removing an Intraconnect Module from an EX4500 Switch" on page 188.
- **Virtual Chassis module**—The serial number ID label is on the circuit board towards the rear of the module. Figure 74 on page 213 shows the location of the serial number ID label. See "Removing a Virtual Chassis Module from an EX4500 Switch" on page 190.

Figure 74: Location of the Serial Number ID Label on the Virtual Chassis Module Used in an EX4500 Switch



Related Documentation

- Contacting Customer Support to Obtain Return Materials Authorization for Switches on page 213
- Returning an EX4500 Switch or Component for Repair or Replacement on page 209

Contacting Customer Support to Obtain Return Materials Authorization for Switches

If you are returning a switch or hardware component to Juniper Networks for repair or replacement, obtain a Return Materials Authorization (RMA) from Juniper Networks Technical Assistance Center (JTAC).

After locating the serial number of the switch or hardware component you want to return, open a Case with Juniper Networks Technical Assistance Center (JTAC) on the Web or by telephone.

For instructions on locating the serial number of the switch or hardware component you want to return:

- See *Locating the Serial Number on an EX2200 Switch or Component*
- See *Locating the Serial Number on an EX3200 Switch or Component*
- See *Locating the Serial Number on an EX3300 Switch or Component*
- See *Locating the Serial Number on an EX4200 Switch or Component*
- See *Locating the Serial Number on an EX4300 Switch or Component*
- See "Locating the Serial Number on an EX4500 Switch or Component" on page 210
- See *Locating the Serial Number on an EX4550 Switch or Component*
- See *Locating the Serial Number on an EX4600 Switch or Component*

- See *Locating the Serial Number on an EX6200 Switch or Component*
- See *Locating the Serial Number on an EX8200 Switch or Component*
- See *Locating the Serial Number on an EX9204 Switch or Component*
- See *Locating the Serial Number on an EX9208 Switch or Component*
- See *Locating the Serial Number on an EX9214 Switch or Component*
- See *Locating the Serial Number on an XRE200 External Routing Engine or Component*
- See *Locating the Serial Number on an EX Series Redundant Power System or Redundant Power System Components*
- See *Locating the Serial Number on an OCX1100 Switch or Component*

Before you request an RMA from JTAC, be prepared to provide the following information:

- Your existing case number, if you have one
- Serial number of the component
- Your name, organization name, telephone number, fax number, and shipping address
- Details of the failure or problem
- Type of activity being performed on the switch when the problem occurred
- Configuration data displayed by one or more **show** commands

You can contact JTAC 24 hours a day, seven days a week on the Web or by telephone:

- Case Manager at CSC: http://www.juniper.net/cm/
- Telephone: +1-888-314-JTAC1-888-314-5822, toll free in U.S., Canada, and Mexico

NOTE: **For international or direct-dial options in countries without toll free numbers, see** http://www.juniper.net/support/requesting-support.html **.**

If you are contacting JTAC by telephone, enter your 11-digit case number followed by the pound (#) key for an existing case, or press the star (*) key to be routed to the next available support engineer.

The support representative validates your request and issues an RMA number for return of the component.

Related Documentation

- *Packing an EX2200 Switch or Component for Shipping*
- *Packing an EX3200 Switch or Component for Shipping*
- *Packing an EX3300 Switch or Component for Shipping*
- *Packing an EX4200 Switch or Component for Shipping*
- *Packing an EX4200 Switch or Component for Shipping*
- *Packing an EX4300 Switch or Component for Shipping*

Packing an EX4500 Switch or Component for Shipping

If you are returning an EX4500 switch or component to Juniper Networks for repair or replacement, pack the item as described in this topic.

Before you begin packing the switch or component, ensure you have:

- Followed all the steps listed in "Contacting Customer Support to Obtain Return Materials Authorization for Switches" on page 213.
- Retrieved the original shipping carton and packing materials. Contact your JTAC representative if you do not have these materials, to learn about approved packing materials. See "Contacting Customer Support to Obtain Return Materials Authorization for Switches" on page 213.
- Ensure you understand how to prevent ESD damage. See "Prevention of Electrostatic Discharge Damage" on page 250.

This topic describes:

Packing an EX4500 Switch for Shipping

If you need to transport the switch to another location or return the switch to Juniper Networks, you need to pack the switch securely in its original packaging to prevent damage during transportation.

Before you pack the switch:

1. On the console or other management device connected to the switch, enter the CLI operational mode and issue the following command to shut down the switch software:

   ```
   user@switch>request system halt
   ```

   Wait until a message appears on the console confirming that the operating system has halted.
2. Disconnect power from the switch by performing one of the following:
   - If the power source outlet has a power switch, set it to the OFF (0) position.
   - If the power source outlet does not have a power switch, gently pull out the male end of the power cord connected to the power source outlet.
3. Remove the cables that connect the switch to all external devices. See "Disconnecting a Fiber-Optic Cable from a Switch" on page 194.
4. Remove all optical transceivers installed in the switch. See "Removing a Transceiver from a Switch" on page 195.

Ensure that you have the following parts and tools available to pack the switch:

- Phillips (+) screwdriver, number 2
- The original switch packing material (cardboard box, accessory box and its contents, and foam padding)
- Electrostatic discharge (ESD) grounding strap
- Antistatic bag

CAUTION: **Do not pack the switch in anything except its original container or the switch might be damaged in transit.**

To pack the switch:

1. If the switch is installed in a rack, or cabinet, have one person support the weight of the switch while another person unscrews and removes the mounting screws.
2. Remove the switch from the rack or cabinet (see "Removing an EX4500 Switch from a Rack or Cabinet" on page 173) and place the switch on a flat, stable surface.

3. Use the Phillips (+) screwdriver, number 2 to remove the rack mounting brackets from the switch chassis.
4. Place the switch in an antistatic bag.
5. Place the bottom portion of the packaging foam in the shipping carton.
6. Place the switch inside the cavity in the bottom packaging foam.
7. Place the top portion of the packaging foam on top of the switch.
8. If you are returning accessories or field-replaceable units (FRUs) with the switch, pack them as instructed in "Packing EX4500 Switch Components for Shipping" on page 217.
9. Place the accessory box vertically by the rear end of the chassis in the shipping carton.
10. Close the top of the cardboard shipping box and seal it with packing tape.
11. Write the RMA number on the exterior of the box to ensure proper tracking.

Packing EX4500 Switch Components for Shipping

To pack the switch components, follow the instructions here.

Ensure that you have the following parts and tools available:

- Antistatic bag, one for each component
- Electrostatic discharge (ESD) grounding strap

CAUTION: **Do not stack switch components. Return individual components in separate boxes if they do not fit together on one level in the shipping box.**

To pack the switch components:

- Place individual components in antistatic bags.
- Use the original packing materials if they are available. If the original packing materials are not available, ensure the component is adequately packed to prevent damage during transit. The packing material you use must be able to support the weight of the component.
- Ensure that the components are adequately protected by wrapping them well with packing materials. Pack the component in an oversized box (if the original box is not available) with extra packing material around the unit so that the component is prevented from moving around inside the box.
- Securely tape the box closed.
- Write the RMA number on the exterior of the box to ensure proper tracking.

Related Documentation

- Returning an EX4500 Switch or Component for Repair or Replacement on page 209
- Unpacking an EX4500 Switch on page 112

PART 8

Safety Information

CHAPTER 18

General Safety Information

General Safety Guidelines and Warnings

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches, the EX Series Redundant Power System (RPS), and the XRE200 External Routing Engine.

This topic also applies to hardware devices in the QFX Series and to OCX1100 switches.

The following guidelines help ensure your safety and protect the device 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 device. Make sure that only authorized service personnel perform other system services.
- Keep the area around the device 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 device.
- 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 device only when it is properly grounded.
- Ensure that the separate protective earthing terminal provided on this device 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 device. 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 chassis or onto any device component. Such an action could cause electrical shock or damage the device.
- 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 cover panels are fully inserted and that the installation screws are fully tightened.

Related Documentation

- AC Power Electrical Safety Guidelines on page 252
- DC Power Electrical Safety Guidelines on page 255
- General Electrical Safety Guidelines and Warnings on page 249
- Maintenance and Operational Safety Guidelines and Warnings on page 242
- Installation Instructions Warning on page 233
- Grounded Equipment Warning on page 241

Definitions of Safety Warning Levels

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches, the EX Series Redundant Power System (RPS), and the XRE200 External Routing Engine.

This topic also applies to hardware devices in the QFX Series and to OCX1100 switches.

The documentation uses the following levels of safety warnings (there are two “Warning” formats):

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 prevent minor injury or discomfort to you or severe damage to the device.

WARNING: This symbol alerts you to the risk of personal injury from a laser.

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.

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.

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.

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.

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.

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.

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.

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.

¡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.

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 Documentation

- General Safety Guidelines and Warnings on page 221
- Installation Instructions Warning on page 233
- Maintenance and Operational Safety Guidelines and Warnings on page 242
- Grounded Equipment Warning on page 241
- Laser and LED Safety Guidelines and Warnings for Switches on page 227
- *Laser and LED Safety Guidelines and Warnings for the QFX Series*
- Warning Statement for Norway and Sweden on page 226

Fire Safety Requirements

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches, the EX Series Redundant Power System (RPS), and the XRE200 External Routing Engine.

This topic also applies to hardware devices in the QFX Series and to OCX1100 switches.

In the event of a fire emergency involving switches and other network equipment, the safety of people is the primary concern. You should establish procedures for protecting people in the event of a fire emergency, provide safety training, and properly provision fire-control equipment and fire extinguishers.

In addition, you should establish procedures to protect your equipment in the event of a fire emergency. Juniper Networks products should be installed in an environment suitable for electronic equipment. We recommend that fire suppression equipment be available in the event of a fire in the vicinity of the equipment and that all local fire, safety, and electrical codes and ordinances be observed when you install and operate your equipment.

Fire Suppression

In the event of an electrical hazard or an electrical fire, you should first turn power off to the equipment at the source. Then use a Type C fire extinguisher, which uses noncorrosive fire retardants, to extinguish the fire.

Fire Suppression Equipment

Type C fire extinguishers, which use noncorrosive fire retardants such as carbon dioxide and Halotron™, are most effective for suppressing electrical fires. Type C fire extinguishers displace oxygen from the point of combustion to eliminate the fire. For extinguishing fire on or around equipment that draws air from the environment for cooling, you should use this type of inert oxygen displacement extinguisher instead of an extinguisher that leaves residues on equipment.

Do not use multipurpose Type ABC chemical fire extinguishers (dry chemical fire extinguishers). The primary ingredient in these fire extinguishers is monoammonium phosphate, which is very sticky and difficult to clean. In addition, in the presence of minute amounts of moisture, monoammonium phosphate can become highly corrosive and corrodes most metals.

Any equipment in a room in which a chemical fire extinguisher has been discharged is subject to premature failure and unreliable operation. The equipment is considered to be irreparably damaged.

NOTE: **To keep warranties effective, do not use a dry chemical fire extinguisher to control a fire at or near a Juniper Networks switch or other network device provided by Juniper. If a dry chemical fire extinguisher is used, the unit is no longer eligible for coverage under a service agreement.**

We recommend that you dispose of any irreparably damaged equipment in an environmentally responsible manner.

Related Documentation

- General Safety Guidelines and Warnings on page 221
- General Electrical Safety Guidelines and Warnings on page 249
- Action to Take After an Electrical Accident on page 264

Qualified Personnel Warning

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches, the EX Series Redundant Power System (RPS), and the XRE200 External Routing Engine.

This topic also applies to hardware devices in the QFX Series and to OCX1100 switches.

WARNING: **Only trained and qualified personnel should install or replace the device.**

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 Documentation

- General Safety Guidelines and Warnings on page 221
- General Electrical Safety Guidelines and Warnings on page 249
- AC Power Electrical Safety Guidelines on page 252
- DC Power Electrical Safety Guidelines on page 255

Warning Statement for Norway and Sweden

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches, the EX Series Redundant Power System (RPS), and the XRE200 External Routing Engine.

This topic also applies to hardware devices in the QFX Series and to OCX1100 switches.

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 Documentation

- General Safety Guidelines and Warnings on page 221

CHAPTER 19

Radiation and Laser Warnings

Laser and LED Safety Guidelines and Warnings for Switches

EX Series switches, OCX1100 switches, and the XRE200 External Routing Engine 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 ports that support optical transceivers, 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 Documentation

- General Safety Guidelines and Warnings on page 221
- Radiation from Open Port Apertures Warning on page 230
- Installation Instructions Warning on page 233
- Grounded Equipment Warning on page 241
- *Pluggable Transceivers Supported on EX Series Switches*
- *Pluggable Transceivers Supported on OCX1100 Switches*

Radiation from Open Port Apertures Warning

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches, the EX Series Redundant Power System (RPS), and the XRE200 External Routing Engine.

This topic also applies to hardware devices in the QFX Series and to OCX1100 switches.

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.

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.

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

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.

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!

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.

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.

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.

¡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.

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 Documentation

- General Safety Guidelines and Warnings on page 221
- Laser and LED Safety Guidelines and Warnings for Switches on page 227
- Installation Instructions Warning on page 233
- Grounded Equipment Warning on page 241
- *Laser and LED Safety Guidelines and Warnings for the QFX Series*

CHAPTER 20

Installation and Maintenance Safety Information

Installation Instructions Warning

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches, the EX Series Redundant Power System (RPS), and the XRE200 External Routing Engine.

This topic also applies to hardware devices in the QFX Series and to OCX1100 switches.

WARNING: Read the installation instructions before you connect the device 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 Documentation

- General Safety Guidelines and Warnings on page 221
- Laser and LED Safety Guidelines and Warnings for Switches on page 227
- *Laser and LED Safety Guidelines and Warnings for the QFX Series*
- Grounded Equipment Warning on page 241
- *Connecting AC Power to an EX2200 Switch*
- *Connecting AC Power to an EX3200 Switch*
- *Connecting AC Power to an EX3300 Switch*
- *Connecting AC Power to an EX4200 Switch*
- *Connecting AC Power to an EX4300 Switch*
- Connecting AC Power to an EX4500 Switch on page 143
- *Connecting AC Power to an EX4550 Switch*
- *Connecting AC Power to an EX4600 Switch*
- *Connecting AC Power to an EX6200 Switch*
- *Connecting AC Power to an EX8200 Switch*
- *Connecting AC Power to an EX9204 Switch*
- *Connecting AC Power to an EX9208 Switch*
- *Connecting AC Power to an EX9214 Switch*
- *Connecting DC Power to an EX2200 Switch*
- *Connecting DC Power to an EX3200 Switch*
- *Connecting DC Power to an EX4200 Switch*
- *Connecting DC Power to an EX4300 Switch*
- Connecting DC Power to an EX4500 Switch on page 145
- *Connecting DC Power to an EX4600 Switch*
- *Connecting DC Power to an EX4550 Switch*
- *Connecting DC Power to an EX6200 Switch*
- *Connecting DC Power to an EX8200 Switch*

- *Connecting DC Power to an EX9204 Switch*
- *Connecting DC Power to an EX9208 Switch*
- *Connecting DC Power to an EX9214 Switch*
- *Connecting AC Power to an XRE200 External Routing Engine*
- *Connecting DC Power to an XRE200 External Routing Engine*
- *Connecting AC Power to an OCX1100 Switch*
- *Connecting DC Power to an OCX1100 Switch*
- *Connecting AC Power to a QFX3100 Director Device*
- *Connecting AC Power to a QFX3008-I Interconnect Device with Single-Phase Wiring Trays*
- *Connecting AC Power to a QFX3008-I Interconnect Device with Three-Phase Delta Wiring Trays*
- *Connecting AC Power to a QFX3008-I Interconnect Device with Three-Phase Wye Wiring Trays*
- *Connecting AC Power to a QFX3500, QFX3600, or QFX3600-I Device*
- *Connecting DC Power to a QFX3500, QFX3600, or QFX3600-I Device*
- *Connecting AC Power to a QFX5100 Device*
- *Connecting DC Power to a QFX5100 Device*

Chassis Lifting Guidelines for EX4500 Switches

The weight of an EX4500 switch is approximately 37 lb (17 kg). Observe the following guidelines for lifting and moving the switch:

- Before moving the switch to a site, ensure that the site meets the power, environmental, and clearance requirements specified in the "Site Preparation Checklist for EX4500 Switches" on page 77.
- Before lifting or moving the switch, disconnect all external cables and wires.
- As when lifting any heavy object, ensure that most of the weight is borne by your legs rather than your back. Keep your knees bent and your back relatively straight. Do not twist your body as you lift. Balance the load evenly and be sure that your footing is firm.

Related Documentation

- General Safety Guidelines and Warnings on page 221
- Installation Instructions Warning on page 233
- Mounting an EX4500 Switch on page 114

Ramp Warning

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches, the EX Series Redundant Power System (RPS), and the XRE200 External Routing Engine.

This topic also applies to hardware devices in the QFX Series and to OCX1100 switches.

WARNING: **When installing the device, 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 Documentation

- General Safety Guidelines and Warnings on page 221
- Installation Instructions Warning on page 233
- Grounded Equipment Warning on page 241

Rack-Mounting and Cabinet-Mounting Warnings

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches, the EX Series Redundant Power System (RPS), and the XRE200 External Routing Engine.

This topic also applies to hardware devices in the QFX Series and to OCX1100 switches.

Ensure that the rack or cabinet in which the device is installed is evenly and securely supported. Uneven mechanical loading could lead to a hazardous condition.

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

- The device must be installed in a rack that is secured to the building structure.
- The device should be mounted at the bottom of the rack if it is the only unit in the rack.
- When mounting the device on 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 equipment, install the stabilizers before mounting or servicing the device in the rack.

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

- 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.

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.

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.

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.

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.

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.

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.

¡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.

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 Documentation

- General Safety Guidelines and Warnings on page 221
- Installation Instructions Warning on page 233
- Grounded Equipment Warning on page 241
- *Mounting an EX2200 Switch*
- *Mounting an EX3200 Switch*
- *Mounting an EX3300 Switch*
- *Mounting an EX4200 Switch*
- *Mounting an EX4300 Switch*
- Mounting an EX4500 Switch on page 114
- *Mounting an EX4550 Switch*
- *Mounting an EX4600 Switch in a Rack or Cabinet*
- *Mounting an EX6210 Switch on a Rack or Cabinet*
- *Mounting an EX8208 Switch on a Rack or Cabinet*
- *Mounting an EX8216 Switch on a Rack or Cabinet*
- *Mounting an EX9200 Switch on a Rack or Cabinet Using a Mechanical Lift*
- *Mounting an EX9204 Switch on a Rack or Cabinet Without Using a Mechanical Lift*
- *Mounting an EX9208 Switch on a Rack or Cabinet Without Using a Mechanical Lift*
- *Mounting an OCX1100 Switch*
- *Mounting a QFX3100 Director Device on Four Posts in a Rack or Cabinet*
- *Mounting a QFX3100 Director Device on Two Posts in a Rack or Cabinet*
- *Mounting a QFX3008-I Interconnect Device on a Rack or Cabinet Using a Mechanical Lift*

- *Mounting a QFX3600 or QFX3600-I Device on Four Posts in a Rack or Cabinet*
- *Mounting a QFX3600 or QFX3600-I Device on Two Posts in a Rack or Cabinet*
- *Mounting a QFX3500 Device in a Rack or Cabinet*
- *Mounting a QFX5100 Device in a Rack or Cabinet*

Grounded Equipment Warning

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches, the EX Series Redundant Power System (RPS), and the XRE200 External Routing Engine.

This topic also applies to hardware devices in the QFX Series and to OCX1100 switches.

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

- General Safety Guidelines and Warnings on page 221

Maintenance and Operational Safety Guidelines and Warnings

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches, the EX Series Redundant Power System (RPS), and the XRE200 External Routing Engine.

This topic also applies to hardware devices in the QFX Series and to OCX1100 switches.

While performing the maintenance activities for devices, observe the following guidelines and warnings:

Battery Handling Warning

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

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.

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.

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.

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.

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.

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.

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.

¡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.

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.

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

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

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

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

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

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

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

¡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.

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.

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

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

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

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

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

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

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

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

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

Operating Temperature Warning

WARNING: To prevent the device from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature of 104° F (40° C) for EX6200 switches, EX8208 switches, EX8216 switches, QFX Series devices, OCX1100 switches, and XRE200 External Routing Engines and 113° F (45° C) for EX2200, EX3300, EX3200, EX4200, EX4300, EX4500, and EX4550 switches. To prevent airflow restriction, allow at least 6 in. (15.2 cm) of clearance around the ventilation openings.

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.

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.

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.

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.

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.

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.

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.

¡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.

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 device must be handled according to all national laws and regulations.

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

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

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

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

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

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

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

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

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

Related Documentation

- General Safety Guidelines and Warnings on page 221
- General Electrical Safety Guidelines and Warnings on page 249
- AC Power Electrical Safety Guidelines on page 252
- DC Power Electrical Safety Guidelines on page 255
- Laser and LED Safety Guidelines and Warnings for Switches on page 227
- *Laser and LED Safety Guidelines and Warnings for the QFX Series*
- Installation Instructions Warning on page 233
- Grounded Equipment Warning on page 241

CHAPTER 21

Power and Electrical Safety Information

General Electrical Safety Guidelines and Warnings

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches, the EX Series Redundant Power System (RPS), and the XRE200 External Routing Engine.

This topic also applies to hardware devices in the QFX Series and to OCX1100 switches.

WARNING: Certain ports on the device are designed for use as intrabuilding (within-the-building) interfaces only (Type 2 or Type 4 ports as described in *GR-1089-CORE*) 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 device 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: **Before removing or installing components of a device, attach an electrostatic discharge (ESD) grounding strap to an ESD point and place the other end of the strap around your bare wrist. Failure to use an ESD grounding strap could result in damage to the switch.**

- Install the device 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 device within marked electrical ratings and product usage instructions.
- To ensure that the device 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 device components without powering off or disconnecting power to the device, as detailed elsewhere in the hardware documentation for this device. Never install an equipment that it appears to be damaged.

Related Documentation

- General Safety Guidelines and Warnings on page 221
- AC Power Electrical Safety Guidelines on page 252
- DC Power Electrical Safety Guidelines on page 255

Prevention of Electrostatic Discharge Damage

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches, the EX Series Redundant Power System (RPS), and the XRE200 External Routing Engine.

This topic also applies to hardware devices in the QFX Series and to OCX1100 switches.

Device components that are shipped in antistatic bags 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 grounding strap when you are handling components that are subject to ESD damage, and make sure that it is in direct contact with your skin.

  If a grounding strap is not available, hold the component in its antistatic bag (see Figure 75 on page 251) in one hand and touch the exposed, bare metal of the device with the other hand immediately before inserting the component into the device.

  WARNING: **For safety, periodically check the resistance value of the ESD grounding strap. The measurement must be in the range 1 through 10 Mohms.**

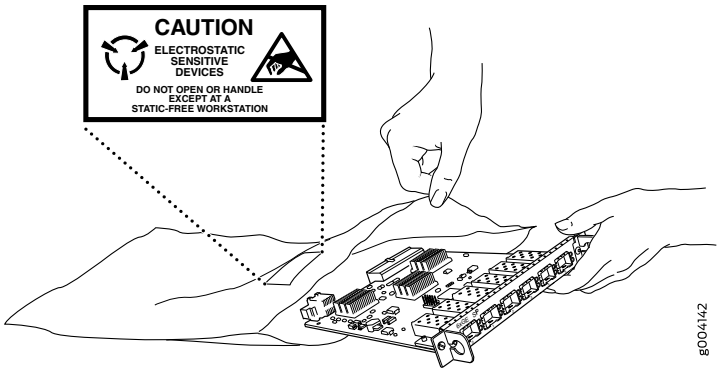
- When handling any component that is subject to ESD damage and that is removed from the device, make sure the equipment end of your ESD grounding strap is attached to the ESD point on the chassis.

  If no grounding strap is available, touch the exposed, bare metal of the device to ground yourself before handling the component.

- Avoid contact between the component that is subject to ESD damage and your clothing. ESD voltages emitted from clothing can damage components.

- When removing or installing a component that is subject to ESD damage, always place it component-side up on an antistatic surface, in an antistatic card rack, or in an antistatic bag (see Figure 75 on page 251). If you are returning a component, place it in an antistatic bag before packing it.

Figure 75: Placing a Component into an Antistatic Bag



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

Related Documentation

- General Safety Guidelines and Warnings on page 221
- See *EX2200 Switches Hardware Overview* for the ESD point location.
- See *Rear Panel of an EX3200 Switch* for the ESD point location.
- See *Rear Panel of an EX3300 Switch* for the ESD point location.
- See *Rear Panel of an EX4200 Switch* for the ESD point location.
- See *EX4300 Switches Hardware Overview* for the ESD point location.
- See Front Panel of an EX4500 Switch on page 12 for the ESD point location.
- See *EX4550 Switches Hardware Overview* for the ESD point location.
- See *Chassis Physical Specifications of an EX6210 Switch* for the ESD point location.
- See *Chassis Physical Specifications of an EX8208 Switch* for the ESD point location.
- See *Chassis Physical Specifications of an EX8216 Switch* for the ESD point location.
- See *EX9204 Switch Hardware Overview* for the ESD point location.
- See *EX9208 Switch Hardware Overview* for the ESD point location.
- See *EX9214 Switch Hardware Overview* for the ESD point location.
- See *OCX1100 Switches Hardware Overview* for the ESD point location.
- See *QFX3008-I Interconnect Device Overview* for the ESD point location.
- See *Front Panel of a QFX3500 Device* for the ESD point location.
- See *Front Panel of a QFX3600 Device* for the ESD point location.
- See *Physical Description of a Redundant Power System*
- See *Port Panel of an EX4600 Switch* for the ESD point location.
- See *Port Panel of a QFX5100-48S Device* for the ESD point location.
- See *Port Panel of a QFX5100-24Q Device* for the ESD point location.
- See *Port Panel of a QFX5100-96S Device* for the ESD point location.

AC Power Electrical Safety Guidelines

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches, the EX Series Redundant Power System (RPS), and the XRE200 External Routing Engine.

This topic also applies to hardware devices in the QFX Series and to OCX1100 switches.

CAUTION: For devices with AC power supplies, an external surge protective device (SPD) must be used at the AC power source.

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

- Note the following warnings printed on the device:

  "**CAUTION:** THIS UNIT HAS MORE THAN ONE POWER SUPPLY CORD. DISCONNECT ALL POWER SUPPLY CORDS BEFORE SERVICING TO AVOID ELECTRIC SHOCK."

  "**ATTENTION:** CET APPAREIL COMPORTE PLUS D'UN CORDON D'ALIMENTATION. AFIN DE PRÉVENIR LES CHOCS ÉLECTRIQUES, DÉBRANCHER TOUT CORDON D'ALIMENTATION AVANT DE FAIRE LE DÉPANNAGE."

- AC-powered devices 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 must comply with local and national electrical codes.
- You must provide an external certified circuit breaker rated minimum 20 A in the building installation.
- The power cord serves as the main disconnecting device for the AC-powered device. The socket outlet must be near the AC-powered device and be easily accessible.
- For devices that have more than one power supply connection, you must ensure that all power connections are fully disconnected so that power to the device is completely removed to prevent electric shock. To disconnect power, unplug all power cords (one for each power supply).

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。

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Related Documentation

- General Safety Guidelines and Warnings on page 221
- General Electrical Safety Guidelines and Warnings on page 249
- Multiple Power Supplies Disconnection Warning on page 263
- *Connecting AC Power to an EX2200 Switch*
- *Connecting AC Power to an EX3200 Switch*
- *Connecting AC Power to an EX3300 Switch*
- *Connecting AC Power to an EX4200 Switch*

- *Connecting AC Power to an EX4300 Switch*
- Connecting AC Power to an EX4500 Switch on page 143
- *Connecting AC Power to an EX4550 Switch*
- *Connecting AC Power to an EX4600 Switch*
- *Connecting AC Power to an EX6200 Switch*
- *Connecting AC Power to an EX8200 Switch*
- *Connecting AC Power to an EX9204 Switch*
- *Connecting AC Power to an EX9208 Switch*
- *Connecting AC Power to an EX9214 Switch*
- *Connecting AC Power to an XRE200 External Routing Engine*
- *Connecting AC Power to an OCX1100 Switch*
- *Connecting AC Power to a QFX3100 Director Device*
- *Connecting AC Power to a QFX3008-I Interconnect Device with Single-Phase Wiring Trays*
- *Connecting AC Power to a QFX3008-I Interconnect Device with Three-Phase Delta Wiring Trays*
- *Connecting AC Power to a QFX3008-I Interconnect Device with Three-Phase Wye Wiring Trays*
- *Connecting AC Power to a QFX3500, QFX3600, or QFX3600-I Device*
- *Connecting AC Power to a QFX5100 Device*

AC Power Disconnection Warning

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches, the EX Series Redundant Power System (RPS), and the XRE200 External Routing Engine.

This topic also applies to hardware devices in the QFX Series and to OCX1100 switches.

WARNING: **Before working on the switch or near power supplies, unplug all the power cords 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 Documentation

- General Safety Guidelines and Warnings on page 221
- General Electrical Safety Guidelines and Warnings on page 249
- AC Power Electrical Safety Guidelines on page 252

DC Power Electrical Safety Guidelines

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches and the XRE200 External Routing Engine.

This topic also applies to hardware devices in the QFX Series and to OCX1100 switches.

- A DC-powered device is equipped with a DC terminal block that is rated for the power requirements of a maximally configured device.

  NOTE: To supply sufficient power, terminate the DC input wiring on a facility DC source that is capable of supplying:

  - Minimum of 7.5 A at –48 VDC for EX2200 and EX3300 switches
  - Minimum of 8 A at –48 VDC for EX3200 and EX4200 switches
  - Minimum of 20 A at –48 VDC for EX4300, EX4500, and EX4550 switches
  - Minimum of 50 A at –48 VDC for EX6210 switches
  - Minimum of 60 A at –48 VDC for EX8208 switches
  - Minimum of 100 A at –48 VDC for EX8216 switches
  - Minimum of 7 A at –48 VDC for QFX3500, EX4600, and QFX5100 devices
  - Minimum of 8 A at –48 VDC for QFX3600 devices
  - Minimum of 7 A at –48 VDC for OCX1100 switches

  Incorporate an easily accessible disconnect device into the facility wiring. Be sure to connect the ground wire or conduit to a solid office earth ground. A closed loop ring is recommended for terminating the ground conductor at the ground stud.

- Run two wires from the circuit breaker box to a source of 48 VDC.
- A DC-powered device that is equipped with a DC terminal block is intended only for installation in a restricted access location. In the United States, a restricted access area is one in accordance with Articles 110-16, 110-17, and 110-18 of the National Electrical Code ANSI/NFPA 70.

  NOTE: Primary overcurrent protection is provided by the building circuit breaker. This breaker must protect against excess currents, short circuits, and earth grounding faults in accordance with NEC ANSI/NFPA 70.

- Ensure that the polarity of the DC input wiring is correct. Under certain conditions, connections with reversed polarity might trip the primary circuit breaker or damage the equipment.
- For personal safety, connect the green and yellow wire to safety (earth) ground at both the device and the supply side of the DC wiring.
- The marked input voltage of –48 VDC for a DC-powered device is the nominal voltage associated with the battery circuit, and any higher voltages are only to be associated with float voltages for the charging function.
- Because the device is a positive ground system, you must connect the positive lead to the terminal labeled RTN, the negative lead to the terminal labeled –48 VDC, and the earth ground to the device grounding points.

Related Documentation

- General Safety Guidelines and Warnings on page 221
- General Electrical Safety Guidelines and Warnings on page 249
- DC Power Disconnection Warning on page 257
- DC Power Grounding Requirements and Warning on page 259
- DC Power Wiring Sequence Warning on page 260
- DC Power Wiring Terminations Warning on page 262
- *Connecting DC Power to an EX2200 Switch*
- *Connecting DC Power to an EX3200 Switch*
- *Connecting DC Power to an EX4200 Switch*
- *Connecting DC Power to an EX4300 Switch*
- Connecting DC Power to an EX4500 Switch on page 145
- *Connecting DC Power to an EX4550 Switch*
- *Connecting DC Power to an EX4600 Switch*
- *Connecting DC Power to an EX6200 Switch*
- *Connecting DC Power to an EX8200 Switch*
- *Connecting DC Power to an EX9204 Switch*
- *Connecting DC Power to an EX9208 Switch*
- *Connecting DC Power to an EX9214 Switch*
- *Connecting DC Power to an OCX1100 Switch*
- *Connecting DC Power to an XRE200 External Routing Engine*
- *Connecting DC Power to a QFX3500, QFX3600, or QFX3600-I Device*
- *Connecting DC Power to a QFX5100 Device*

DC Power Disconnection Warning

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches and the XRE200 External Routing Engine.

This topic also applies to hardware devices in the QFX Series and to OCX1100 switches.

WARNING: **Before performing any of the DC power procedures, ensure that power is removed from the DC circuit. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the OFF position, and tape the device handle of the circuit breaker in the OFF position.**

Waarschuwing Voordat u een van de onderstaande procedures uitvoert, dient u te controleren of de stroom naar het gelijkstroom circuit uitgeschakeld is. Om u ervan te verzekeren dat alle stroom UIT is geschakeld, kiest u op het schakelbord de stroomverbreker die het gelijkstroom circuit bedient, draait de stroomverbreker naar de UIT positie en plakt de schakelaarhendel van de stroomverbreker met plakband in de UIT positie vast.

Varoitus Varmista, että tasavirtapiirissä ei ole virtaa ennen seuraavien toimenpiteiden suorittamista. Varmistaaksesi, että virta on KATKAISTU täysin, paikanna tasavirrasta huolehtivassa kojetaulussa sijaitseva suojakytkin, käännä suojakytkin KATKAISTU-asentoon ja teippaa suojakytkimen varsi niin, että se pysyy KATKAISTU-asennossa.

Attention Avant de pratiquer l'une quelconque des procédures ci-dessous, vérifier que le circuit en courant continu n'est plus sous tension. Pour en être sûr, localiser le disjoncteur situé sur le panneau de service du circuit en courant continu, placer le disjoncteur en position fermée (OFF) et, à l'aide d'un ruban adhésif, bloquer la poignée du disjoncteur en position OFF.

Warnung Vor Ausführung der folgenden Vorgänge ist sicherzustellen, daß die Gleichstromschaltung keinen Strom erhält. Um sicherzustellen, daß sämtlicher Strom abgestellt ist, machen Sie auf der Schalttafel den Unterbrecher für die Gleichstromschaltung ausfindig, stellen Sie den Unterbrecher auf AUS, und kleben Sie den Schaltergriff des Unterbrechers mit Klebeband in der AUS-Stellung fest.

Avvertenza Prima di svolgere una qualsiasi delle procedure seguenti, verificare che il circuito CC non sia alimentato. Per verificare che tutta l'alimentazione sia scollegata (OFF), individuare l'interruttore automatico sul quadro strumenti che alimenta il circuito CC, mettere l'interruttore in posizione OFF e fissarlo con nastro adesivo in tale posizione.

Advarsel Før noen av disse prosedyrene utføres, kontroller at strømmen er frakoblet likestrømkretsen. Sørg for at all strøm er slått AV. Dette gjøres ved å lokalisere strømbryteren på brytertavlen som betjener likestrømkretsen, slå strømbryteren AV og teipe bryterhåndtaket på strømbryteren i AV-stilling.

Aviso Antes de executar um dos seguintes procedimentos, certifique-se que desligou a fonte de alimentação de energia do circuito de corrente contínua. Para se assegurar que toda a corrente foi DESLIGADA, localize o disjuntor no painel que serve o circuito de corrente contínua e coloque-o na posição OFF (Desligado), segurando nessa posição a manivela do interruptor do disjuntor com fita isoladora.

¡Atención! Antes de proceder con los siguientes pasos, comprobar que la alimentación del circuito de corriente continua (CC) esté cortada (OFF). Para asegurarse de que toda la alimentación esté cortada (OFF), localizar el interruptor automático en el panel que alimenta al circuito de corriente continua, cambiar el interruptor automático a la posición de Apagado (OFF),

y sujetar con cinta la palanca del interruptor automático en posición de Apagado (OFF).

Varning! Innan du utför någon av följande procedurer måste du kontrollera att strömförsörjningen till likströmskretsen är bruten. Kontrollera att all strömförsörjning är BRUTEN genom att slå AV det överspänningsskydd som skyddar likströmskretsen och tejpa fast överspänningsskyddets omkopplare i FRÅN-läget.

Related Documentation

- General Safety Guidelines and Warnings on page 221
- General Electrical Safety Guidelines and Warnings on page 249
- DC Power Electrical Safety Guidelines on page 255
- DC Power Grounding Requirements and Warning on page 259
- DC Power Wiring Sequence Warning on page 260
- DC Power Wiring Terminations Warning on page 262

DC Power Grounding Requirements and Warning

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches and the XRE200 External Routing Engine.

This topic also applies to hardware devices in the QFX Series and to OCX1100 switches.

An insulated grounding conductor that is identical in size to the grounded and ungrounded branch circuit supply conductors but is identifiable by green and yellow stripes is installed as part of the branch circuit that supplies the device. The grounding conductor is a separately derived system at the supply transformer or motor generator set.

WARNING: **When you install the device, the ground connection must always be made first and disconnected last.**

Waarschuwing Bij de installatie van het toestel moet de aardverbinding altijd het eerste worden gemaakt en het laatste worden losgemaakt.

Varoitus Laitetta asennettaessa on maahan yhdistäminen aina tehtävä ensiksi ja maadoituksen irti kytkeminen viimeiseksi.

Attention Lors de l'installation de l'appareil, la mise à la terre doit toujours être connectée en premier et déconnectée en dernier.

Warnung Der Erdanschluß muß bei der Installation der Einheit immer zuerst hergestellt und zuletzt abgetrennt werden.

Avvertenza In fase di installazione dell'unità, eseguire sempre per primo il collegamento a massa e disconnetterlo per ultimo.

Advarsel Når enheten installeres, må jordledningen alltid tilkobles først og frakobles sist.

Aviso Ao instalar a unidade, a ligação à terra deverá ser sempre a primeira a ser ligada, e a última a ser desligada.

¡Atención! Al instalar el equipo, conectar la tierra la primera y desconectarla la última.

Varning! Vid installation av enheten måste jordledningen alltid anslutas först och kopplas bort sist.

Related Documentation

- General Safety Guidelines and Warnings on page 221
- General Electrical Safety Guidelines and Warnings on page 249
- DC Power Electrical Safety Guidelines on page 255
- DC Power Disconnection Warning on page 257
- DC Power Wiring Sequence Warning on page 260
- DC Power Wiring Terminations Warning on page 262

DC Power Wiring Sequence Warning

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches and the XRE200 External Routing Engine.

This topic also applies to hardware devices in the QFX Series and to OCX1100 switches.

WARNING: Wire the DC power supply using the appropriate lugs. When connecting power, the proper wiring sequence is ground to ground, +RTN to +RTN, then –48 V to –48 V. When disconnecting power, the proper wiring sequence is –48 V to –48 V, +RTN to +RTN, then ground to ground. Note that the ground wire must always be connected first and disconnected last.

Waarschuwing De juiste bedradingsvolgorde verbonden is aarde naar aarde, +RTN naar +RTN, en –48 V naar – 48 V. De juiste bedradingsvolgorde losgemaakt is en –48 naar –48 V, +RTN naar +RTN, aarde naar aarde.

Varoitus Oikea yhdistettava kytkentajarjestys on maajohto maajohtoon, +RTN varten +RTN, –48 V varten – 48 V. Oikea irrotettava kytkentajarjestys on –48 V varten – 48 V, +RTN varten +RTN, maajohto maajohtoon.

Attention Câblez l'approvisionnement d'alimentation CC En utilisant les crochets appropriés à l'extrémité de câblage. En reliant la puissance, l'ordre approprié de câblage est rectifié pour rectifier, +RTN à +RTN, puis –48 V à –48 V. En débranchant la puissance, l'ordre approprié de câblage est –48 V à –48 V, +RTN à +RTN, a alors rectifié pour rectifier. Notez que le fil de masse

devrait toujours être relié d'abord et débranché pour la dernière fois. Notez que le fil de masse devrait toujours être relié d'abord et débranché pour la dernière fois.

Warnung Die Stromzufuhr ist nur mit geeigneten Ringösen an das DC Netzteil anzuschliessen. Die richtige Anschlusssequenz ist: Erdanschluss zu Erdanschluss, +RTN zu +RTN und dann -48V zu -48V. Die richtige Sequenz zum Abtrennen der Stromversorgung ist -48V zu -48V, +RTN zu +RTN und dann Erdanschluss zu Erdanschluss. Es ist zu beachten dass der Erdanschluss immer zuerst angeschlossen und als letztes abgetrennt wird.

Avvertenza Mostra la morsettiera dell alimentatore CC. Cablare l'alimentatore CC usando i connettori adatti all'estremità del cablaggio, come illustrato. La corretta sequenza di cablaggio è da massa a massa, da positivo a positivo (da linea ad L) e da negativo a negativo (da neutro a N). Tenere presente che il filo di massa deve sempre venire collegato per primo e scollegato per ultimo.

Advarsel Riktig tilkoples tilkoplingssekvens er jord til jord, +RTN til +RTN, –48 V til – 48 V. Riktig frakoples tilkoplingssekvens er –48 V til – 48 V, +RTN til +RTN, jord til jord.

Aviso Ate con alambre la fuente de potencia cc Usando los terminales apropiados en el extremo del cableado. Al conectar potencia, la secuencia apropiada del cableado se muele para moler, +RTN a +RTN, entonces –48 V a –48 V. Al desconectar potencia, la secuencia apropiada del cableado es –48 V a –48 V, +RTN a +RTN, entonces molió para moler. Observe que el alambre de tierra se debe conectar siempre primero y desconectar por último. Observe que el alambre de tierra se debe conectar siempre primero y desconectar por último.

¡Atención! Wire a fonte de alimentação de DC Usando os talões apropriados na extremidade da fiação. Ao conectar a potência, a seqüência apropriada da fiação é moída para moer, +RTN a +RTN, então –48 V a –48 V. Ao desconectar a potência, a seqüência apropriada da fiação é –48 V a –48 V, +RTN a +RTN, moeu então para moer. Anote que o fio à terra deve sempre ser conectado primeiramente e desconectado por último. Anote que o fio à terra deve sempre ser conectado primeiramente e desconectado por último.

Varning! Korrekt kopplingssekvens ar jord till jord, +RTN till +RTN, –48 V till –48 V. Korrekt kopplas kopplingssekvens ar –48 V till –48 V, +RTN till +RTN, jord till jord.

Related Documentation

- General Safety Guidelines and Warnings on page 221
- General Electrical Safety Guidelines and Warnings on page 249
- DC Power Electrical Safety Guidelines on page 255
- DC Power Disconnection Warning on page 257
- DC Power Grounding Requirements and Warning on page 259

- DC Power Wiring Terminations Warning on page 262

DC Power Wiring Terminations Warning

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches and the XRE200 External Routing Engine.

This topic also applies to hardware devices in the QFX Series and to OCX1100 switches.

WARNING: When stranded wiring is required, use approved wiring terminations, such as closed-loop or spade-type with upturned lugs. These terminations must be the appropriate size for the wires and must clamp both the insulation and conductor.

Waarschuwing Wanneer geslagen bedrading vereist is, dient u bedrading te gebruiken die voorzien is van goedgekeurde aansluitingspunten, zoals het gesloten-lus type of het grijperschop type waarbij de aansluitpunten omhoog wijzen. Deze aansluitpunten dienen de juiste maat voor de draden te hebben en dienen zowel de isolatie als de geleider vast te klemmen.

Varoitus Jos säikeellinen johdin on tarpeen, käytä hyväksyttyä johdinliitäntää, esimerkiksi suljettua silmukkaa tai kourumaista liitäntää, jossa on ylöspäin käännetyt kiinnityskorvat. Tällaisten liitäntöjen tulee olla kooltaan johtimiin sopivia ja niiden tulee puristaa yhteen sekä eristeen että johdinosan.

Attention Quand des fils torsadés sont nécessaires, utiliser des douilles terminales homologuées telles que celles à circuit fermé ou du type à plage ouverte avec cosses rebroussées. Ces douilles terminales doivent être de la taille qui convient aux fils et doivent être refermées sur la gaine isolante et sur le conducteur.

Warnung Wenn Litzenverdrahtung erforderlich ist, sind zugelassene Verdrahtungsabschlüsse, z.B. für einen geschlossenen Regelkreis oder gabelförmig, mit nach oben gerichteten Kabelschuhen zu verwenden. Diese Abschlüsse sollten die angemessene Größe für die Drähte haben und sowohl die Isolierung als auch den Leiter festklemmen.

Avvertenza Quando occorre usare trecce, usare connettori omologati, come quelli a occhiello o a forcella con linguette rivolte verso l'alto. I connettori devono avere la misura adatta per il cablaggio e devono serrare sia l'isolante che il conduttore.

Advarsel Hvis det er nødvendig med flertrådede ledninger, brukes godkjente ledningsavslutninger, som for eksempel lukket sløyfe eller spadetype med oppoverbøyde kabelsko. Disse avslutningene skal ha riktig størrelse i forhold til ledningene, og skal klemme sammen både isolasjonen og lederen.

Aviso Quando forem requeridas montagens de instalação eléctrica de cabo torcido, use terminações de cabo aprovadas, tais como, terminações de cabo

em circuito fechado e planas com terminais de orelha voltados para cima. Estas terminações de cabo deverão ser do tamanho apropriado para os respectivos cabos, e deverão prender simultaneamente o isolamento e o fio condutor.

¡Atención! Cuando se necesite hilo trenzado, utilizar terminales para cables homologados, tales como las de tipo "bucle cerrado" o "espada", con las lengüetas de conexión vueltas hacia arriba. Estos terminales deberán ser del tamaño apropiado para los cables que se utilicen, y tendrán que sujetar tanto el aislante como el conductor.

Varning! När flertrådiga ledningar krävs måste godkända ledningskontakter användas, t.ex. kabelsko av sluten eller öppen typ med uppåtvänd tapp. Storleken på dessa kontakter måste vara avpassad till ledningarna och måste kunna hålla både isoleringen och ledaren fastklämda.

Related Documentation

- General Safety Guidelines and Warnings on page 221
- General Electrical Safety Guidelines and Warnings on page 249
- DC Power Electrical Safety Guidelines on page 255
- DC Power Disconnection Warning on page 257
- DC Power Grounding Requirements and Warning on page 259
- DC Power Wiring Sequence Warning on page 260

Multiple Power Supplies Disconnection Warning

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches, the EX Series Redundant Power System (RPS), and the XRE200 External Routing Engine.

This topic also applies to hardware devices in the QFX Series and to OCX1100 switches.

WARNING: **For a device that has more than one power supply connection, you must ensure that all power connections are fully disconnected so that power to the device is completely removed.**

Related Documentation

- General Safety Guidelines and Warnings on page 221
- General Electrical Safety Guidelines and Warnings on page 249
- AC Power Electrical Safety Guidelines on page 252
- DC Power Electrical Safety Guidelines on page 255

TN Power Warning

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches, the EX Series Redundant Power System (RPS), and the XRE200 External Routing Engine.

This topic also applies to hardware devices in the QFX Series and to OCX1100 switches.

WARNING: The device 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 Documentation

- General Safety Guidelines and Warnings on page 221
- General Electrical Safety Guidelines and Warnings on page 249
- Grounded Equipment Warning on page 241
- Multiple Power Supplies Disconnection Warning on page 263

Action to Take After an Electrical Accident

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches, the EX Series Redundant Power System (RPS), and the XRE200 External Routing Engine.

This topic also applies to hardware devices in the QFX Series and to OCX1100 switches.

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 device.
3. If possible, send another person to get medical aid. Otherwise, assess the condition of the victim, then call for help.

Related Documentation

- General Safety Guidelines and Warnings on page 221
- General Electrical Safety Guidelines and Warnings on page 249
- AC Power Electrical Safety Guidelines on page 252
- DC Power Electrical Safety Guidelines on page 255

PART 9

Compliance Information

CHAPTER 22

Compliance Information

Agency Approvals for EX Series Switches

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches, the EX Series Redundant Power System (RPS), and the XRE200 External Routing Engine.

These hardware devices comply with the following standards:

- Safety
  - CAN/CSA-C22.2 No. 60950-1 Information Technology Equipment
  - UL 60950-1 Information Technology Equipment
  - EN 60950-1 Information Technology Equipment
  - IEC 60950-1 Information Technology Equipment
  - EN 60825-1 Safety of Laser Products - Part 1: Equipment classification and requirements
- 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 Documentation

- Compliance Statements for EMC Requirements for EX Series Switches on page 270
- Compliance Statements for Acoustic Noise for EX Series Switches on page 274

Compliance Statements for EMC Requirements for EX Series Switches

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches, the EX Series Redundant Power System (RPS), and the XRE200 External Routing Engine.

This topic describes the EMC requirements for these hardware devices for:

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 can be extended by means

of a certified connector assembly. The customer should be aware that compliance with the above conditions might 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, might give the telecommunications company cause to request the user to disconnect the equipment.

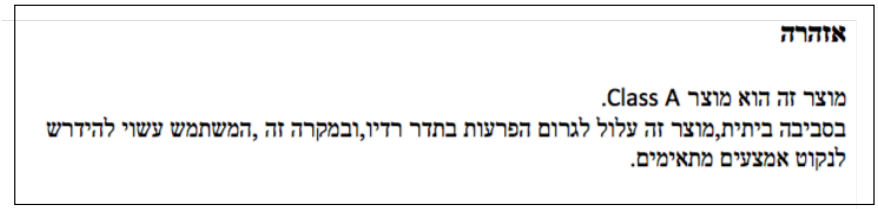
CAUTION: **Users should not attempt to make electrical ground connections by themselves, but should contact the appropriate inspection authority or an electrician, as appropriate.**

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 might be particularly important in rural areas.

European Community

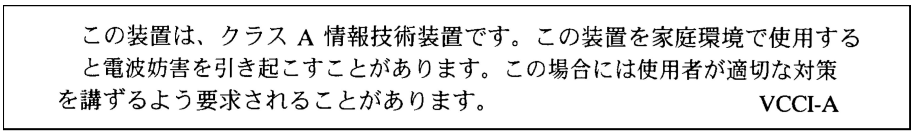
This is a Class A device. In a domestic environment this device might cause radio interference, in which case the user needs to take adequate measures.

Israel



Translation from Hebrew–Warning: This product is Class A. In residential environments, the product may cause radio interference, and in such a situation, the user may be required to take adequate measures.

Japan



The preceding translates as follows:

This is a Class A device. In a domestic environment this device might cause radio interference, in which case the user needs to take adequate measures.

VCCI-A

Korea

이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

Korean Class A Warning g040913

The preceding translates as follows:

This equipment is Industrial (Class A) electromagnetic wave suitability equipment and seller or user should take notice of it, and this equipment is to be used in the places except for home

United States

The device 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, might cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case users need to correct the interference at their 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, might 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.

Nonregulatory Environmental Standards

NEBS compliance—These EX Series switches are Network Equipment Building System (NEBS) compliant:

- EX2200-24T and EX2200-48T
- EX3200-24T, EX3200-48T
- EX3300-24T, EX3300-48T
- EX4200-24T, EX4200-24F, EX4200-24F-S, EX4200-48T and EX4200-48T-S
- EX4300-24T, EX4300-24T-S, EX4300-24P, EX4300-24P-S, EX4300-32F, EX4300-32F-S, EX4300-48T, EX4300-48T-AFI, EX4300-48T-S, EX4300-48P, and EX4300-48P-S
- All EX4500 switches with AC power supplies
- EX4550-32T-AFO, EX4550-32T-AFI, EX4550-32F-AFO, EX4550-32F-AFI, and EX4550-32F-S
- EX4600-40F and EX4600-40F-S
- All EX6200 switches

NOTE: For the EX6200-48P line cards, the intra-building ports must use shielded intra-building cabling or wiring that is grounded at both ends.

- All EX8200 switches

Those switch switches meet the following NEBS compliance standards:

- SR-3580 NEBS Criteria Levels (Level 4 Compliance)
- GR-1089-CORE: EMC and Electrical Safety for Network Telecommunications Equipment
- GR-63-CORE: NEBS, Physical Protection
  - The equipment is suitable for installation as part of the Common Bonding Network (CBN).
  - The equipment is suitable for installation in locations where the National Electrical Code (NEC) applies.
  - The battery return connection is to be treated as an Isolated DC return (DC-I), as defined in GR-1089-CORE.

Related Documentation

- Agency Approvals for EX Series Switches on page 269
- Compliance Statements for Acoustic Noise for EX Series Switches on page 274

Compliance Statements for Acoustic Noise for EX Series Switches

This topic applies to hardware devices in the EX Series product family, which includes EX Series switches, the EX Series Redundant Power System (RPS), and the XRE200 External Routing Engine.

Maschinenlärminformations-Verordnung - 3. GPSGV, der höchste Schalldruckpegel beträgt 70 dB(A) oder weniger gemäss EN ISO 7779

Translation:

The emitted sound pressure is below 70 dB(A) per EN ISO 7779.

Related Documentation

- Agency Approvals for EX Series Switches on page 269
- Compliance Statements for EMC Requirements for EX Series Switches on page 270

Declaration of Conformity for EX4500 Switches

Figure 76 on page 275 shows the Declaration of Conformity for the European Union (EU).

Figure 76: Declaration of Conformity for the EU

JUNIPER NETWORKS

Declaration of Conformity

CE

Juniper Networks, Inc.
1194 N. Mathilda Ave
Sunnyvale, CA 94089 USA

declares that under our sole responsibility the products

EX4500 Ethernet Switch

are in conformity with the provisions of the following EC Directives, including all amendments, and with national legislation implementing these directives:

Low Voltage Directive 2006/95/EC
EMC Directive 2004/108/EC

The following harmonized standards were applied:

EN 300 386 V1.4.1: 2008
EN 55022 Class A: 2006, including A1: 2007
EN 55024 +A1+A2: 1998
EN 60950-1: 2005

This product carries the CE Mark, which was first affixed in 2010.

Place	Signature	Date
Sunnyvale, CA		**4/21/2010**

Kevin Kimma
Regulatory Compliance Manager
1194 N. Mathilda Ave
Sunnyvale, CA 94089 USA

DoC: 10 EX4500

s021005

Figure 77 on page 276 shows the Suppliers Declaration of Conformity for Australia and New Zealand.

Figure 77: Suppliers Declaration of Conformity for Australia and New Zealand

SUPPLIERS DECLARATION OF CONFORMITY

- section 182 of the Australian Radiocommunications Act 1992
- section 134 of the New Zealand Radiocommunications Act 1989

I/We
Juniper Australia Pty Ltd.

Of
Level 1, 181 Miller Street North Sydney NSW 2060

Australian Business number ABN: ABN: 36 091 016 312
Supplier code number: N10070

Declare that the following customer equipment:

Juniper Networks, Inc **EX4500 Ethernet Series Switch**

to which this declaration relates complies with all applicable standards as listed below

EN 60950-1: 2005 2nd Edition (2005)	Safety Requirements for Customer Equipment
EN 55022: 2006 + A1:2007	Electromagnetic Interference—Limits and Methods of Measurement of Information Technology Equipment
EN 55024: 1998+A1:2001+A2:2003	Electromagnetic Interference—Immunity Measurement of Information Technology Equipment
EN 300 386 V1.4.1 (2008-04)	Telecommunications Network Equipment

Matthew Miller
(signature of declarant)

Director, Systems Engineering A/NZ
(position held in the manufacturing or importing organization

s021006

JUNIPER NETWORKS

Related Documentation

- Agency Approvals for EX Series Switches on page 269
- Compliance Statements for EMC Requirements for EX Series Switches on page 270
- Compliance Statements for Acoustic Noise for EX Series Switches on page 274