JUNIPER
NETWORKS

Engineering
Simplicity

Virtual Chassis Fabric Hardware Documentation

Juniper Networks, Inc.
1133 Innovation Way
Sunnyvale, California 94089
USA
408-745-2000
www.juniper.net

YEAR 2000 NOTICE

Juniper Networks hardware and software products are Year 2000 compliant. Junos OS has no known time-related limitations through the year 2038. However, the NTP application is known to have some difficulty in the year 2036.

END USER LICENSE AGREEMENT

Table of Contents

2

Planning

3 **Safety**

4 Installation

5   **Maintenance**

6 **Troubleshooting**

About This Guide

Use this guide to plan, install, perform initial software configuration, perform routine maintenance, and to troubleshoot VCF hardware.

After completing the installation and basic configuration procedures covered in this guide, refer to the Junos OS documentation for further software configuration.

RELATED DOCUMENTATION

QFX5100-48S Quick Start

QFX5100-48T Quick Start

QFX5100-24Q Quick Start

QFX5100-96S Quick Start

QFX5110-32Q Quick Start

QFX5110-48S Quick Start

QFX3600 Quick Start (EOL)

QFX3500 Quick Start (EOL)

1
PART

Overview

CHAPTER 1

Virtual Chassis Fabric Overview

IN THIS CHAPTER

Virtual Chassis Fabric Overview

The Juniper Networks Virtual Chassis Fabric (VCF) provides a low-latency, high-performance fabric architecture that can be managed as a single device. VCF is an evolution of the Virtual Chassis feature, which enables you to interconnect multiple devices into a single logical device, inside of a fabric architecture. The VCF architecture is optimized to support small and medium-sized data centers that contain a mix of 1-Gbps, 10-Gbps, and 40-Gbps Ethernet interfaces.

▷ **Video:** What is Virtual Chassis Fabric?

A VCF is constructed using a spine-and-leaf architecture. In the spine-and-leaf architecture, each spine device is interconnected to each leaf device. A VCF supports up to twenty total devices, and up to four devices can be configured as spine devices. See for an illustration of the VCF spine-and-leaf architecture.

Figure 1: VCF Spine-and-Leaf Architecture
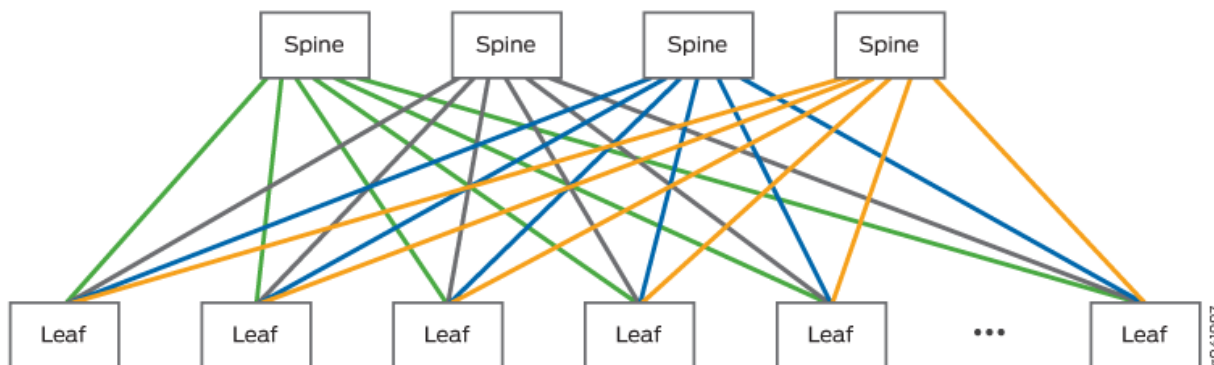
A VCF is based on either QFX5100 or QFX5110 switches as the spine devices, as follows:

- You can configure a VCF with QFX5100 switches as the spine devices, referred to as a QFX5100 VCF. In an optimal QFX5100 VCF configuration, the leaf devices are also QFX5100 switches. You can, however, also create a mixed QFX5100 VCF by including any combination of QFX5100, QFX3600, QFX3500, and EX4300 switches as leaf devices.

   NOTE: EX4300 multigigabit model (EX4300-48MP) switches are not supported in a VCF.

- Starting in Junos OS Release 17.3R1, you can configure a QFX5110 VCF, which is a VCF with QFX5110-32Q switches as the spine devices. In an optimal QFX5110 VCF configuration, the leaf devices are also QFX5110 switches. You can, however, create a QFX5110 VCF by including any combination of QFX5110 and QFX5100 switches as leaf devices. A QFX5110 VCF that also contains QFX5100 devices is a non-mixed VCF because both types of switches run the same software image when interconnected into a VCF.

See *Understanding Virtual Chassis Fabric Components* for more information about the spine-and-leaf architecture, supported device types, and which device types are required or recommended to be in each role.

A VCF provides the following benefits:

- Latency—VCF provides predictable low latency because it uses a fabric architecture that ensures each device is one or two hops away from every other device in the fabric. The weighted algorithm that makes traffic-forwarding decisions in a VCF is designed to avoid congestion and ensures low latency by intelligently forwarding traffic over all paths within the VCF to any destination device., ensuring predictable low latency for all traffic traversing the VCF.

- Resiliency—The VCF architecture provides a resilient framework because traffic has multiple paths across the fabric. Traffic is, therefore, easily diverted within the fabric when a device or link fails.

- Flexibility—You can easily expand the size of your VCF by adding devices to the fabric as your networking needs grow.

- Investment protection—In environments that need to expand because the capabilities of a traditional QFX Series Virtual Chassis are maximized, a VCF is often a logical upgrade option because it enables the system to evolve without having to remove existing, previously purchased devices from the network.

- Manageability—VCF provides multiple features that simplify configuration and management. VCF, for instance, has an autoprovisioning feature that enables you to plug and play devices into the fabric after minimal initial configuration. VCF leverages many of the existing configuration procedures from a Virtual Chassis, so that you can configure and maintain a VCF easily if you are already familiar with the procedures for configuring and maintaining a Virtual Chassis.

Change History Table

Feature support is determined by the platform and release you are using. Use Feature Explorer to determine if a feature is supported on your platform.

Release	Description
17.3R1	Starting in Junos OS Release 17.3R1, you can configure a QFX5110 VCF, which is a VCF with QFX5110-32Q switches as the spine devices.

RELATED DOCUMENTATION

Virtual Chassis Fabric Best Practices Guide

Network Configuration Example: MetaF abric™ Architecture 1.1: Configuring Virtual Chassis Fabric and Network Director 1.6

Understanding Virtual Chassis Fabric Components

Understanding Virtual Chassis Fabric Configuration | 5

Autoprovisioning a Virtual Chassis Fabric | 390

Preprovisioning a Virtual Chassis Fabric | 395

Understanding Virtual Chassis Fabric Configuration

This topic describes the configuration options available for your Virtual Chassis Fabric (VCF).

This topic covers:

Virtual Chassis Fabric Setup

You must setup your VCF using one of the following options:

Autoprovisioned Virtual Chassis Fabric Configuration

Autoprovisioned configuration allows you to "plug and play" leaf devices into a VCF after minimal initial configuration.

The minimal configuration requirements for autoprovisioning a VCF include setting the configuration mode to autoprovisioned and explicitly identifying the spine devices in your VCF by serial number. After this minimal configuration is complete, all supported devices—supported devices are either devices that have been zeroized or devices in factory default mode that have never been configured into a Virtual Chassis or VCF—are automatically added to the VCF as leaf devices when they are cabled to spine devices using supported 10-Gbps SFP+ ports or 40-Gbps QSFP+ ports. During this process, the Virtual Chassis ports (VCPs) are configured automatically, and other parameters such as fabric and mixed mode are automatically detected and set.

For best results, a spine device in an autoprovisioned configuration should be configured into fabric mode and rebooted manually *before* being interconnected into a VCF. Otherwise, if the VCF automatically sets fabric mode for the device, the subsequent automatic device reboot might be unexpected at that point during VCF configuration and operation.

A spine device in an autoprovisioned VCF must also have the same mixed mode setting as other member devices in the VCF. Setting either fabric mode or mixed mode requires the device to be rebooted, so as a best practice, you should configure your spine device into fabric mode and at the same

time, if necessary, configure mixed mode, and reboot the device manually before interconnecting it into the VCF.

Similar to the behavior for spine devices, a leaf device in an autoprovisioned configuration that is zeroized or in factory default configuration and not yet configured into fabric mode is automatically configured into fabric mode and rebooted during the automatic VCP conversion process when it is interconnected into a VCF. The leaf device is also automatically rebooted if the device needs to be configured into or out of mixed mode to participate in the VCF. You can optionally avoid the downtime that accompanies a leaf device reboot by manually setting the leaf device into fabric mode and into or out of mixed mode, zeroizing the device at that point if necessary, and manually rebooting the device *before* interconnecting it into the VCF.

Preprovisioned Virtual Chassis Fabric Configuration

In a preprovisioned configuration, you deterministically control the devices in your VCF by associating each device's serial number to a member ID and role.

The advantage of configuring a VCF using a preprovisioned configuration is that you can more explicitly control which devices are added to your VCF, and in what roles. At the same time, as with an autoprovisioned VCF, preprovisioned VCFs support automatic VCP conversion. As part of the VCP conversion process, when leaf devices that have been zeroized or are in factory default mode are interconnected to configured spine devices, the VCF can automatically detect and, if needed, set fabric and mixed modes. If fabric mode or mixed mode settings are automatically updated, the devices are also rebooted automatically. Alternatively, you can avoid a potentially unexpected automatic device reboot (and associated down time) by manually configuring the fabric or mixed mode setting on the device and manually rebooting it *before* interconnecting it into the VCF. For best results when adding devices to a preprovisioned VCF, we recommend manually setting fabric and mixed modes, zeroizing or restoring the factory default configuration if necessary, and manually rebooting the devices being added before interconnecting them into the VCF.

The disadvantage of using a preprovisioned configuration is that the configuration process requires more manual steps than the autoprovisioned configuration process.

Nonprovisioned Virtual Chassis Fabric Configuration

⚠️ **CAUTION**: We discourage nonprovisioned VCF configuration. You can configure all aspects of a VCF using autoprovisioned or preprovisioned configuration. Nonprovisioned VCF configuration should only be used by VCF experts in specialized scenarios.

A nonprovisioned VCF is the default method for creating a VCF; it is the configuration mode used when a VCF has not been configured into autoprovisioned or preprovisioned mode.

In a nonprovisioned VCF, member roles are determined by a primary-role election algorithm. The first value checked by the primary-role election algorithm is the primary-role priority value. The switches with the highest primary-role priority values assume the primary and backup Routing Engine roles in a VCF.

If two or more devices have the same primary-role priority value and are candidates for the Routing Engine role, the primary-role election algorithm uses other parameters to determines which device is elected as the Routing Engine. See *Understanding Virtual Chassis Fabric Components*.

The default primary-role priority value for all devices is 128. You should always configure two spine devices with the highest primary-role priority to ensure the Routing Engine role is assigned to a spine device.

In a nonprovisioned VCF, you must manually configure every VCP.

Configuration File Management in a VCF

You configure a VCF by logging onto the primary Routing Engine and making configuration changes. See the next section for information on logging into a VCF.

The configuration file that is modified when you are on the primary Routing Engine is automatically shared with all other devices in the VCF when it is committed. Each device stores it's own copy of the configuration file.

Logging into a Virtual Chassis Fabric

The recommended method of logging into a VCF is through the use of a Virtual Management Ethernet (VME) interface. The VME interface is a logical interface representing all of the out-of-band management ports on the member devices. When you connect to the VCF configuration using the VME interface's IP address, the connection is always redirected to the management port on device in the primary Routing Engine role. The VME interface is not tied to a device, so it can always be used to log in to the VCF even after the primary Routing Engine changes. We recommend cabling the management ports—an *me* or *em* interface—on each Routing Engine in your VCF to support the VME interface.

If you log in to the console port of any member device in a VCF, your session is automatically redirected to the device acting in the primary Routing Engine role.

Understanding Interface Numbering

Interfaces in Junos OS are specified as follows:

type-fpc/pic/port

A VCF applies this convention as follows:

- *type*—The interface type.

- *fpc*—Flexible PIC Concentrator. In a VCF, the *fpc* is the member ID of the switch. For instance, the *fpc* of member 16 in the VCF is 16.

- *pic*—the number of the PIC (*Physical Interface Card*) on the member device.

- *port*—the port number.

For more detailed information on interface numbering, see *Understanding Interface Naming Conventions*.

RELATED DOCUMENTATION

Network Configuration Example: MetaF abric™ Architecture 1.1: Configuring Virtual Chassis Fabric and Network Director 1.6

Autoprovisioning a Virtual Chassis Fabric | **390**

Preprovisioning a Virtual Chassis Fabric | **395**

Configuring a Nonprovisioned Virtual Chassis Fabric | **400**

Virtual Chassis Fabric Hardware Overview

The Juniper Networks Virtual Chassis Fabric (VCF) spine-and-leaf architecture supports two types of hardware configurations based on the switch model used as the spine in the VCF.

- QFX5110 VCF

    - QFX5110-32Q (spine or leaf)

    - QFX5110-48S (leaf)

    - QFX5100-24Q (leaf)

    - QFX5100-48S (leaf)

    - QFX5100-48T (leaf)

        NOTE: Available on Junos OS Release 17.3R2 and later.

    - QFX5100-96S (leaf)

- QFX5100 VCF

  - QFX5100-24Q (spine or leaf)

  - QFX5100-48S (spine or leaf)

  - QFX5100-48T (leaf)

  - QFX5100-96S (leaf)

  - QFX3600 (leaf)

  - QFX3500 (leaf)

  - EX4300 (leaf)

Homogeneous configurations are Installations with all members within the same line of switches (for example, QFX5100-24Q, QFX5100-48S, QFX5100-48T, and QFX5100-96S in a QFX5100 VCF). QFX5100 VCF installations with a mixture of models are called *mixed mode*. For example, a mixed mode QFX5100 VCF might contain a EX4300 or QFX3600 as leaf devices. Mixed mode devices must be configured before joining the VCF and are not eligible for the auto-provisioned configuration (plug and play). Adding a device configured as mixed mode to a VCF can cause those devices to be marked inactive if the other devices are not also configured as mixed mode. In both mixed mode and homogeneous configurations, you must run the same Junos OS release on all devices. In a QFX5100 VCF, the optimum configuration comprises only QFX5100 models. When both the QFX5100-24Q and the QFX5100-48S are available in a VCF, use the QFX5100-24Q as the spine.

In a QFX5110 VCF, the optimum configuration comprises only QFX5110 models. When multiple models of QFX5110 are in a VCF, use the QFX5110-32Q as the spine. All QFX5110 VCF configurations are considered homogeneous.

RELATED DOCUMENTATION

Virtual Chassis Fabric Installation Overview

CHAPTER 2

QFX5110 Overview

QFX5110 Hardware Overview

The QFX5110 line of switches delivers low latency, flexible deployment options, and rich automation features. QFX5110 Switches build a strong underlay foundation for flexible, high-performance, standards-based fabrics and routing that improve network reliability and agility.

This topic covers:

Benefits of QFX5110

Flexible fabric support   QFX5110 offers multiple fabric options to fit your desired network architecture:

- Virtual Chassis (VC), with up to 10 members

- Virtual Chassis Fabric (VC), which offers a single pane management for up to 20 nodes

- MC-LAG, which provides dual-homing with reduced complexity related to STP

- Junos Fusion Datacenter, where QFX5110 can operate as a satellite leaf node for 1 Gigabit, 10 Gigabit, 40 Gigabit, or 100 Gigabit connectivity

Overlay options	QFX5110 provides L2 and L3 VXLAN gateway support that works in conjunction with a robust EVPN control plane to efficiently manage your virtualized workloads. Another option, OVSDB-VXLAN can be introduced to stitch virtualized and physical workloads.
High density and low latency applications	Powered with high density 10 Gigabit or 40 Gigabit network ports and four 100G uplinks, the QFX5110 delivers 1.76 Tbps of throughput and a low latency of 550 nS. Your legacy applications continue to be supported by 100 Mbps or 1 Gigabit copper SFP transceivers.

QFX5110 Models Overview

The QFX5110 line of switches offers two compact 1 U models that are ideal for top-of-rack, QFX Virtual Chassis, or Virtual Chassis Fabric (VCF) deployments, the 48-port QFX5110-48S and the 32-port QFX5110-32Q. Performance of the control plane running on all the QFX5110 switches is enhanced by the 1.8-Ghz quad-core Intel CPU with 16 GB of memory and 64 GB of solid-state drive (SSD) storage. Both models offer flexible port configurations of 1-Gigabit Ethernet, 10-Gigabit Ethernet, 40-Gigabit Ethernet, and 100-Gigabit Ethernet.

Both models can be ordered with either ports-to-FRUs or FRUs-to-ports airflow and with AC or DC power supplies.

The QFX5110-32Q can be used as:

- A standalone switch (Junos OS Release 17.2R1 and later).

- A primary, backup, or line card in a QFX5110 Virtual Chassis (Junos OS Release 17.3R1 and later).

  A QFX5110 Series Virtual Chassis allows you to connect up to 10 QFX5110 or supported QFX5100 switches into one logical device and manage the device as a single chassis using a ring topology. The following QFX5100 switches are supported in a QFX5110 Virtual Chassis:

  - QFX5100-24Q

  - QFX5100-48S

- QFX5100-96S

For a QFX5100 switch to participate in a QFX5110 Virtual Chassis, the switch must have the same software version and image installed as the software running on the QFX5110 switches in the Virtual Chassis. You do not need to configure mixed mode. In a QFX5110 Virtual Chassis, we recommend to use QFX5110 switches in the primary and backup Routing Engine roles, and QFX5100 switches only in the linecard role.

- A spine or leaf device in a QFX5110 VCF (Junos OS Release 17.3R1 and later).

  VCF uses QFX Virtual Chassis technology to interconnect multiple devices into a single logical device and manage that device as a single logical device inside of a fabric architecture. You can configure up to a total of 20 QFX5110 or QFX5100 devices in a VCF. Out of the 20 total devices, you can configure a maximum of 4 spine devices. You can use these models in any combination as leaf devices:

  - QFX5100-24Q

  - QFX5100-48S

  - QFX5100-48T (Junos OS Release 17.3R2 and later)

  - QFX5100-96S

  - QFX5110-48S

    NOTE: If only QFX5110-48S switches are available, cable and configure the switches as a QFX5110 Virtual chassis.

    NOTE: Unike a QFX5100 VCF, EX4300 switches are not supported in the QFX5110 VCF.

The QFX5110-48S can be used as:

- A standalone switch (Junos OS Release 15.1X53-D210 and later).

- A primary, backup, or line card in a QFX5110 Virtual Chassis (Junos OS Release 17.3R1 and later).

  A QFX5110 Series Virtual Chassis allows you to connect up to 10 QFX5110 or supported QFX5100 switches into one logical device and manage the device as a single chassis using a ring topology. The following QFX5100 switches are supported in a QFX5110 Virtual Chassis:

  - QFX5100-24Q

  - QFX5100-48S

- QFX5100-96S

For a QFX5100 switch to participate in a QFX5110 Virtual Chassis, the switch must have the same software version and image installed as the software running on the QFX5110 switches in the Virtual Chassis. You do not need to configure mixed mode. In a QFX5110 Virtual Chassis, we recommend to use QFX5110 switches in the primary and backup Routing Engine roles, and QFX5100 switches only in the line card role.

- A leaf device in a QFX5110 VCF (Junos OS Release 17.3R1 and later).

VCF uses QFX Virtual Chassis technology to interconnect multiple devices into a single logical device and manage that device as a single logical device inside of a fabric architecture. You can configure up to a total of 20 QFX5110 devices in a QFX5110 VCF. Use QFX5110-32Q as the spine devices. You can use these models in any combination as leaf devices:

- QFX5100-24Q

- QFX5100-48S

- QFX5100-48T (Junos OS Release 17.3R2 and later)

- QFX5100-96S

- QFX5110-48S

    NOTE: If only QFX5110-48S switches are available, cable and configure the switches as a QFX5110 Virtual chassis.

- A satellite device in a Junos Fusion Provider Edge system (Junos OS 18.1R2 and later)

    NOTE: The QFX5110-48S does not support channelized ports in a Junos Fusion environment.

QFX5110-48S Hardware

As shown in , the QFX5110-48S is a 10-Gigabit Ethernet enhanced small form-factor pluggable plus (SFP+) switch with 48 SFP+ ports and four 100-Gbps quad small form-factor (QSFP) pluggable solution (QSFP28) ports. Each SFP+ port (**0** through **47**)can operate as a native 10-Gigabit Ethernet port or a 1-Gigabit Ethernet port when 1-Gigabit Ethernet optics are inserted.

Each QSFP28 port (**48** through **51**) can operate as a native 100-Gigabit Ethernet port, a native 40-Gigabit Ethernet port, or as 4 independent 10-Gigabit ports when using breakout cables. The four QSFP28 ports can be used as either access ports or as uplinks. The QFX5110-48S provides an

aggregate throughput of 960 Gbps. The QFX5110-48S has a 1 U form factor and comes standard with redundant fans and redundant power supplies.

Figure 2: QFX5110-48S Port Panel
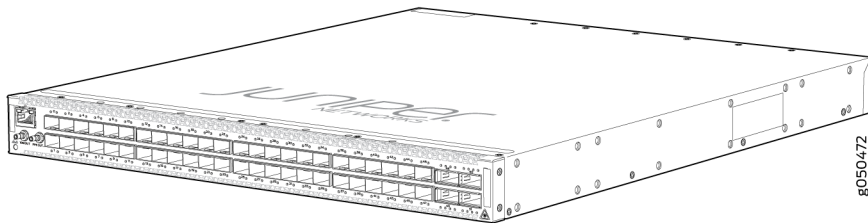
QFX5110-32Q Hardware

As shown in , the QFX5110-32Q is a flexible configuration switch allowing either 32 ports of 40-Gigabit Ethernet quad small form-factor pluggable plus (QSFP+) or 20 ports of QSFP+ and 4 ports of high-density 100-Gigabit Ethernet quad small form-factor pluggable solution (QSFP28). Each QSFP+ port can operate as a native 40-Gigabit Ethernet port, or as four independent 10-Gigabit Ethernet ports when using breakout cables. The four QSFP28 ports are available either as access ports or as uplinks.

The QFX5110-32Q can be channelized using one of the available system modes. For full details on the different port channelization modes, see *QFX5110-32Q Port Panel*. The QFX5110-32Q switch provides an aggregate throughput of 2.56 Tbps.

Figure 3: QFX5110-32Q Port Panel
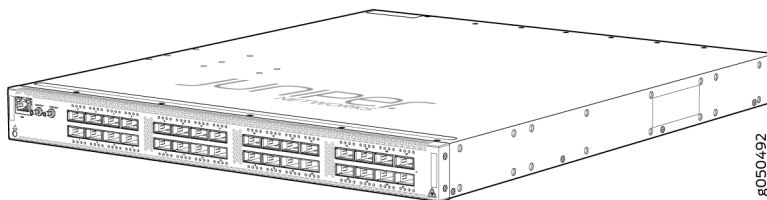
System Software

QFX Series devices use the Junos operating system (OS), which is installed on a QFX5110 switch's 64-GB internal solid-state flash drive. The same Junos OS code base that runs on QFX5110 switches also runs on all Juniper Networks EX Series switches, and M Series, MX Series, and T Series routers.

The QFX5110-48S switch is supported on Junos OS Release 15.1X53-D210 and later; the QFX5110-32Q is supported on Junos OS 17.2R1 and later.

QFX5110 switches employ the security feature, Secure Boot, which is based on the UEFI 2.4 standard. The BIOS has been hardened and serves as a core root of trust. The BIOS updates, the bootloader, and the kernel are cryptographically protected. No action is required to implement Secure Boot.

If a premium or advanced feature is configured on the QFX5110 without a valid license, an alarm is raised and system log (syslog) messages are generated. For more information on licensing, see https://www.juniper.net/documentation/us/en/software/license/juniper-licensing-user-guide/topics/concept/licenses-for-qfx.html.

For more information about which features are supported on QFX Series devices, see Feature Explorer.

You manage the switch using the Junos OS command-line interface (CLI), accessible through the console and out-of-band management ports on the device.

RELATED DOCUMENTATION

Virtual Chassis Fabric Hardware Documentation

Virtual Chassis Fabric Overview

QFX5110-48S Port Panel

IN THIS SECTION

- Switch Overview | **16**
- Network Ports | **16**
- Channelizing Interfaces | **17**
- Virtual Chassis and Virtual Chassis Fabric | **17**

The port panel of the QFX5110-48S is primarily comprised of 48 small form-factor pluggable plus (SFP+) and 4 quad small form-factor pluggable solution (QSFP28) ports. It also provides a central location for the Precision Time Protocol (PTP) connections to a grandmaster clock.

This topic describes:

Switch Overview

The port panel of the QFX5110-48S supports 48 logical 10-GbE ports when operating as a standalone switch. These data ports (**0** through **47**) support either 1-Gbps or 10-Gbps SFP+ transceivers. You can also use SFP+ DAC cables and 10-Gbps active optical cables (AOC) in any access port. Starting in Junos OS Release 18.3R1, the 10-GbE ports also support 100 Mbps.

The remaining 4 QSFP28 ports (**48** through **51**) support speeds of 40 GbE or 100 GbE. Each port can be configured as an independent 100-GbE port or as an independent 40-GbE port. These port are usually used as uplinks or Virtual Chassis Ports (VCP) on QFX5110 Virtual Chassis or Virtual Chassis Fabric (VCF). In 40-GbE mode, these ports can be channelized using QSFP+ to SFP+ DAC breakout (DACBO) cables.

Figure 4 on page 16 shows the port panel of the QFX5110-48S.

Figure 4: QFX5110-48S Port Panel
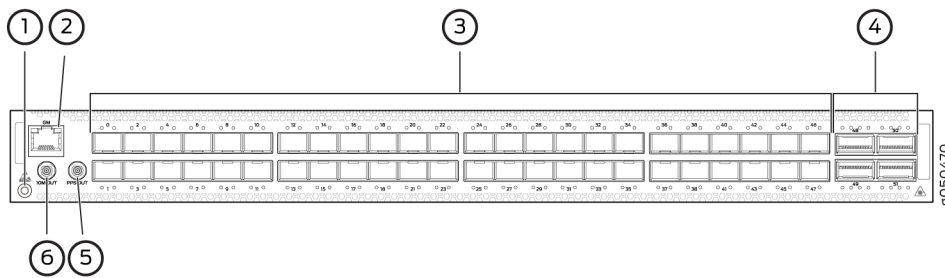
1– Electrostatic discharge (ESD) terminal	4– 4 QSFP28 ports
2– RJ-45 connection to grandmaster clock	5– Output clock at 10 Mhz
3– 48 SFP+ ports	6– 1 pulse per second (PPS) output connection

Network Ports

> **CAUTION**: When you use the latest OEM part number FCLF8521P2BTL (printed on the transceiver label), you can install 1GbE transceivers (such as QFX-SFP-1GE-T) in any port with no restrictions. The same applies for devices that support 10GbE copper transceivers. However, if you are using the older OEM part number SP7041-M1-JN (not shipped in last 3+ years) instead, do not install 1GbE copper transceivers (such as QFX-SFP-1GE-T) directly above or below another 1GbE copper transceiver. Use only the top row or bottom row to avoid damage to the device caused when the transceivers are installed above or below each other.

The QFX5110-48S device ports (**0** to **47**) support:

- 10-Gbps SFP+ transceivers

- 1-Gbps SFP transceivers

- SFP+ direct attach copper (DAC) cables

- SFP+ active optical cables (AOC)

The QFX5110-48S uplink ports (**48** to **51**) support:

- 100-Gbps QSFP28 transceivers

- 40-Gbps QSFP+ transceivers

- 100-Gbps AOC

- 40-Gbps AOC (Junos OS 18.3R1 and later)

- 100-Gbps QSFP28 DAC cables

- 40-Gbps QSFP+ DAC cables

- 40-Gbps QSFP+ to SFP+ DACBO cables (40-Gbps breaks out to 10-Gbps for copper connections)

- 40-Gbps AOCBO cables (40-Gbps breaks out to 10-Gbps for fiber connections)

Channelizing Interfaces

For downstream traffic, the QFX5110-48S has 4 physical or 16 logical ports that can be used for port channelization. The default 100-Gigabit Ethernet ports can be configured as 40-Gigabit Ethernet, and in this configuration can either operate as dedicated 40-Gigabit Ethernet ports or can be channelized to 4 independent 10-Gigabit Ethernet ports using copper or fiber breakout cables.

To channelize the ports, manually configure the port speed using the `set chassis fpc` *slot-number* `port` *port-number* `channel-speed` *speed* command, where the speed can be set to 10-Gigabit Ethernet, 40-Gigabit Ethernet, or 100-Gigabit Ethernet. The ports do not support auto-channelization.

Virtual Chassis and Virtual Chassis Fabric

To connect QFX5110 switches as members in a QFX5110 Virtual Chassis, you need a pair of dedicated ports on each switch and cables that link each member in the Virtual Chassis into a ring topology. Each member in the ring has at least one direct Virtual Chassis port (VCP) connection to a upstream and downstream member. QFX5110 switches are recommended in the primary, backup, or line card role. You may only mix QFX5100 members with QFX5110 members in a QFX5110 Virtual Chassis; no other QFX Series or EX Series switches are supported. See *Connecting QFX5110 and QFX5100 Members in a QFX5110 Virtual Chassis* for a a diagram of cabling QFX5110 switches in a ring topology.

To connect a QFX5110 switch as a spine or leaf device in a Virtual Chassis Fabric (VCF), you need a pair of dedicated ports and cables that link each spine device and leaf device in the VCF. All spine devices have at least one direct VCP connection to each leaf device in the VCF. See *Connecting QFX5110 in a QFX5110 Virtual Chassis Fabric* for a cabling diagram.

QFX5110-32Q Port Panel

The port panel of the QFX5110-32Q primarily comprises 28 quad small form-factor pluggable plus (QSFP+) ports and 4 quad small form-factor pluggable solution (QSFP28) ports. The mixture of QSFP+ and QSFP28 ports allows for flexible configuration as either all 40-Gigabit Ethernet ports or a mixture of 40-Gigabit Ethernet and 100-Gigabit Ethernet for high-speed uplinks. The port panel also provides a central location for the Precision Time Protocol (PTP) connections to a grandmaster clock.

This topic describes:

Switch Overview

The ports on the QFX5110-32Q support 40-Gbps or 100-Gbps speeds natively. All ports autosense the type of transceiver and set the port to the corresponding speed. The QSFP+ ports can support channelization to four independent 10 GbE downstream ports, see "Channelizing Interfaces" on page 19. Although all network ports can be configured as either uplink or as access ports, best practice is to configure the four QSFP28 ports (**28** through **31**) as uplinks to take advantage of the 100-Gbps speeds.

The port panel also provides PTP connections to a grandmaster clock (requires Junos OS Release 18.1R1). There are also 10-MHz pulses-per-second (PPS) SubMiniature B (SMB) input and output connections to measure the timing drift to and from the grandmaster clock.

Figure 5 on page 19 shows the port panel of the QFX5110-32Q.

Figure 5: QFX5110-32Q Port Panel
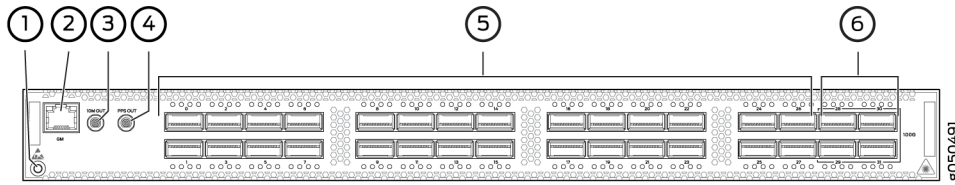
1– Electrostatic discharge (ESD) terminal	4– 1 pulse per second (PPS) output connection
2– RJ-45 connection to grandmaster clock	5– 28 QSFP+ ports
3– Output clock at 10 MHz	6– 4 QSFP28 ports

Network Ports

The QFX5110-32Q device ports (**0** through **27**) support:

- 40-Gbps QSFP+ transceivers

- QSFP+ direct attach copper (DAC) cables

- QSFP+ active optical cables (AOC) (Junos OS Release 18.3R1 and later)

- 40-Gbps QSFP+ to SFP+ DACBO cables (40 Gbps breaks out to 10 Gbps for copper connections on supported ports)

- 40-Gbps AOCBO cables (40 Gbps breaks out to 10 Gbps for fiber connections on supported ports)

The QFX5110-32Q uplink ports (**28** through **31**) support:

- 100-Gbps QSFP28 transceivers

- 40-Gbps QSFP+ transceivers

- 100-Gbps AOC

- 40-Gbps AOC (Junos OS Release 18.3R1 or later)

- 100-Gbps QSFP28 DAC cables

- 40-Gbps QSFP+ DAC cables

Channelizing Interfaces

CAUTION: Starting with Junos OS Release 18.1R1, default behaviors changed for:

- System mode—Flexi-pic mode is replaced by non-oversubscribed mode.

- Auto-sense—The ports auto-sense the transceiver and set the port speed to match.

The Packet Forwarding Engine on the switch is restarted when you issue system mode changes. As a result, you might experience packet loss on the switch.

The following system modes are available on the QFX5110-32Q:

- Default mode (from Junos OS Release 17.2R1 up to Junos OS Release 18.1R1)

  All 32 QSFP+ and QSFP28 ports on the switch are configured for 40-Gigabit Ethernet only. All ports are supported as access or uplink ports, but cannot be channelized.

- Default mode (Junos OS 18.1R1 and later)

  If you connect 40-Gbps optics to all 32 ports, only ports **1** through **18** are available to channelize to 4 independent 10-Gbps speed downstream ports. You can use the remaining ports as dedicated 40 Gbps ports. No ports are disabled.

  Depending on the optics installed, you can channelize between 18 to 20 ports.

  - If the system detects a 100-Gbps optic in any one of the QSFP28 ports (**28** to **31**), the port forms a port group and disables ports **20** to **27**. The 40 Gbps QSFP+ ports **0** to **19** can be channelized to 4 independent 10 Gbps speed downstream ports.

  - If the system detects 40 Gbps optics in the QSFP28 ports (**28** to **31**), you can channelize the 40 Gbps QSFP+ ports **1** to **18** to 4 independent 10 Gbps speed downstream ports. You can use the remaining ports as dedicated 40 Gbps ports. No ports are disabled.

  > ⚠️ **CAUTION**: Ports **20** through **27** are not be available for channelization if you have populated the 100 Gbps QSFP28 ports with 100 Gbps optics.

- Flexi-pic mode (from Junos OS Release 17.2R1 up to Junos OS Release 18.1R1):

  - Ports **0** through **19** of the switch are configured for 40-Gigabit Ethernet and can be channelized to 4 independent 10-Gigabit Ethernet ports.

  - Ports **20** though **27** are disabled.

  - Ports **28** through **31** are configured as 100-Gigabit Ethernet.

> ⚠️ **CAUTION**: Take care when changing the channelization mode from Flexi-pic to default. If you have existing ports that are channelized in Flexi-pic mode, remove the channelization from the interface before changing the system mode. Changing the Flexi-pic mode to the default mode with channelized ports causes the ports to go down, log a system log error, and remain down. You must manually remove the channelization configuration on the ports to bring the ports up in default mode. Because there can be a slight loss of data while the FPC reboots, we recommend that you only configure the changes during a maintenance window for this release.

> **NOTE**: QFX5110-32Q switches that are configured for Flexi-pic mode and upgraded to Junos OS Release 18.1R1 and later come up in default mode.

- Non-oversubscribed mode (Junos OS Release 18.1R1 and later)

  Ports **0** through **23** only can be channelized. The remaining ports are disabled. Use this mode to achieve 960 Gbps speeds for either 24 ports of 40 Gigabit Ethernet or 96 ports of 10 Gigabit Ethernet.

Use the `request chassis system-mode` command to change the system mode for the switch. If you attempt to channelize a non-supported port, the configuration is ignored.

Virtual Chassis and Virtual Chassis Fabric

To connect QFX5110 switches as members in a QFX5110 Virtual Chassis, you need a pair of dedicated ports on each switch and cables that link each member in the Virtual Chassis into a ring topology. Each member in the ring has at least one direct Virtual Chassis port (VCP) connection to a upstream and downstream member. QFX5110 switches are recommended in the master, backup, or line card role. You may only mix QFX5100 members with QFX5110 members in a QFX5110 Virtual Chassis; no other QFX Series or EX Series switches are supported. See *Connecting QFX5110 and QFX5100 Members in a QFX5110 Virtual Chassis* for a a diagram of cabling QFX5110 switches in a ring topology.

To connect a QFX5110 switch as a spine or leaf device in a Virtual Chassis Fabric (VCF), you need a pair of dedicated ports and cables that link each spine device and leaf device in the VCF. All spine devices have at least one direct VCP connection to each leaf device in the VCF. See *Connecting QFX5110 in a QFX5110 Virtual Chassis Fabric* for a cabling diagram.

CHAPTER 3

QFX5100 Overview

IN THIS CHAPTER

QFX5100 Device Hardware Overview

IN THIS SECTION

The QFX5100 line of 10/40GbE switches delivers low latency, flexible deployment options, and rich automation features. QFX5100 Switches build a strong underlay foundation for flexible, high-performance, standards-based fabrics and routing that improve network reliability and agility.

QFX5100 Hardware

QFX5100 line of switches offer two compact 1 U models and a 2 U model that provide wire-speed packet performance, very low latency, and rich set of Layer 2 and Layer 3 features. In addition to a high-throughput Packet Forwarding Engine, the performance of the control plane running on all the QFX5100 switches is enhanced by the 1.5 Ghz dual-core Intel CPU with 8 GB of memory and 32 GB of solid-state drive (SSD) storage.

The QFX5100-24Q-AA switch has a 2.5 GHz 4-core Intel CPU with 32 GB of memory and 128 GB of SSD storage.

The QFX5100 line of switches include both 10GE and 40GE fixed-configurations:

- QFX5100-48S

  As shown in , the QFX5100-48S is a 10-Gigabit Ethernet Enhanced Small Form-Factor Pluggable (SFP+) top-of-rack switch with 48 SFP+ ports and 6 Quad SFP+ (QSFP+) ports. Each SFP+ port can operate as a native 10 Gigabit port, when 10 Gbps optics are used. The SFP+ ports can also run at 1 Gbps, or at 100 Mbps speeds when 1_Gigabit optics are inserted. Each QSFP+ port (**48** through **53**) can operate as uplink ports or four QSFP+ port (**50** through **53**) can operate at native 40-Gigabit speed or as 4 independent 10-Gigabit port speeds. The 6 QSFP+ ports can be used as either access ports or as uplinks. The QFX5100-48S provides full duplex throughput of 1.44 Tbps. The QFX5100-48S has a 1 U form factor and comes standard with redundant fans and redundant power supplies. The switch can be ordered with either ports-to-FRUs or FRUs-to-ports airflow and with AC or DC power supplies.

Figure 6: QFX5100-48S Port Panel

The QFX5100-48S can be used as:

- A standalone switch.

- A Node device in a QFabric system.

  The QFX5100-48S is supported on both the QFX3000-G and QFX3000-M QFabric systems.

- A primary, backup, or line card in a QFX Virtual Chassis.

  A QFX Virtual Chassis allows you to interconnect up to 10 QFX3500, QFX3600, or QFX5100 switches into one logical device and manage the device as a single chassis using a ring topology.

- A line card in a QFX5110 Virtual Chassis.

  A QFX5110 Virtual Chassis must have a QFX5110-32Q as the primary. Only QFX5110 and select models of QFX5100 can participate in a QFX5110 Virtual Chassis.

- A spine or leaf device in a standard QFX5100 Virtual Chassis Fabric (VCF).

  VCF uses Virtual Chassis technology to interconnect multiple devices into a single logical device and manage that device as a single logical device inside of a fabric architecture. VCF architecture supports up to 20 total devices in a spine and leaf topology. Out of the 20 total devices, you can configure a maximum of 4 spine devices.

  A QFX5100 VCF uses QFX5100 devices as spines or leaf devices. You can also use QFX3500, QFX3600, and EX4300 models as leaf devices in a QFX5100 VCF.

  Whenever possible, configure the QFX5100-24Q as the spine device in a QFX5100 VCF. You can use the QFX5100-48S as the spine in an all QFX5100-48S VCF or when EX4300 devices are used as leaf devices.

- A leaf device in a QFX5110 VCF.

  A QFX5110 VCF must have a minimum of two QFX5110-32Q as spine devices. Junos OS Release 17.3R1 or later is required for QFX5110 VCF.

- A satellite device in a Junos Fusion system.

  Junos OS Release 14.2.3 or later is required for Junos Fusion.

- QFX5100-48SH

  As shown in Figure 7 on page 24, the QFX5100-48SH is the same form factor and port configuration as the QFX5100-48S. The QFX5100-48SH is specifically designed for Junos Fusion and comes pre-configured with Satellite Network Operational System (SNOS) instead of Juniper Networks Junos OS. The switch may not be converted to Junos OS without an additional license. The switch can be ordered with either ports-to-FRUs or FRUs-to-ports airflow and with AC power supplies.

  The QFX5100-48SH can only be used as a satellite device in a Junos Fusion system.

Figure 7: QFX5100-48SH Port Panel

- QFX5100-48T

As shown in Figure 8 on page 25, the QFX5100-48T is a tri-speed 100/1000/10GBASE-T top-of-rack switch with 48 10GBASE-T access ports and 6 QSFP+ ports. Each 40-Gigabit QSFP+ port (**48** through **53**) can operate either as uplink ports or four QSFP+ ports (**50** through **53**) can operate at native 40-Gigabit port or be channelized into 4 independent 10 Gigabit ports. The 6 QSFP+ ports can be used as either access ports or as uplinks. The QFX5100-48T provides full duplex throughput of 720 Gbps. The QFX5100-48T has a 1 U form factor and comes standard with redundant fans and redundant power supplies. The switch can be ordered with either ports-to-FRUs or FRUs-to-ports airflow and with AC or DC power supplies.

Figure 8: QFX5100-48T Port Panel

The QFX5100-48T can be used as:

- A standalone switch.

- A Node device in a QFabric system.

  The QFX5100-48T is supported on both the QFX3000-G and QFX3000-M QFabric systems.

- A primary, backup, or line card in a QFX Virtual Chassis.

  A QFX Series Virtual Chassis allows you to interconnect up to ten QFX5100, QFX3500, or QFX3600, switches into one logical device and manage the device as a single chassis using a ring topology.

- A line card in a QFX5110 Virtual Chassis.

  You can configure up to ten QFX5110 and QFX5100 switches into one logical device and manage the device as a single chassis using a ring topology. In a QFX5110 Virtual Chassis, configure QFX5110-32Q as the primary and backup. Junos OS Release 17.3R2 or later is required on all members for QFX5110 VCF with QFX5100-48T leaf devices.

- A leaf device in a standard QFX5100 Virtual Chassis Fabric (VCF).

  VCF uses Virtual Chassis technology to interconnect multiple devices into a single logical device and manage that device as a single logical device inside of a fabric architecture. VCF architecture supports up to 20 total devices in a spine and leaf topology. Of those 20 devices, four QFX5100 devices can be configured as spine devices.

In a QFX5100 VCF, the QFX5100-48T is always a leaf device and a QFX5100-24Q is the spine device.

- A leaf device in a QFX5110 VCF.

A QFX5110 VCF must have a minimum of two QFX5110-32Q as spine devices. Junos OS Release 17.3R2 or later is required on all VCF devices for QFX5100-48T leaf devices to operate in a QFX5110 VCF.

- A satellite device in a Junos Fusion system.

Junos OS Release 14.2.3 or later is required for Junos Fusion.

- QFX5100-48TH

As shown in Figure 9 on page 26, the QFX5100-48TH is the same form factor and port configuration as the QFX5100-48T. The QFX5100-48TH is specifically designed for Junos Fusion and comes pre-configured with Satellite Network Operational System (SNOS) instead of Juniper Networks Junos OS. The switch may not be converted to Junos OS without an additional license. The switch can be ordered with either ports-to-FRUs or FRUs-to-ports airflow and with AC power supplies.

The QFX5100-48TH can only be used as a satellite device in a Junos Fusion system.

Figure 9: QFX5100-48THPort Panel

- QFX5100-24Q

As shown in Figure 10 on page 27, the QFX5100-24Q is a 40-Gigabit Ethernet QSFP+ switch with 24 high-density QSFP+ ports. Each QSFP+ port can operate as a native 40 Gbps port or as 4 independent 10 Gbps ports. The QFX5100-24Q switch has a 1 U form factor and comes standard with redundant fans and redundant power supplies. The switch can be ordered with either ports-to-FRUs or FRUs-to-ports airflow and with AC or DC power supplies.

The QFX5100-24Q switch has two module bays for the optional expansion module, QFX-EM-4Q, which can add a total of 8 additional QSFP+ ports to the chassis. When operating as a standalone switch and fully populated with QFX-EM-4Q Expansion Modules, the QFX5100-24Q switch is

equivalent to 80 10 Gbps interfaces and 4 40-Gbps interfaces. Of these total ports, 104 logical ports are available for 10G port channelization. For full details on the different port channelization modes, see *Port Panel of a QFX5100-24Q Device*. All ports on the QFX5100-24Q and QFX-EM-4Q can be configured as either access ports or as uplinks. The QFX5100-24Q switch provides full duplex throughput of 2.56 Tbps.

Figure 10: QFX5100-24Q Port Panel
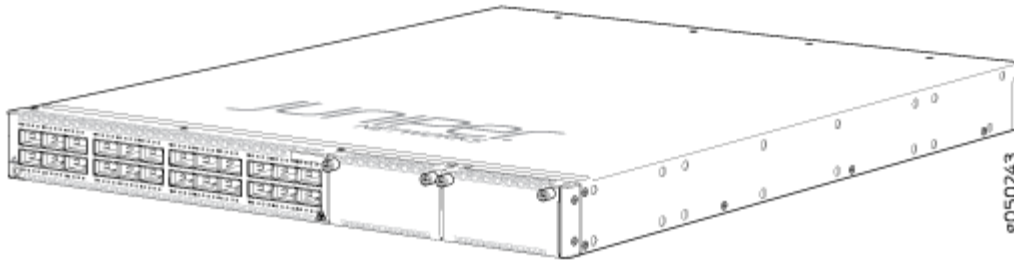
The QFX5100-24Q can be used as:

- A standalone switch.

- An interconnect device in a QFX3000-M QFabric system.

- A Node device in a QFabric system.

  The QFX5100-24Q is supported on both the QFX3000-G and QFX3000-M QFabric systems. A QFX5100-24Q Node device is equivalent to 80 10-Gbps interfaces and 4 40-Gbps interfaces.

- A primary, backup, or line card in a QFX Virtual Chassis.

  A QFX Series Virtual Chassis allows you to interconnect up to 10 QFX3500, QFX3600, or QFX5100 switches into one logical device and manage the device as a single chassis in a ring topology.

  Use QFX5100-24Q switches as the primary and backup in a QFX Virtual Chassis.

- A line card in a QFX5110 Virtual Chassis.

  A QFX5110 Virtual Chassis must have a QFX5110-32Q as the primary. Only QFX5110 switches and select models of QFX5100 can participate in a QFX5110 Virtual Chassis. Junos OS Release 17.3R1 or later is required for QFX5110 Virtual Chassis.

- A spine or leaf device in a standard QFX5100 Virtual Chassis Fabric (VCF).

  VCF uses Virtual Chassis technology to interconnect multiple devices into a single logical device and manage that device as a single logical device inside of a fabric architecture. VCF architecture

supports up to 20 total devices in a spine and leaf topology. Out of the 20 total devices, you can configure a maximum of 4 spine devices.

A QFX5100 VCF uses QFX5100 devices as spines or leaf devices. You can also use QFX3500, QFX3600, and EX4300 models as leaf devices in a QFX5100 VCF.

Whenever possible, configure the QFX5100-24Q as the spine device in a QFX5100 VCF.

- A leaf device in a QFX5110 VCF.

  A QFX5110 VCF must have a minimum of two QFX5110-32Q as spine devices. Junos OS Release 17.3R1 or later is required for QFX5110 VCF.

- A satellite device in a Junos Fusion system.

  Junos OS Release 14.2.3 or later is required for Junos Fusion.

The QFX5100-24Q switch has two bays on the port panel for optional expansion modules. The QFX5100-24Q supports two expansion modules to increase port density:

- QFX-EM-4Q, which provides four additional 40-Gigabit Quad SFP+ (QSFP+) ports. See .

Figure 11: QFX-EM-4Q Expansion Module
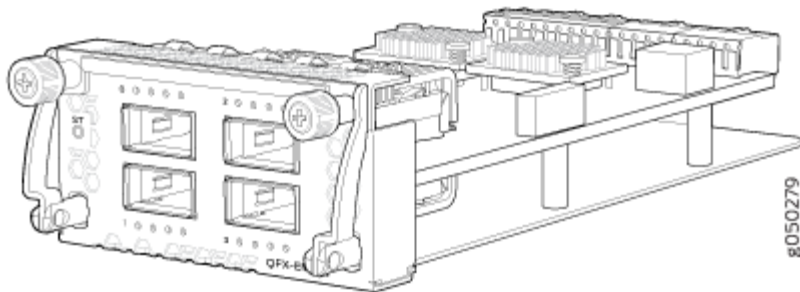
- EX4600-EM-8F, which provides eight additional 10-Gigabit Ethernet Enhanced Small Form-Factor Pluggable (SFP+) or four 1-Gigabit Ethernet ports. See .

> ⚠ **CAUTION**: Use only the top four ports or the bottom four ports for SFP transceivers. Because SFP transceivers are larger than SFP+ transceivers, attempting to stack SFP transceivers can cause internal damage to the module.

Figure 12: EX4600-EM-8F Expansion Module
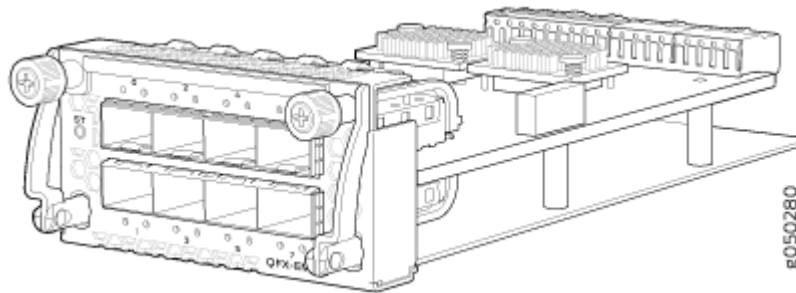
> NOTE: The EX4600-EM-8F is not supported on the QFX5100-24Q running in QFabric systems.

The QFX5100-24Q is configured for the QFX-EM-4Q by default, but any combination of the two modules is supported. Expansion modules can be hot-inserted or hot-removed. However, when an EX4600-EM-8F is inserted instead of the default QFX-EM-4Q, the new configuration causes the interfaces to temporarily go down. Likewise, when an EX4600-EM-8F is running on the QFX5100-24Q and it is swapped with a QFX-EM-4Q, the interfaces temporarily go down, which can cause a short disruption in traffic.

- QFX5100-24Q-AA

  As shown in Figure 13 on page 30, the QFX5100-24Q-AA is a 1 U, top-of-rack, 40-Gigabit Ethernet QSFP+ switch with 24 high-density QSFP+ ports. Each QSFP+ port can be configured to support 40-Gigabit Ethernet or as a set of 4 independent 10-Gigabit Ethernet ports. The QFX5100-24Q-AA can also be configured to support twenty-four 40-Gigabit Ethernet interfaces or ninety-six 10-Gigabit Ethernet interfaces using breakout cables (channelization mode) with 1280 Gbps output. The switch can be ordered with either ports-to-FRUs or FRUs-to-ports airflow and with AC or DC power supplies. The QFX5100-24Q switch provides full duplex throughput of 2.56 Tbps.

  The QFX5100-24Q-AA module bay can accommodate a single Packet Flow Accelerator (PFA) double-wide expansion module (QFX-PFA-4Q) or two single-wide optional expansion modules (two or one each of QFX-EM-4Q and EX4600-EM-8F). The QFX-PFA-4Q, which features a high-performance field-programmable gate array (FPGA), provides four additional QSFP+ ports to the chassis. Each QFX-EM-4Q adds four QSFP+ ports to the chassis and each EX4600-EM-8F adds eight 10-Gigabit SFP+ ports to the chassis. The QFX-EM-4Q ports can also be configured as either access ports or uplink ports, but only ports 0 and 2 can be channelized using port mode. For full details on the different port channelization modes, see *Port Panel of a QFX5100-24Q Device*. All ports on the QFX5100-24Q and QFX-EM-4Q can be configured as either access ports or uplink ports.

  This switch provides the hardware support to enable PTP boundary clocks by using the QFX-PFA-4Q module. The QFX5100-24Q-AA also supports GPS in and out signals when QFX-PFA-4Q is installed.

The CPU subsystem of this switch includes a 2-port 10-Gigabit Ethernet network interface card (NIC) to provide a high bandwidth path or to alternate traffic path to guest VMs directly from the Packet Forwarding Engine.

Figure 13: QFX5100-24Q-AA Port Panel with QFX-PFA-4Q

The QFX5100-24Q-AA can be used as a standalone switch that supports high frequency statistics collection. Working with Juniper Networks Cloud Analytics Engine, this switch monitors and reports the workload and application behavior across the physical and virtual infrastructure.

The QFX5100-24Q-AA supports the following expansion modules to increase port density:

- QFX-PFA-4Q (double-wide), which provides four additional QSFP+ ports. See .

Figure 14: QFX-PFA-4Q Expansion Module
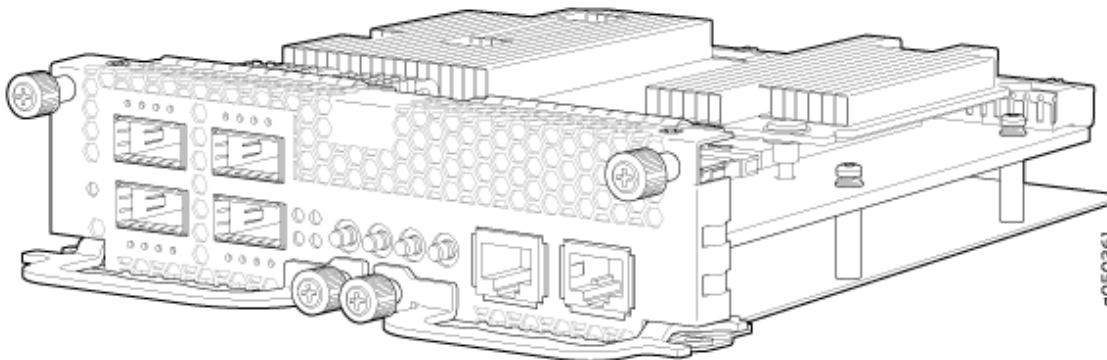
- QFX-EM-4Q (single-wide), which provides 4 additional 40-Gigabit Ethernet QSFP+ ports. See .

- EX4600-EM-8F (single-wide), which provides 8 additional 10-Gigabit Ethernet SFP+ ports. See .

The QFX5100-24Q switch supports the QFX-PFA-4Q and you must take the switch offline before replacing the expansion module. Any combination of EX4600-EM-8F and QFX-EM-4Q is also supported. These two expansion modules can be hot-inserted or hot-removed. However, when an EX4600-EM-8F is inserted instead of a QFX-EM-4Q, the new configuration causes the interfaces to temporarily go down. Likewise, when an EX4600-EM-8F is running on the QFX5100-24Q and is swapped with a QFX-EM-4Q, the interfaces temporarily go down, which can cause a short disruption in traffic.

- QFX5100-96S

As shown in , the QFX5100-96S switch is a is a 10-Gigabit Ethernet Enhanced Small Form-Factor Pluggable (SFP+) top-of-rack switch with 96 SFP+ ports and 8 Quad SFP+ (QSFP+) ports. Each SFP+ port can operate as a native 10 Gigabit port, when 10 Gbps optics are used. The SFP+ ports can also run at 1 Gbps, or at 100 Mbps speeds when 1_Gigabit optics are inserted. QSFP+ ports 96 and 100 can operate at native 40 Gbps speed or can be channelized to 4 independent 10 Gbps port speeds. The 8 QSFP+ ports can be used as either access ports or as uplinks. The QFX5100-96S switch has a 2 U form factor and comes standard with redundant fans and redundant power supplies. The switch can be ordered with either ports-to-FRUs or FRUs-to-ports airflow and with AC or DC power supplies.

Figure 15: QFX5100-96S Port Panel

The QFX5100-96S can be used as:

- A standalone switch.

- A member in a QFX Virtual Chassis.

  A QFX Series Virtual Chassis allows you to interconnect up to ten QFX3500, QFX3600, or QFX5100 switches into one logical device and manage the device as a single chassis in a ring topology.

- A spine or leaf device in a Virtual Chassis Fabric (VCF).

VCF uses Virtual Chassis technology to interconnect multiple devices into a single logical device and manage that device as a single logical device inside of a fabric architecture. VCF architecture supports up to 20 total devices in a spine and leaf topology. Of those 20 devices, 4 QFX5100 devices can be configured as spine devices.

In a mixed environment with QFX5100-24Q, QFX5100-98S and EX4300, use the QFX5100-24Q as the spine device and the QFX5100-96S and EX4300 as a leaf devices. You may use the QFX5100-96S as a spine in an all QFX5100-96S VCF or in a VCF that has a mixture of QFX5100-96S and EX4300.

- A line card in a mixed QFX5110 Virtual Chassis.

  A QFX5110 Virtual Chassis must have a QFX5110-32Q as the primary. Only QFX5110 switches and select models of QFX5100 switches can participate in a QFX5110 Virtual Chassis. Junos OS Release 17.3R1 or later is required for QFX5110 Virtual Chassis.

- A spine or leaf device in a standard QFX5100 Virtual Chassis Fabric (VCF).

  VCF uses Virtual Chassis technology to interconnect multiple devices into a single logical device and manage that device as a single logical device inside of a fabric architecture. VCF architecture supports up to 20 total devices in a spine and leaf topology. Out of the 20 total devices, you can configure a maximum of 4 spine devices.

  A QFX5100 VCF uses QFX5100 devices as spines or leaf devices. You can also use QFX3500, QFX3600, and EX4300 models as leaf devices in a QFX5100 VCF.

  Whenever possible, configure the QFX5100-24Q as the spine device in a QFX5100 VCF.

- A leaf device in a QFX5110 VCF.

  A QFX5110 VCF must have a minimum of two QFX5110-32Q as spine devices. Junos OS Release 17.3R1 or later is required for QFX5110 VCF.

- A satellite device in a Junos Fusion system.

  Junos OS Release 14.2.3 or later is required for Junos Fusion.

System Software

QFX Series devices use the Junos operating system (OS), which provides Layer 2 and Layer 3 switching, routing, and security services. Junos OS is installed on a QFX5100 switch's 32-gigabyte (GB) internal solid state flash drive. The same Junos OS code base that runs on QFX5100 switches also runs on all Juniper Networks EX Series switches, M Series, MX Series, and T Series routers.

Participation in a QFX5110 Virtual Chassis or a QFX5110 VCF requires the same Junos OS image on all devices in the Virtual Chassis or VCF. Junos OS 17.3R1 or later is the minimum software release for QFX5110 Virtual Chassis or QFX5110 VCF.

For more information about which features are supported on QFX Series devices, see Feature Explorer.

You manage the switch using the Junos OS command-line interface (CLI), accessible through the console and out-of-band management ports on the device.

RELATED DOCUMENTATION

Plan a Virtual Chassis Fabric Deployment

Port Panel of a QFX5100-24Q Device

IN THIS SECTION

- Switch Ports | **34**
- QFabric Systems | **35**
- Channelizing Interfaces (Non-QFabric) | **35**
- Virtual Chassis and Virtual Chassis Fabric | **36**
- Port LEDs | **36**

The port panel of the QFX5100-24Q device consists of 24 quad small-form factor pluggable plus (QSFP +) ports. Each QSFP+ socket can be configured to support 40 GbE or as a set of 4 independent 10 GbE ports using breakout cables (channelization mode). In standalone mode, any of the 24 ports **0** through **23** can be configured as either uplink or access ports. The QFX5100-24Q device has two module bays for the optional expansion modules, QFX-EM-4Q or EX4600-EM-8F. The QFX-EM-4Q, can add a total of 8 additional QSFP+ ports to the chassis and the EX4600-EM-8F can provide 8 additional 10-Gigabit Ethernet Enhanced Small Form-Factor Pluggable (SFP+) ports. The QFX-EM-4Q ports can also be configured as either access ports or as uplinks, but only ports 0 and 2 can be channelized using port mode. Figure 16 on page 34 shows the port panel of the QFX5100-24Q device.

Figure 16: QFX5100-24Q Device Port Panel

1– Electrostatic Discharge (ESD) terminal	3– Expansion module bays with cover panels (2)
2– QSFP+ access interface or uplink ports (24)	
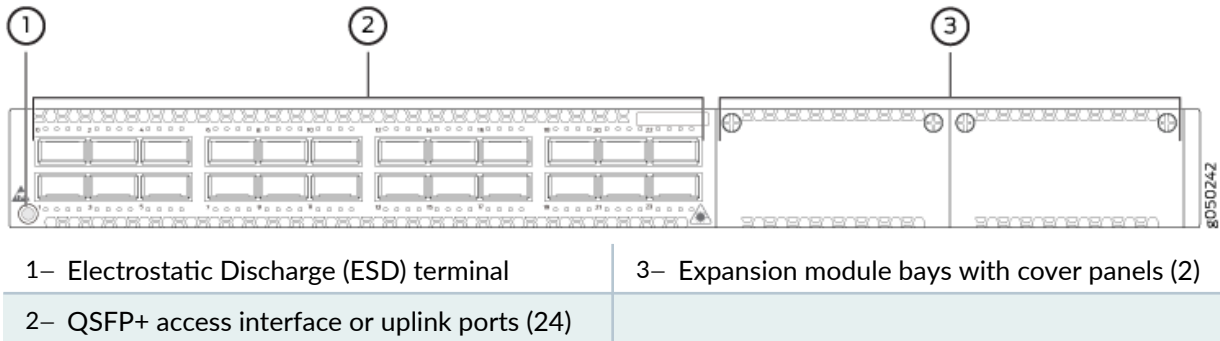
Switch Ports

The QFX5100-24Q device ports, (**0** through **23**) support:

- 40 Gbps QSFP+ transceivers

- QSFP+ to QSFP+ direct attach copper (DAC) cables

- QSFP+ to SFP+ direct attach copper break out (DACBO) cables

- QSFP+ to QSFP+ active optical cables (AOC)

- QSFP+ to SFP+ active optical breakout cable (AOCBO)

- Access ports

  You can use 40-Gigabit Ethernet QSFP+ transceivers and QSFP+ direct attach copper cables in any downstream port. See *Determining Interface Support for the QFX5100 Device*.

- Uplink ports

  You can configure up to 4 of the 40 GbE ports as uplinks. Each additional QFX-EM-4Q, Expansion Module adds the switch uplink capacity by 2 for a total of 8 uplinks.

  To connect a QFX5100-24Q switch as a Node device in a QFabric system, you need:

  - Four QSFP+ uplink ports on each QFX5100-24Q Node device to connect to the data plane network through the QFX3008-I or QFX5100-24Q Interconnect devices.

  - Two additional QSFP+ uplink ports on each QFX5100-24Q Node device connect to the data plane network through the QFX3008-I or QFX5100-24Q Interconnect devices. .

QFabric Systems

The QFX5100-24Q operates as a Node device in both the QFX3000-G and QFX3000-M QFabric systems. Additionally, the QFX5100-24Q can be configured as an Interconnect Device in QFX3000-M QFabric systems allowing a maximum of 16 Node devices. The QFX5100-24Q may not be mixed with QFX3600-I Interconnect devices in the same QFabric system.

When operating as a Node device, ports **0** through **7** are default FTE ports; ports **8** through **15** can be configured as either uplink (FTE) or access ports (XLE). In the port range **8** through **23**, only 12 ports can be channelized when the 2 QFX-EM-4Q are installed.

> **NOTE**: The EX4600-EM-8S expansion module is not supported on the QFX5100-24Q device in a QFabric system.

Channelizing Interfaces (Non-QFabric)

When fully populated with 2 QFX-EM-4Q Expansion Modules, the QFX5100-24Q device has 128 physical ports. However, only 104 logical ports can be used for port channelization. Depending on the system mode you configure for channelization, different ports are restricted. If you attempt to channelize a restricted port, the configuration is ignored. The following system modes are available on the QFX5100-24Q device:

- Default mode

  All 24 QSFP+ ports on the switch (PIC 0) are channelized by default (96 ports). With QFX-EM-4Q Expansion Modules (PIC 1) and (PIC 2), the QSFP+ ports are supported for access or uplink ports, but cannot be channelized. Ports are over-subscribed In this mode and could be subject to packet-loss. You can have one of two port combinations: 32 40-Gbps QSFP+ ports, or 96 10-Gigabit Ethernet ports plus 8 40-Gbps QSFP+ ports.

- 104 port mode

  All 24 QSFP+ ports on the switch (PIC 0) are channelized (96 ports). Two ports on QFX-EM-4Q Expansion Module (PIC 1) are also channelized (8 additional). In this mode, ports 0 and 2 are channelized by default and ports 1 and 3 are disabled. If additional QSFP+ ports are detected in an expansion module (PIC 2), those ports are ignored.

- Flexi-pic mode

  Ports 0 through 3 of the switch cannot be channelized; ports 4 through 24 are channelized by default (80 ports). With QFX-EM-4Q Expansion Modules (PIC 1) and (PIC 2), the QSFP+ ports are supported for access or uplink ports, but cannot be channelized. With EX4600-EM-8F Expansion Modules installed (PIC 1) and (PIC 2), the 16 SFP+ ports of SFP are recognized for a total of 96 logical ports.

- Non-oversubscribed mode

  All 24 QSFP+ ports on the switch (PIC 0) are channelized (96 ports). Expansion modules on PIC 1 and PIC 2 are not supported and cannot be channelized. There is no packet loss for packets of any size in this mode.

Virtual Chassis and Virtual Chassis Fabric

The QFX5100-24Q device operates as a standalone switch, a member of a QFX Virtual Chassis, or as a spine or leaf device in a QFX5100 Virtual Chassis Fabric (VCF). QFX Virtual Chassis support up to 10 members. QFX5100 VCF supports 20 QFX5100 and EX4300 devices, of which 4 QFX5100 devices can be configured as spines.

To connect a QFX5100-24Q device as a member in a QFX Virtual Chassis, you need to cable a pair of ports to link each member in the Virtual Chassis into a ring topology. Each member in the ring has at least one direct Virtual Chassis port (VCP) connection to each directly connected member. QFX5100-24Q devices are recommended in the primary, backup, or line card role. When mixed with QFX3500 or QFX3600 devices, configure the QFX5100-24Q device in the primary and backup roles. See *Connecting QFX Series and EX Series Switches in a QFX Virtual Chassis* for cabling diagrams. The Virtual Chassis feature is not applicable to QFX devices in a QFabric.

To connect a QFX5100-24Q device as a spine or leaf device in a QFX5100 VCF, you need to cable a set of ports as VCP connections that link each spine device and leaf device. All spine devices have at least one direct VCP connection to each leaf device in the VCF. Non-channelized DAC cables can be configured as VCP connections. See *Connecting a QFX5100 Device in a Virtual Chassis Fabric* for a cabling diagram.

> **BEST PRACTICE**: Whenever possible use the QFX5100-24Q device as a spine device. By using the QFX5100-24Q device in a maximum configuration of 20 total devices, four QFX5100-24Q devices may be used as spine devices. All members can be connected to the spine using QSFP+ ports.

As of Junos OS release 17.3R1, you can also connect a QFX5100-24Q as a leaf device in a QFX5110 VCF or as a member in a QFX5110 Virtual Chassis.

Port LEDs

The bi-color LEDs labeled Link/Activity LED in indicate link activity or faults.

Figure 17: LEDs on the QSFP+ Uplink Ports
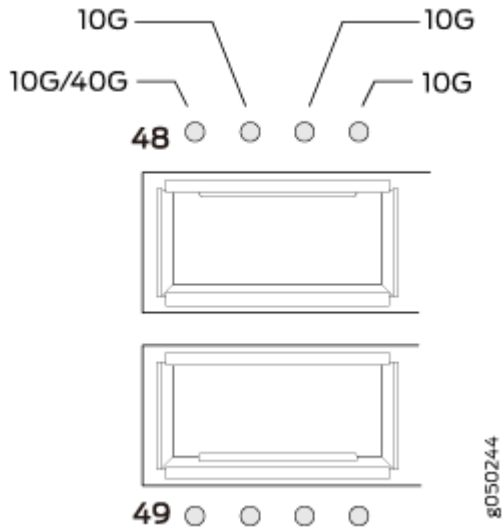
describes the SFP+ access port LEDs.

Table 1: Port LEDs on a QFX5100-24Q Switch

Color	State	Description
Unlit	Off	The port is administratively disabled, there is no power, or there is a fault. **NOTE**: When configured for channelized 10-Gigabit Ethernet, the LED remains unlit only if all four of the 10-Gigabit Ethernet SFP+ breakout links are down.
Green	On steadily	A link is established, but there is no link activity. **NOTE**: When configured for channelized 10-Gigabit Ethernet, the LED is lit green when at least one of the four 10-Gigabit Ethernet SFP+ breakout links is established.
	Blinking	A link is established, and there is link activity. **NOTE**: When configured for channelized 10-Gigabit Ethernet, the LED is lit green when at least one of the four 10-Gigabit Ethernet SFP+ breakout links is established.

Table 1: Port LEDs on a QFX5100-24Q Switch *(Continued)*

Color	State	Description
Amber	Blinking	All four LEDs blink to indicate the beacon function was enabled on the port.

Port Panel of QFX5100-48S and QFX5100-48SH Devices

The port panel of the QFX5100-48S and QFX5100-48SH switches supports up to a maximum of 72 logical 10 GbE ports when operating as a standalone switch. Forty-eight physical ports(**0** through **47**) support 10 Gigabit Ethernet small form-factor pluggable plus (SFP+) transceivers. These ports can also support 1 Gigabit SFP transceivers and can be configured at either 1 Gbps or 1 Gbps speeds using the `set interface speed` command. All 48 of these ports can be used for SFP+ transceivers or SFP+ direct attach copper (DAC) cables. You can use 1-Gigabit Ethernet SFP+, 10-Gigabit Ethernet SFP+ transceivers and SFP+ DAC cables in any access port.

The remaining 24 logical ports are the six 40 GbE physical ports (**48** through **53**) that support up to 6 quad small-form factor pluggable plus (QSFP+) transceivers . Each QSFP+ socket can operate either as a single 40 Gbps port or as a set of 4 independent 10 Gbps ports using QSFP+ breakout cables. The 40 GbE ports can be configured as either access ports or as uplinks.

> ⚠️ **CAUTION**: When you use the latest OEM part number FCLF8521P2BTL (printed on the transceiver label), you can install 1GbE transceivers (such as QFX-SFP-1GE-T) in any port with no restrictions. The same applies for devices that support 10GbE copper transceivers. However, if you are using the older OEM part number SP7041-M1-JN (not shipped in last 3+ years) instead, do not install 1GbE copper transceivers (such as QFX-SFP-1GE-T) directly above or below another 1GbE copper transceiver. Use only the top row or bottom row to avoid damage to the device caused when the transceivers are installed above or below each other.

To connect a QFX5100-48S switch as a node device in a QFabric system, you need:

- Four QSFP+ uplink ports on each QFX5100-48S Node device to connect to the data plane network through the QFX3008-I or QFX5100-24Q Interconnect devices.

- The two remaining QSFP+ uplink ports on each QFX5100-48S Node device connect to the data plane network through the QFX3008-I or QFX5100-24Q Interconnect devices. See *Determining Interface Support for the QFX5100 Device*.

To connect a QFX5100-48S switch as a member in a QFX Virtual Chassis, you need a pair of dedicated ports and cables that link each member in the Virtual Chassis into a ring topology. Each member in the ring has at least one direct Virtual Chassis port (VCP) connection to a upstream and downstream member. QFX5100-48S switches are recommended in the primary, backup, or line card role. When mixed with QFX3500 or QFX3600 devices, configure the QFX5100-48S in the primary and backup roles. See *Connecting QFX Series and EX Series Switches in a QFX Virtual Chassis* for cabling diagrams.

To connect a QFX5100-48S switch as a spine or leaf device in a QFX5100 Virtual Chassis Fabric (VCF), you need a pair of dedicated ports and cables that link each spine device and leaf device in the VCF. All spine devices have at least one direct VCP connection to each leaf device in the VCF. See *Connecting a QFX5100 Device in a Virtual Chassis Fabric* for a cabling diagram.

> **BEST PRACTICE**: In a mixed QFX5100 VCF environment with multiple models of QFX5100 and the EX4300, use QFX5100-24Q as spine devices. In the maximum configuration of 20 total devices, up to four QFX5100-24Q devices may be used as spine devices. All members can be connected to the spine using QSFP+ ports. You can configure the QFX5100-96S as a spine in an all QFX5100-96S VCF or in a mixed VCF comprised of EX4300 and QFX5100-96S.

As of Junos OS release 17.3R1, you can also connect a QFX5100-48S as a leaf device in a QFX5110 VCF or as a member in a QFX5110 Virtual Chassis.

shows the port panel of a QFX5100-48S switch.

Figure 18: QFX5100-48S Switch Port Panel

1– Electrostatic Discharge (ESD) terminal	3– 40 GbE ports (6)
2– 10 G ports (48)	
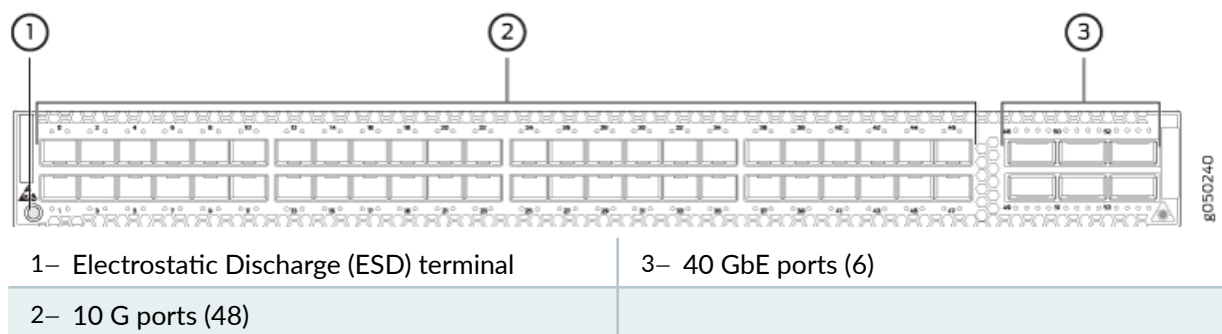
The QFX5100-48S and QFX5100-48SH device ports, (**0** through **47**) support:

- SFP transceivers that can run at either 100 Mbps or 1 Gbps speed

- SFP+ transceivers at 10 Gbps speed

- SFP to SFP direct attach copper (DAC) cables

- SFP+ to SFP+ DAC cables

- SFP+ to SFP+ active optical cables (AOC)

The QFX5100-48S and QFX5100-48SH 40 G uplink or data ports (**48** through **53**) support:

- QSFP+ transceivers

- QSFP+ to QSFP+ direct attach copper (DAC) cables

- QSFP+ to SFP+ DAC breakout cables (DACBO)

- QSFP+ to QSFP+ active optical cables (AOC)

- QSFP+ to SFP+ AOC breakout cables (AOCBO)

Port Panel of QFX5100-48T and QFX5100-48TH Devices

The port panel of the QFX5100-48T and QFX5100-48TH devices supports 48 10GBASE-T ports and 6 quad small-form factor pluggable (QSFP+) ports. Forty-eight copper physical ports (**0** through **47**) are tri-speed and support up to 10-Gigabit Ethernet. These 10GbE/1GbE/100 Mbps ports can be configured as access ports. See *Determining Interface Support for the QFX5100 Device*.

The remaining six ports (**48** through **53**), support 40 GbE QSFP+ transceivers. Each QSFP+ socket can operate either as a single 40 Gbps port or as a set of 4 independent 10 Gbps ports using QSFP+ breakout cables. The 40 GbE ports can be configured as either access ports or as uplinks.

To connect a QFX5100-48T device as a member in a QFX Virtual Chassis, you need a pair of dedicated ports and cables that link each member in the Virtual Chassis into a ring topology. Each member in the ring has at least one direct Virtual Chassis port (VCP) connection to a upstream and downstream member. QFX5100-48T switches are recommended in the primary, backup, or line card role. When mixed with QFX3500 or QFX3600 devices, configure the QFX5100-48T device in the primary and backup roles. See *Connecting QFX Series and EX Series Switches in a QFX Virtual Chassis* for cabling diagrams.

To connect a QFX5100-48T device as a leaf device in a Virtual Chassis Fabric (VCF), you need a pair of dedicated ports and cables that link each spine device and leaf device in the VCF. All spine devices have at least one direct VCP connection to each leaf device in the VCF. See *Connecting a QFX5100 Device in a Virtual Chassis Fabric* for a cabling diagram.

The QFX5100-48T device operates as a standalone switch, a member of a QFX Virtual Chassis, a member of a QFX5110 Virtual Chassis, act as a leaf device in a Juniper Networks Virtual Chassis Fabric (VCF). QFX Virtual Chassis and QFX5100 Virtual Chassis both support up to 10 members. VCF supports 20 total devices, of which 4 QFX5100-24Q devices can be configured as spine devices.

> **BEST PRACTICE**: Use the QFX5100-24Q as a spine device and any QFX5100 device (except QFX5100-24Q-AA, QFX5100-48TH, or QFX510048SH) as leaf devices.

shows the port panel of a QFX5100-48T or QFX5100-48TH device.

Figure 19: QFX5100-48T or QFX5100-48TH Switch Port Panel
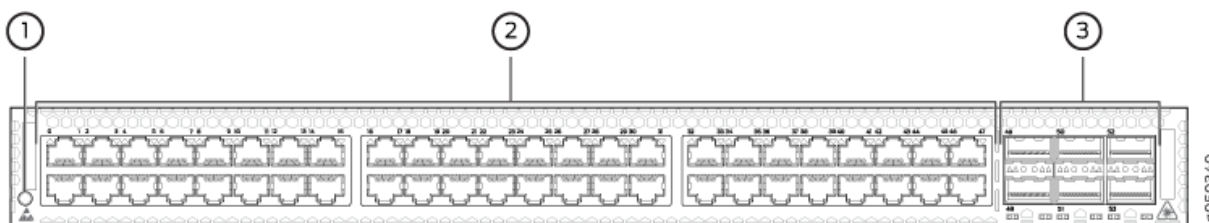
1– Electrostatic Discharge (ESD) terminal	3– 40 GbE ports (6)
2– 10GBASE-T ports (48)	

The QFX5100-48T and QFX5100-48TH device ports, (**0** through **47**) support RJ45 connectors. The 40 G uplink or data ports (**48** through **53**) support:

- QSFP+ transceivers

- QSFP+ to QSFP+ direct attach copper (DAC) cables

- QSFP+ to SFP+ DAC breakout cables (DACBO)

- QSFP+ to QSFP+ active optical cables (AOC)

- QSFP+ to SFP+ AOC breakout cables (AOCBO)

To connect a QFX5100-48T switch as a Node device in a QFabric system, you need:

- Four QSFP+ uplink ports on each QFX5100-48T Node device to connect to the data plane network through the QFX3008-I or QFX5100-24Q Interconnect devices.

- The two remaining QSFP+ uplink ports on each QFX5100-48T Node device connect to the data plane network through the QFX3008-I or QFX5100-24Q Interconnect devices.

Access port pinouts for the QFX5100-48T switch are the same as the management port connector pinouts for the QFX Series. For more information, see *RJ-45 Management Port Connector Pinout Information*.

Connect the QFX5100 in a Virtual Chassis or Virtual Chassis Fabric

Port Panel of a QFX5100-96S Device

IN THIS SECTION

- Switch Ports | **43**
- Channelizing Interfaces | **43**
- Virtual Chassis and Virtual Chassis Fabric Support | **44**

The port panel of the QFX5100-96S switch consists of 96 small form-factor pluggable plus (SFP+) and 8 quad small-form factor pluggable plus (QSFP+) ports that are normally configured as access ports. Physical ports(**0** through **95**) support 10 Gbps SFP+ transceivers and 1 Gbps transceivers. The eight 40-Gigabit ports (**96** through **104**) support QSFP+ transceivers and are normally configured as uplinks or Virtual Chassis ports (VCPs). Although the 104 physical ports of the QFX5100-96S would map to 128 logical ports using channelization, only 104 logical ports are supported.

Figure 20 on page 42 shows the port panel of a QFX5100-96S switch.

Figure 20: QFX5100-96S Switch Port Panel
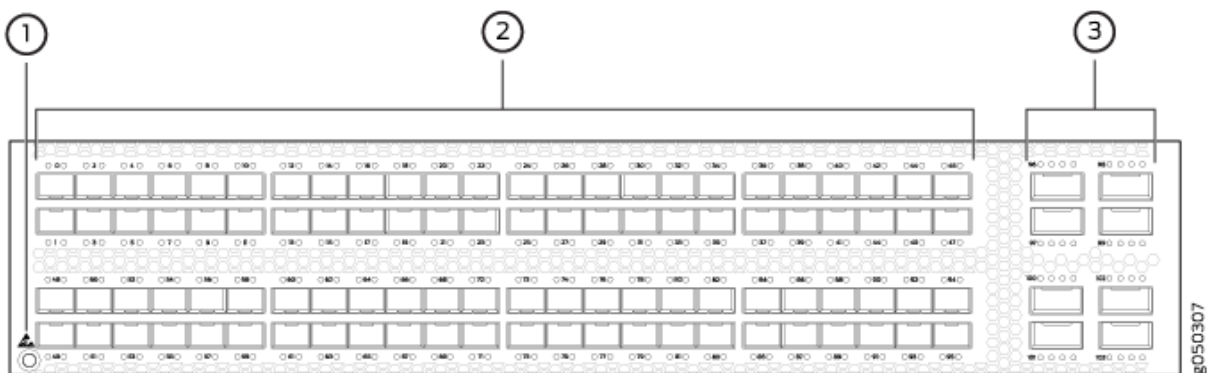
1– Electrostatic Discharge (ESD) terminal	3– 40 Gigabit Ethernet ports (8)
2– 10 Gigabit Ethernet ports (96)	

This topic describes:

Switch Ports

The QFX5100-96S switch ports, (**0** through **95**) support:

- SFP transceivers that can run at either 100 Mbps or 1 Gbps speed

- SFP+ transceivers at 10 Gbps speed

- SFP to SFP direct attach copper (DAC) cables

- SFP+ to SFP+ DAC cables

- SFP+ to SFP+ active optical cables (AOC)

Ports **96** through **104** support:

- 40 Gbps QSFP+ transceivers

Additionally ports **96** and **100** support:

- SFP+ transceivers

- QSFP+ to QSFP+ direct attach copper (DAC) cables

- QSFP+ to SFP+ DAC breakout cables (DACBO)

- QSFP+ to QSFP+ active optical cables (AOC)

- QSFP+ to SFP+ AOC breakout cables (AOCBO)

> ⚠️ **CAUTION**: When you use the latest OEM part number FCLF8521P2BTL (printed on the transceiver label), you can install 1GbE transceivers (such as QFX-SFP-1GE-T) in any port with no restrictions. The same applies for devices that support 10GbE copper transceivers. However, if you are using the older OEM part number SP7041-M1-JN (not shipped in last 3+ years) instead, do not install 1GbE copper transceivers (such as QFX-SFP-1GE-T) directly above or below another 1GbE copper transceiver. Use only the top row or bottom row to avoid damage to the device caused when the transceivers are installed above or below each other.

Channelizing Interfaces

The port panel of the QFX5100-96S switch supports up to a maximum of 104 logical 10 GbE ports that can be distributed over 96 small form-factor pluggable plus (SFP+) and 8 quad small-form factor pluggable plus (QSFP+) transceivers . Because of an 104 port restriction, only two of the eight QSFP+

can be channelized. Depending on how you set the system mode for channelization, the behavior of channelization for the QSFP+ changes. The following system modes are available for the QFX5100-96S switch:

- Non-oversubscribed

  All 96 SFP+ ports on the switch (PIC 0) are supported. In this mode, the eight QSFP+ ports are not supported and cannot be channelized. There is no packet loss for packets of any size in this mode.

- Default mode

  All 96 SFP+ ports on the switch (PIC 0) are supported. QSFP+ ports **96** and **100** can be channelized. If ports **96** and **100** are channelized, the interfaces on ports **97**, **98**, **99**, **101**, **102**, and **103** are disabled.

Virtual Chassis and Virtual Chassis Fabric Support

The QFX5100-96S switch operates as a standalone switch, as a member in a QFX Virtual Chassis, as a member in a QFX5110 Virtual Chassis, as a spine or leaf device in a QFX5100 Virtual Chassis Fabric (VCF), or as a leaf device in a QFX5110 VCF. QFX Virtual Chassis support up to 10 members; QFX5100 VCF supports a total of 20 devices, of which 4 QFX5100 devices can be configured as spines. A QFX Virtual Chassis is cabled in a ring topology, where a VCF is cabled in a spine and leaf topology.

Virtual Chassis

In a QFX Virtual Chassis, you can connect up to 10 standalone QFX5100-96S switches into a QFX Series Virtual Chassis and manage the interconnected switches as a single chassis. The advantages of connecting multiple switches into a Virtual Chassis include better-managed bandwidth at a network layer, simplified configuration and maintenance because multiple devices can be managed as a single device, increased fault tolerance and high availability (HA) because a Virtual Chassis can remain active and network traffic can be redirected to other member switches when a single member switch fails, and a flatter, simplified Layer 2 network topology that minimizes or eliminates the need for loop prevention protocols such as Spanning Tree Protocol (STP).

As of Junos OS release 17.3R1, you can also connect a QFX5100-96S as a member in a QFX5110 Virtual Chassis.

Virtual Chassis Fabric

The VCF provides a low-latency, high-performance fabric architecture that can be managed as a single device. VCF is an evolution of the Virtual Chassis feature, which allows you to interconnect multiple devices into a single logical device, inside of a fabric architecture. The VCF architecture is optimized to support small and medium-sized data centers that contain a mix of 1-Gpbs, 10-Gpbs, and 40-Gbps Ethernet interfaces.

A VCF is constructed using a spine-and-leaf architecture and topology. In the spine-and-leaf architecture, each spine device is interconnected to each leaf device. A VCF supports up to 20 devices, of which 4 QFX5100 devices can be configured into spine devices. In a mixed environment with QFX5100-24Q, QFX5100-98S and EX4300, use the QFX5100-24Q as the spine device and the QFX5100-96S and EX4300 as a leaf devices. You may use the QFX5100-96S as a spine in an all QFX5100-96S VCF or in a VCF that has a mixture of QFX5100-96S and EX4300.

As of Junos OS release 17.3R1, you can also connect a QFX5100-24Q as a leaf device in a QFX5110 VCF.

QFX3600 Overview

IN THIS CHAPTER

QFX3600 Device Overview

IN THIS SECTION

The Juniper Networks QFX3600 device is a high-speed, multipurpose switch especially designed for next-generation data centers. The QFX3600 device can be configured as:

- A standalone switch

- A Node device in a QFX3000-M or QFX3000-G QFabric system

- An Interconnect device in a QFX3000-M QFabric system

- A member in a QFX Virtual Chassis

- A leaf node in a QFX5100 Virtual Chassis Fabric (VCF)

Sixteen 40-Gbps ports in the device use quad small form-factor pluggable plus (QSFP+) transceivers. The small form-factor and front facing ports in the switch make it suitable for deployment in high-density server racks and container-based data center deployments.

In a QFX3000-G QFabric system, the QFX3600 device can operate as a Node device through the 40-Gbps uplinks ports to a Juniper Networks QFX3008-I Interconnect device. On a QFX3000-M QFabric

device, the QFX3600 can be configured to operate as either a Node device or as a QFX3600-I Interconnect device. When configured as a Node device in a QFX3000-M QFabric system, , the QFX3600 device can connect to either a QFX3600-I Interconnect device to a QFX5100-24Q through the 40-Gbps uplink ports.Together, the QFX3600 Node devices and Interconnect devices form a multistage, nonblocking switch fabric that provides a high-performance, low-latency, unified interconnect solution for next-generation data centers.

The QFX3600 Node devices and QFX3008-I or QFX3600-I Interconnect devices are connected to Juniper Networks QFX3100 Director devices in a control plane and management network. The QFX3100 Director device presents the QFabric system devices as a single network entity, allowing for simplified management of your data center using the Junos OS command-line interface (CLI).

In a QFX Virtual Chassis, the QFX3600 device can participate with other QFX3600 devices or QFX3500 devices in a ring topology with up to 10 members.

In a QFX5100 Virtual Chassis Fabric, the QFX3600 device can participate as a leaf device. Up to a total of 32 devices can participate in the Virtual Chassis Fabric.

Software

QFX Series devices use the Junos operating system (OS), which provides Layer 2 and Layer 3 switching, routing, and security services. Junos OS is installed on the QFX3600 device's 8-gigabyte (GB) internal flash drive. The same Junos OS code base that runs on QFX Series devices also runs on all Juniper Networks EX Series, J Series, M Series, MX Series, and T Series devices.

For more information about which features are supported on QFX Series devices, see Feature Explorer.

When the QFX3600 device is operating as a standalone switch, you manage the switch using the Junos OS command-line interface (CLI), accessible through the console and out-of-band management ports on the device.

When a QFX Series device operates as part of a QFabric system, all the devices in the data center fabric are managed through the Administrator software installed on the QFX3100 Director devices. Each device in a QFabric system is interconnected in a single control plane and management network, using the redundant management ports on each device.

Hardware

The compact QFX3600 chassis is 1 rack unit (1 U) in size and designed to fit in industry-standard 19-inch rack-mount enclosures, as well as high-density server racks and container-based data center deployments. See Figure 21 on page 48 and Figure 22 on page 48 and *Chassis Physical Specifications for QFX3600 and QFX3600-I Devices*.

Figure 21: QFX3600 Chassis Front
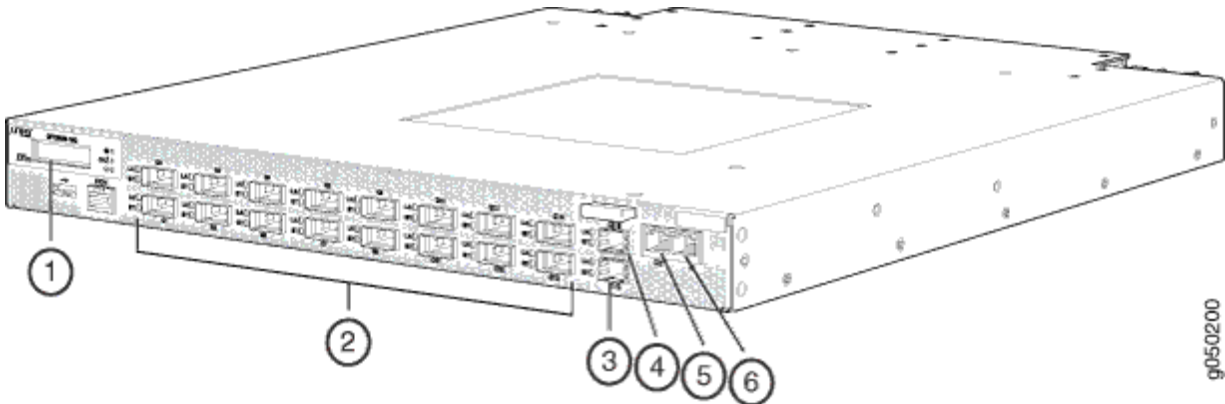
1–	LCD panel	4–	**C0S** 1-Gbps SFP management port
2–	QSFP+ ports	5–	**C0** 1000BASE-T RJ-45 management port
3–	**C1S** 1-Gbps SFP management port	6–	**C1** 1000BASE-T RJ-45 management port

Figure 22: QFX3600 Chassis Rear
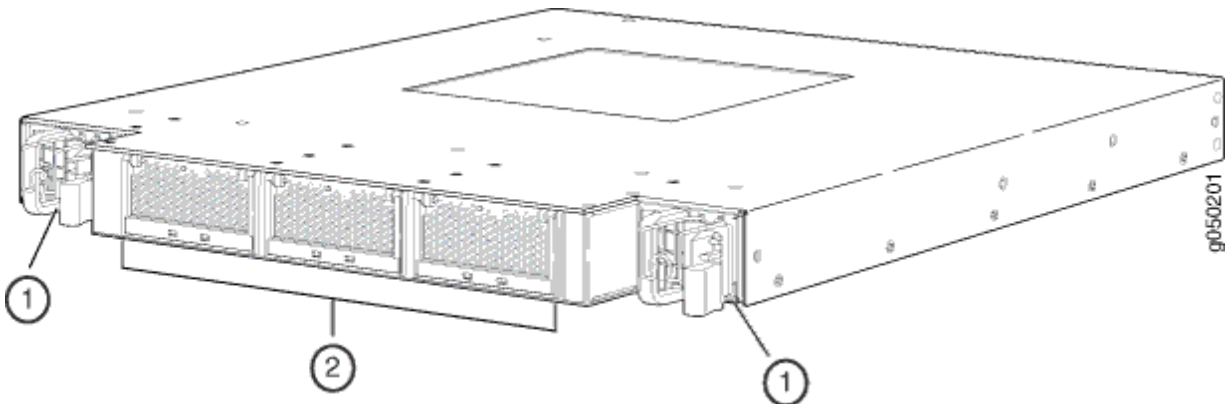
1–	Power supplies	2–	Fan trays

The front panel of the QFX3600 chassis has an LCD panel that displays the device hostname and the number of active alarms. It also has sixteen 40-Gbps ports labeled **Q0** through **Q15** that support quad small form-factor pluggable plus (QSFP+) transceivers. See *Front Panel of a QFX3600 Device*.

If you are using the QFX3600 device as a Node device in a QFabric system, by default, four ports (labeled **Q0** through **C3**) are configured for uplink connections between your QFX3600 Node device and your Interconnect device, and twelve ports (labeled **Q4** through **Q15**) support 48 10-Gigabit Ethernet or 12 40-Gigabit Ethernet interfaces for connections to either endpoint systems (such as servers and storage devices) or external networks. Optionally, you can choose to configure the first eight ports (labeled **Q0** through **Q7**) for uplink connections between your QFX3600 Node device and your Interconnect device and ports **Q2** through **Q15** for 10-Gigabit Ethernet or 40-Gigabit Ethernet

connections to either endpoint systems or external networks. See *Configuring the Port Type on QFX3600 Node Devices* and *Determining Interface Support for the QFX3600 Device*.

If you are using the QFX3600 device as a standalone switch, by default, all 16 QSFP+ ports (**Q0** through **Q15**) are configured as 40-Gigabit Ethernet (*xle*) ports. Optionally, you can choose to configure each port to operate as 10-Gigabit Ethernet (*xe*) ports. Port **00** is unique because the number of ports you can specify as 10-Gigabit Ethernet varies by Junos OS release. In some Junos OS releases, port **00** has a reserved port and in other releases, the port is available. See the topics on channelizing interfaces or configuring the port type for your specific software release.

The rear panel of the QFX3600 chassis has two redundant power supplies and three redundant fan trays that are field-replaceable and hot-swappable. See *Rear Panel of QFX3600 and QFX3600-I Devices*.

RELATED DOCUMENTATION

Field-Replaceable Units for QFX3600 and QFX3600-I Devices

Site Preparation Checklist for a QFX3600 or QFX3600-I Device

Installing and Removing QFX3600 or QFX3600-I Device Hardware Components

Front Panel of a QFX3600 Device

The front panel of the QFX3600 device consists of the following components:

- LCD panel—The LCD panel displays the device hostname and the number of active alarms.

  > **TIP**: Alternatively, you can use the `show chassis lcd` CLI command to view what is currently displayed on the LCD panel.

- Chassis status LEDs

- USB port

- Console (**CON**) port

- Management ports—The QFX3600 device has four management ports. The ports labeled **C0** and **C1** are 1000BASE-T RJ-45 ports, and the ports labeled **C0S** and **C1S** are 1-Gbps SFP ports.

  - If you are using the QFX3600 device as a Node device in a QFabric system, these ports are used to connect the QFX3600 device to the QFabric system control plane and management network.

See *Determining Transceiver Support for QFabric Systems* for information about the supported transceivers and required cables.

- If you are using the QFX3600 device as a standalone switch, these ports are used to connect the QFX3600 device to a management network. See *Cable Specifications for Console and Management Connections for the QFX Series* for information about the required cables.

> **NOTE**: When an SFP transceiver is inserted into a management port, the corresponding RJ-45 management port (**C0** or **C1**) is disabled. Either RJ-45 or SFP management ports can be used, but not both.

- Chassis serial number label and ESD point

> **NOTE**: The chassis serial number ID label is located on a sliding panel on the top right of the front panel on a QFX3600 device (see Figure 23 on page 51). To use the sliding panel as an ESD point, pull the sliding panel partway out of the chassis, and connect a tape-style ESD grounding strap to the panel.

- Access and uplink ports—The QFX3600 device has sixteen 40-Gbps ports labeled **Q0** through **Q15** that support quad small form-factor pluggable plus (QSFP+) transceivers.

  - If you are using the QFX3600 device as a Node device in a QFabric system, by default, four ports (labeled **Q0** through **Q3**) are configured for uplink connections between your QFX3600 Node device and your Interconnect device, and twelve ports (labeled **Q4** through **Q15**) use QSFP+ direct-attach copper (DAC) breakout cables or QSFP+ transceivers with fiber breakout cables to support 48 10-Gigabit Ethernet interfaces for connections to either endpoint systems (such as servers and storage devices) or external networks. Optionally, you can choose to configure the first eight ports (labeled **Q0** through **Q7**) for uplink connections between your QFX3600 Node device and your Interconnect device and ports **Q2** through **Q15** for 10-Gigabit Ethernet connections to either endpoint systems or external networks. See *Determining Transceiver Support for QFabric Systems*.

  - If you are using the QFX3600 device as a standalone switch, by default, all 16 QSFP+ ports (**Q0** through **Q15**) are configured as 40-Gigabit Ethernet (*xle*) ports. Optionally, you can choose to configure each port to operate as 10-Gigabit Ethernet (*xe*) ports. The number of ports supported is release dependent. See *Configuring the Port Type on QFX3600 Standalone Switches* for your release for more information about configuring the port type. You can use QSFP+ direct-attach copper (DAC) cables, QSFP+ DAC breakout cables, or QSFP+ transceivers. You can use QSFP+ transceivers to create four 10-Gigabit Ethernet ports by using a fiber breakout cable to distribute the interfaces to four 10GBASE-SR SFP+ transceivers. (Juniper Networks does not sell fiber

breakout cables, they must be purchased separately.) See *Determining Interface Support for the QFX3600 Device*.

- Access port and uplink port LEDs

shows the front of a QFX3600 device.

Figure 23: QFX3600 Device Front Panel
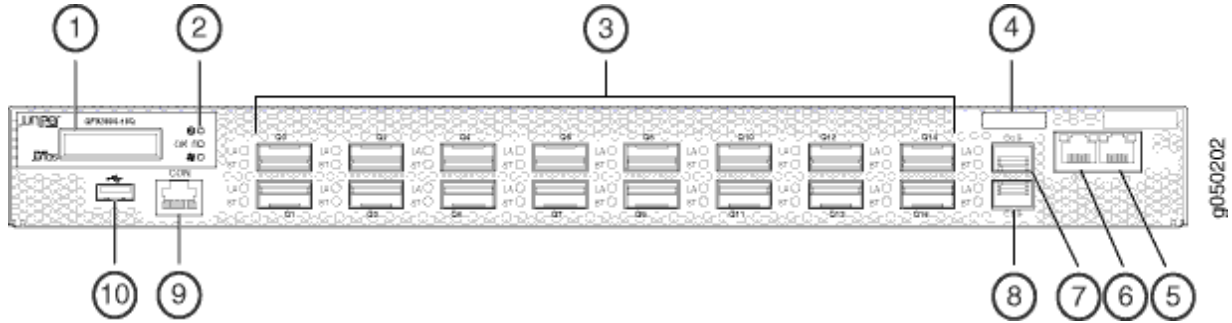
1–	LCD panel	6–	**C0** management port
2–	Chassis status LEDs	7–	**C0S** management port
3–	Access and uplink ports	8–	**C1S** management port
4–	Chassis serial number label and ESD point	9–	Console (**CON**) port
5–	**C1** management port	10–	USB port

RELATED DOCUMENTATION

Field-Replaceable Units for QFX3600 and QFX3600-I Devices

Rear Panel of QFX3600 and QFX3600-I Devices

USB Port Specifications for the QFX Series

Chassis Status LEDs in the QFX3600 and QFX3600-I Device

Access Port and Uplink Port LEDs on a QFX3600 or QFX3600-I Device

Prevention of Electrostatic Discharge Damage

Installing and Removing QFX3600 or QFX3600-I Device Hardware Components

CHAPTER 5

QFX3500 Overview

IN THIS CHAPTER

QFX3500 Device Overview

IN THIS SECTION

The Juniper Networks QFX3500 device is a high-speed, multipurpose switch especially designed for next-generation data centers. The QFX3500 can be configured as a standalone switch, a Node device in a QFabric system, or as a member of a QFX Virtual Chassis.

Forty-eight 10-Gbps access ports in the device use small form-factor pluggable plus (SFP+) transceivers and operate by default as 10-Gigabit Ethernet interfaces. Optionally, you can choose to configure up to 12 of the ports as 2-Gbps, 4-Gbps, or 8-Gbps Fibre Channel (FC) interfaces, and up to 36 of the ports as 1-Gigabit Ethernet interfaces. When used as a standalone switch, four 40-Gbps uplink ports in the device use quad small form-factor pluggable plus (QSFP+) to four SFP+ copper breakout cables to support an additional 15 10-Gigabit Ethernet interfaces.

QFX3500 devices can function as a Fibre Channel over Ethernet (FCoE)-FC gateway or as an FCoE transit switch. FCoE is a method of supporting converged FC and Ethernet traffic on a data center bridging (DCB) network by encapsulating unmodified FC frames in Ethernet to transport the FC frames over the physical Ethernet network.

In a QFabric system, a QFX3500 device functions as a Node device, connected to a QFabric system through 40-Gbps uplink ports to a Juniper Networks QFX3008-I or QFX3600-I Interconnect device.

Together, the QFX3500 Node devices and QFX3008-I or QFX3600-I Interconnect devices form a multistage, nonblocking switch fabric that provides a high-performance, low-latency, unified interconnect solution for next-generation data centers.

The QFX3500 Node devices and Interconnect devices are connected to Juniper Networks QFX3100 Director devices in an out-of-band management network through Juniper Networks EX4200 Ethernet Switches. The QFX3100 Director devices present the QFabric system devices as a single network entity, which enables simplified management of your data center using the Junos OS command-line interface (CLI).

In a QFX Virtual Chassis, the QFX3500 device can participate with other QFX3500 devices and QFX3600 devices in a ring topology with up to 10 members.

In a QFX5100 Virtual Chassis Fabric, the QFX3500 device can participate as a leaf device. Up to a total of 20 devices can participate in the QFX5100 Virtual Chassis Fabric.

Software

QFX Series devices use the Junos operating system (OS), which provides Layer 2 and Layer 3 switching, routing, and security services. Junos OS is installed on the QFX3500 device's 8-gigabyte (GB) internal flash drive. The same Junos OS code base that runs on QFX3500 devices also runs on all Juniper Networks EX Series switches, and J Series, M Series, MX Series, and T Series routers.

For more information about which features are supported on QFX Series devices, see Feature Explorer.

When the QFX3500 device is operating as a standalone switch, you manage the switch using the Junos OS command-line interface (CLI), accessible through the console and out-of-band management ports on the device.

When a QFX Series device operates as part of a QFabric system, all the devices in the data center fabric are managed through the Administrator software installed on the QFX3100 Director devices. Each device in a QFabric system is interconnected in a single control plane and management network, using the redundant management ports on each device.

Hardware

The compact QFX3500 device is 1 rack unit (1 U) in size and designed to fit in industry-standard 19-inch rack-mount enclosures. See Figure 24 on page 54 and Figure 25 on page 54 and *Chassis Physical Specifications for a QFX3500 Chassis*.

NOTE: The standard mounting configuration for the QFX3500 device uses a two rail mounting system. The QFX3500-RB-ACRB device model uses a four rail mounting system for installations that need to recess the switch or need to mount the port (rear) end of the switch forward.

Figure 24: QFX3500 Device Front
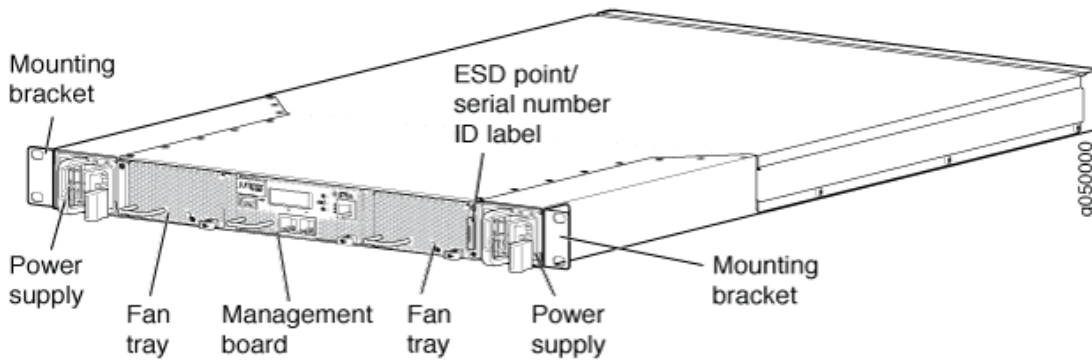
Figure 25: QFX3500 Device Rear
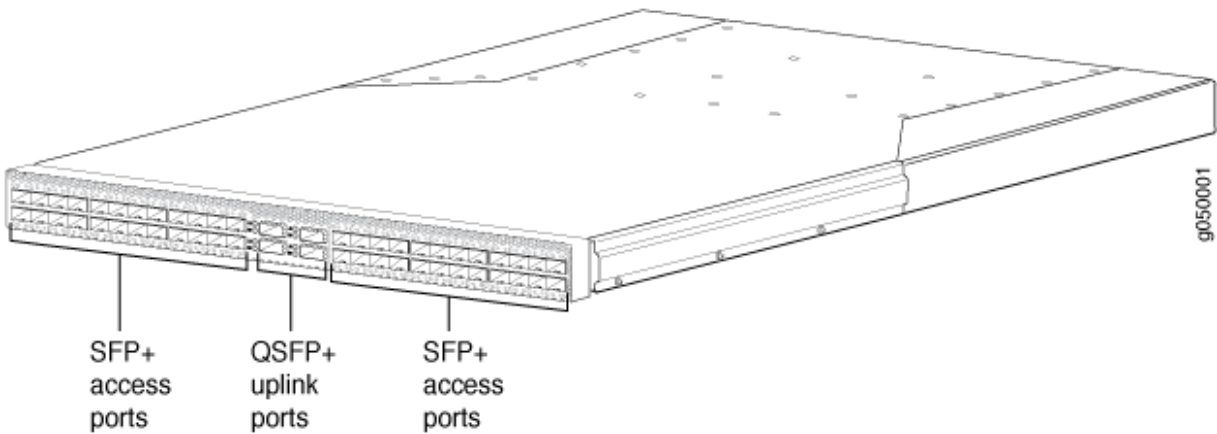
The front panel of the QFX3500 chassis has an LCD panel that displays the device hostname and the number of active alarms. See *Front Panel of a QFX3500 Device*. The rear panel has 48 10-Gbps access ports and 4 40-Gbps uplink ports. See *Rear Panel of a QFX3500 Device*.

SFP+ Access Ports

The QFX3500 device has 48 access ports (**0** through **47**) that support small form-factor pluggable plus (SFP+) and small form-factor pluggable (SFP) transceivers, as well as SFP+ direct attach copper cables, also known as Twinax cables. See *Determining Interface Support for the QFX3500 Device*.

- Up to 48 of the access ports can be used for SFP+ transceivers or SFP+ direct attach copper cables. You can use 10-Gigabit Ethernet SFP+ transceivers and SFP+ direct attach copper cables in any access port. You can use 2-Gbps, 4-Gbps, or 8-Gbps Fibre Channel SFP+ transceivers in ports **0** through **5** and ports **42** through **47**.

  > **NOTE**: If you use Fibre Channel SFP+ transceivers in ports **0** through **5** or ports **42** through **47**, you must configure the entire block of ports as Fibre Channel ports. For example, if you use a Fibre Channel SFP+ transceiver in any of the ports **0** through **5**, then ports **0** through **5** must be configured as Fibre Channel ports. If you use a Fibre Channel SFP+ transceiver in any of the ports **42** through **47**, then ports **42** through **47** must be configured as Fibre Channel ports. You then cannot use 10-Gigabit Ethernet SFP+ transceivers in these ports.

- Up to 36 of the access ports can be used for SFP transceivers. Gigabit Ethernet SFP transceivers can be used in ports **6** through **41**.

  > **CAUTION**: When you use the latest OEM part number FCLF8521P2BTL (printed on the transceiver label), you can install 1GbE transceivers (such as QFX-SFP-1GE-T) in any port with no restrictions. The same applies for devices that support 10GbE copper transceivers. However, if you are using the older OEM part number SP7041-M1-JN (not shipped in last 3+ years) instead, do not install 1GbE copper transceivers (such as QFX-SFP-1GE-T) directly above or below another 1GbE copper transceiver. Use only the top row or bottom row to avoid damage to the device caused when the transceivers are installed above or below each other.

shows the location of the SFP+ access ports, including the ports that can be used with Fibre Channel SFP+ transceivers and Gigabit Ethernet SFP transceivers.

Figure 26: SFP+ Access Port Locations
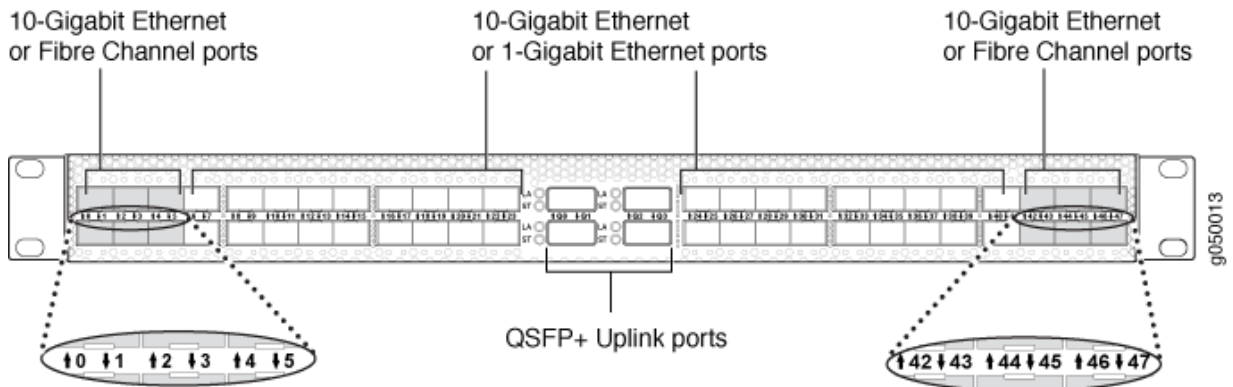
QSFP+ Uplink Ports

The QFX3500 device has four uplink ports (**Q0** through **Q3**) that support up to four QSFP+ transceivers, as well as QSFP+ DAC or DAC breakout cables. See *Determining Interface Support for the QFX3500 Device*.

When the QFX3500 device is used as part of a QFabric system, these uplink ports are used to connect the QFX3500 Node device to QFX3008-I or QFX3600-I Interconnect devices. See *Connecting a QFX3500 Node Device to a QFX3008-I Interconnect Device* or *Connecting a QFX3500 Node Device to a QFX3600-I Interconnect Device*.

When the QFX3500 device is used as a standalone switch, these uplink ports are configured by default as 15 10-Gigabit Ethernet interfaces. Another option for these ports is to configure one or more of the ports as 40-Gigabit Ethernet interfaces.

> **NOTE**: Port **Q0** is unique in that the number of 10-Gigabit Ethernet interfaces supported varies by Junos OS release. In some Junos OS releases, port **00** has a reserved port and in other releases the port is available. See the topics on Channelizing Interfaces or Configuring the Port Type, for your specific release.

shows the location of the QSFP+ uplink ports and the default 10-Gigabit Ethernet interface numbering.

> **NOTE**: The QSFP+ uplink ports are not supported in Junos OS Release 11.1. The QSFP+ uplink ports are supported in Junos OS Release 11.2 and later. To configure the ports as 40-Gigabit Ethernet interfaces, you must be using Junos OS Release 12.2X50-D20 or later.

Figure 27: QSFP+ Uplink Port Locations
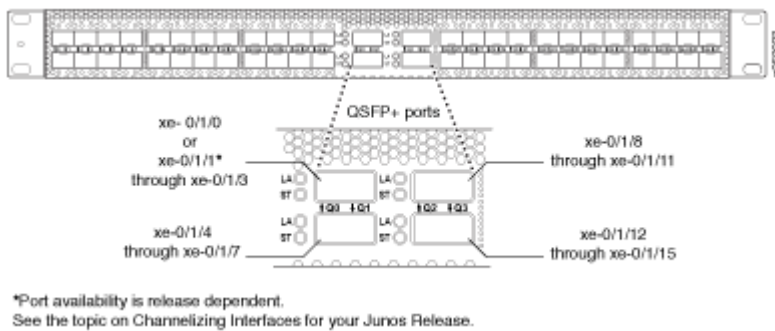
RELATED DOCUMENTATION

Field-Replaceable Units in a QFX3500 Device

Site Preparation Checklist for a QFX3500 Device

Access Port and Uplink Port LEDs on a QFX3500 Device

Installing and Removing QFX3500 Device Hardware Components

Front Panel of a QFX3500 Device

The front panel of the QFX3500 device consists of the following components:

- Management board

- Chassis serial number label and ESD point

> **NOTE**: The chassis serial number ID label is located on a sliding panel to the right of the fan tray on a QFX3500 device (see Figure 29 on page 58). To use the sliding panel as an ESD

point, pull the sliding panel partway out of the chassis, and connect a clip-style or tape-style ESD grounding strap to the panel.

- Fan trays

- Power supplies

and show the front of a QFX3500 device.

Figure 28: QFX3500 Device Front Panel
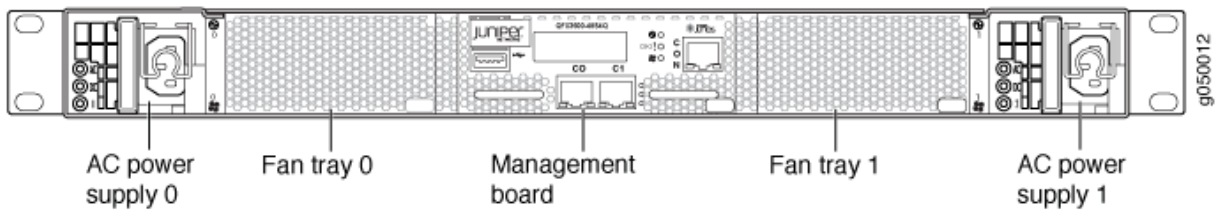
Figure 29: QFX3500 Device Front
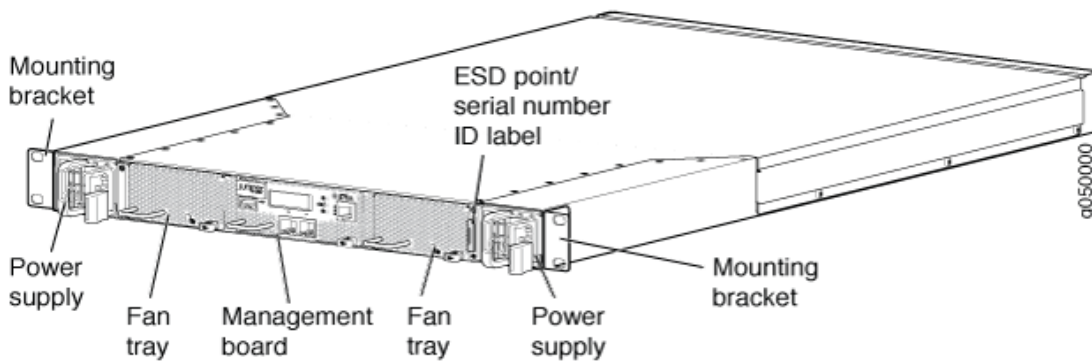
RELATED DOCUMENTATION

Field-Replaceable Units in a QFX3500 Device

Rear Panel of a QFX3500 Device

USB Port Specifications for the QFX Series

Management Board for a QFX3500 Device

Chassis Status LEDs on a QFX3500 Device

Cooling System and Airflow for a QFX3500 Device

AC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

Prevention of Electrostatic Discharge Damage

Installing and Removing QFX3500 Device Hardware Components

CHAPTER 6

EX4300 Overview

IN THIS CHAPTER

EX4300 Switches Hardware Overview

IN THIS SECTION

Juniper Networks EX4300 Ethernet Switches provide connectivity for high-density environments and scalability for growing networks. These switches can be deployed wherever you need high density of Gigabit Ethernet ports or redundancy. Typically, EX4300 switches are used in large branch offices, campus wiring closets, and data centers. In data centers, EX4300 switches can be positioned as top-of-rack switches; the top devices in a rack to provide connectivity for all the devices in the rack and provide options for optimized airflow (hot aisle/cold aisle).

Three variants of the EX4300 switches are available—24-port, 32-port, and 48-port switches, with or without PoE+, with AC or DC power supplies, and with different airflow directions. EX4300 switches also provide uplink ports and a slot for installing an optional uplink module.

You can manage EX4300 switches by using the CLI. You can manage EX4300 switches except the Multigigabit switches EX4300-48MP and EX4300-48MP-S by using the J-Web graphical interface, Junos Space, and Network Director. Starting in Junos OS Release 18.3R1, you can manage EX4300-48MP and EX4300-48MP-S switches by using Junos Space and Network Director also.

This video provides a brief overview of the EX4300-48MP switch:

> **Video:** EX4300-48MP Switch Hardware Overview

Benefits of the EX4300 Switch

Compact solution—The EX4300 switch is a modular single rack unit device that is an apt solution for crowded wiring closets and access switch locations such as data center, campus, and branch office environments. It provides carrier-class reliability of modular systems with the economics and flexibility of stackable platforms.

Support for Virtual Chassis—EX4300 switches support Virtual Chassis technology. You can interconnect up to 10 EX4300 switches to form a Virtual Chassis.

High availability—EX4300 switches provide high availability through redundant power supplies and fans, graceful Routing Engine switchover (GRES), and nonstop bridging and routing when deployed in a Virtual Chassis configuration.

Support for MACsec—EX4300 switches support IEEE 802.1AE MACsec, providing support for link-layer data confidentiality, data integrity, and data origin authentication. The MACsec feature enables EX4300 to support 88 Gbps of near line-rate hardware-based traffic encryption on all Gigabit Ethernet and 10 Gigabit Ethernet ports.

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.

EX4300 Switches First View

EX4300 switches provide connectivity for high-density Gigabit Ethernet data center top-of-rack, enterprise, and campus aggregation/core deployments. EX4300 switches can be used in large branch offices, campus wiring closets, and data centers. In data centers, these switches can be positioned as the top devices in a rack to provide connectivity for all devices in the rack and provide options for optimized airflow (hot aisle/cold aisle).

To provide carrier-class reliability, EX4300 switches include:

- Dual redundant, load-sharing power supplies that are hot-insertable and hot-removable field-replaceable units (FRUs).

- Two fan modules that are field-replaceable units.

- Redundant Routing Engines in a Virtual Chassis or QFX5100 Virtual Chassis Fabric (VCF) configuration. This redundancy enables graceful Routing Engine switchover (GRES).

- Junos OS with its modular design that enables failed system processes to gracefully restart.

The following EX4300 switches are available:

24-Port EX4300 Switches

The 24-port EX4300 switches—EX4300-24T and EX4300-24P—provide 24 built-in 10/100/1000BASE-T Ethernet network ports and four built-in 40-Gigabit Ethernet quad small form-factor pluggable plus (QSFP+) ports that can house 40-Gigabit QSFP+ transceivers. All network ports in the EX4300-24P switch are equipped for Power over Ethernet (PoE+), whereas EX4300-24T has no PoE+ ports. 24-port EX4300 switches support AC power supply and fan module with front-to-back airflow direction and have a slot for installing an optional 4-port 10-Gigabit Ethernet SFP+ uplink module (model number: EX-UM-4X4SFP), which has four 10-Gigabit Ethernet small form-factor pluggable plus (SFP+) ports that can house four 10-gigabit small form-factor pluggable (SFP+) transceivers, four 1-gigabit small form-factor pluggable (SFP) transceivers, or a combination of SFP+ and SFP transceivers in the four ports on the uplink module.

Figure 30 on page 62 shows the front panel of a 24-port EX4300 switch.

Figure 30: Front Panel of a 24-Port EX4300 Switch
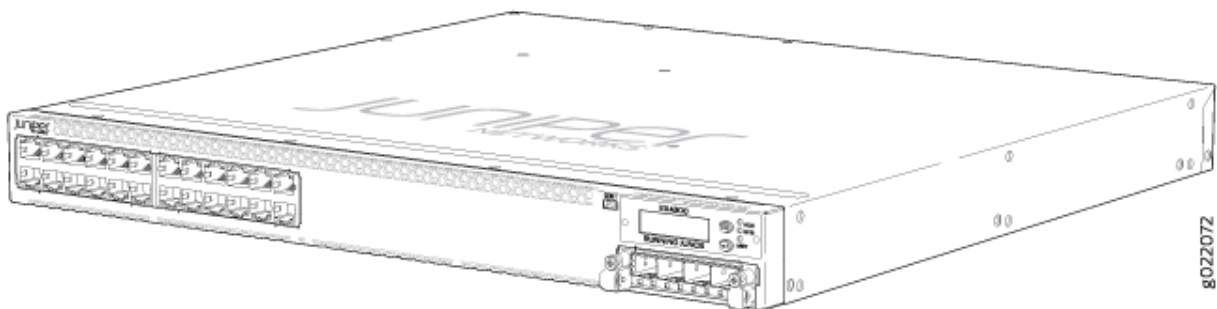
Figure 31 on page 63 shows the rear panel of a 24-port EX4300 switch with power supplies and fan modules installed.

Figure 31: Rear Panel of a 24-Port EX4300 Switch

lists the 24-port EX4300 switch models and their components.

Table 2: Components in 24-Port EX4300 Switches

Switch Models	Built-In Ports	Number of PoE-Enabled Ports	Fan Modules Shipped by Default	Power Supply Shipped by Default	Supported Uplink Module
EX4300-24T	24 10/100/1000BASE-T Ethernet ports and four QSFP+ ports	0	Two fan modules; each with an **AIR OUT (AFO)** label.	A 350 W AC power supply with the **AIR OUT (AFO)** label.	4-port 10-Gigabit Ethernet SFP+ uplink module (model number: EX-UM-4X4SFP)
EX4300-24T-S	24 10/100/1000BASE-T Ethernet ports and four QSFP+ ports	0	Fan modules for this model are not shipped by default; you must order two fan modules labeled either **AIR OUT (AFO)** or **AIR IN (AFI)** separately.	Power supplies for this model are not shipped by default; you must order either AC power supplies or DC power supplies separately.	4-port 10-Gigabit Ethernet SFP+ uplink module (model number: EX-UM-4X4SFP)

Table 2: Components in 24-Port EX4300 Switches *(Continued)*

Switch Models	Built-In Ports	Number of PoE-Enabled Ports	Fan Modules Shipped by Default	Power Supply Shipped by Default	Supported Uplink Module
EX4300-24P	24 10/100/1000BASE-T Ethernet ports and four QSFP+ ports	24	Two fan modules; each with an **AIR OUT (AFO)** label.	A 715 W AC power supply with the **AIR OUT (AFO)** label.	4-port 10-Gigabit Ethernet SFP+ uplink module (model number: EX-UM-4X4SFP)
EX4300-24P-S	24 10/100/1000BASE-T Ethernet ports and four QSFP+ ports	24	Fan modules for this model are not shipped by default; you must order two fan modules labeled either **AIR OUT (AFO)** or **AIR IN (AFI)** separately.	Power supplies for this model are not shipped by default; you must order either AC power supplies or DC power supplies separately.	4-port 10-Gigabit Ethernet SFP+ uplink module (model number: EX-UM-4X4SFP)

You can use the QSFP+ ports as network ports or as Virtual Chassis ports (VCPs) to connect the switch in a Virtual Chassis or a VCF. By default, the built-in QSFP+ ports are configured as VCPs. You can also use the uplink module ports to connect members of a Virtual Chassis or a VCF across multiple wiring closets by configuring the ports as VCPs. For more information about Virtual Chassis, see Understanding EX Series Virtual Chassis. For more information about VCFs, see Virtual Chassis Fabric Overview.

32-Port EX4300 Switches

The 32-port EX4300 switches—EX4300-32F and EX4300-32F-DC—provide 32 built-in 1-Gigabit Ethernet small form-factor pluggable (SFP) network ports that can house SFP transceivers, four built-in 10-Gigabit Ethernet small form-factor pluggable plus (SFP+) ports that can house SFP+ and SFP transceivers, and two built-in quad small form-factor pluggable plus (QSFP+) ports that can house 40-Gigabit QSFP+ transceivers. They support power supply and fan module with front-to-back airflow direction and have a slot for installing an optional uplink module—a 2-port 40-Gigabit Ethernet QSFP+ uplink module (model number: EX-UM-2QSFP) that can house two QSFP+ transceivers or an 8-port 10-

Gigabit Ethernet SFP+ uplink module (model number: EX-UM-8X8SFP) that can house eight SFP+ transceivers, eight SFP transceivers, or a combination of SFP and SFP+ transceivers in the eight ports on the uplink module.

Figure 32 on page 65 shows the front panel of a 32-port EX4300 switch.

Figure 32: Front Panel of a 32-Port EX4300 Switch
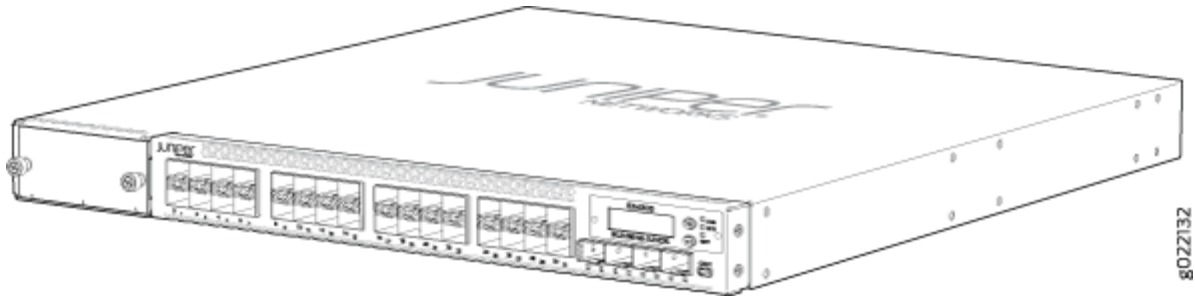
Figure 33 on page 65 shows the rear panel of a 32-port EX4300 switch.

Figure 33: Rear Panel of a 32-Port EX4300 Switch
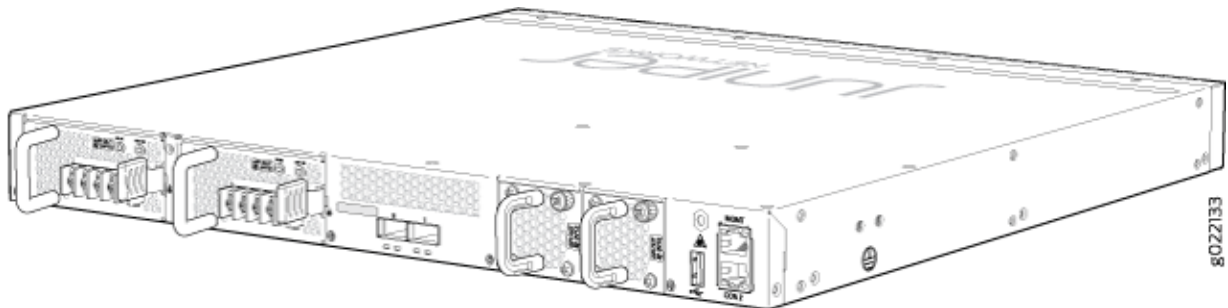
Table 3 on page 66 lists the 32-port EX4300 switch models and their components.

Table 3: Components in 32-Port EX4300 Switches

Switch Models	Built-In Ports	Number of PoE-Enabled Ports	Fan Modules	Power Supply Shipped by Default	Supported Uplink Modules
EX4300-32F	32 SFP ports, four SFP+ ports, and two QSFP+ ports	0	Two fan modules; each with an **AIR OUT (AFO)** label.	A 350 W AC power supply with the **AIR OUT (AFO)** label.	2-port 40-Gigabit Ethernet QSFP+ uplink module (model number: EX-UM-2QSFP) and 8-port 10-Gigabit Ethernet SFP+ uplink module (model number: EX-UM-8X8SFP)
EX4300-32F-S	32 SFP ports, four SFP+ ports, and two QSFP+ ports	0	Fan modules for this model are not shipped by default; you must order two fan modules labeled either **AIR OUT (AFO)** or **AIR IN (AFI)** separately.	Power supplies for this model are not shipped by default; you must order either AC power supplies or DC power supplies separately.	2-port 40-Gigabit Ethernet QSFP+ uplink module (model number: EX-UM-2QSFP) and 8-port 10-Gigabit Ethernet SFP+ uplink module (model number: EX-UM-8X8SFP)
EX4300-32F-DC	32 SFP ports, four SFP+ ports, and two QSFP+ ports	0	Two fan modules; each with an **AIR OUT (AFO)** label.	A 550 W DC power supply with the **AIR OUT (AFO)** label.	2-port 40-Gigabit Ethernet QSFP+ uplink module(model number: EX-UM-2QSFP) and 8-port 10-Gigabit Ethernet SFP+ uplink module (model number: EX-UM-8X8SFP)

You can use the built-in QSFP+ ports as network ports or as VCPs to connect the switch in a Virtual Chassis or a VCF. By default, the built-in QSFP+ ports are configured as VCPs. You can also use the uplink module ports to connect members of a Virtual Chassis or a VCF across multiple wiring closets by configuring these ports as VCPs. For more information about Virtual Chassis, see Understanding EX Series Virtual Chassis. For more information about VCFs, see Virtual Chassis Fabric Overview.

48-Port EX4300 Switches

The 48-port EX4300 switches EX4300-48T and EX4300-48P provide 48 built-in 10/100/1000BASE-T Ethernet network ports, with or without PoE+ depending on the switch model, and four built-in quad small form-factor pluggable plus (QSFP+) ports that can house 40-Gigabit QSFP+ transceivers. All network ports in the EX4300-48P switch are equipped for Power over Ethernet (PoE+), whereas EX4300-48T has no PoE+ ports. These switches support AC or DC power supply with different airflow directions. Each switch provides a slot for installing an optional 4-port 10-Gigabit Ethernet SFP+ uplink module (model number: EX-UM-4X4SFP), which has four SFP+ ports that can house four SFP+ transceivers, four SFP transceivers, or a combination of SFP and SFP+ transceivers in the four ports on the uplink module.

The 48-port EX4300 switches with multigigabit ports—EX4300-48MP and EX4300-48MP-S—provide 24 built-in 10/100/1000BASE-T Ethernet network ports, 24 built-in 100/1000/2500/5000/10000BASE-T Ethernet network ports, and four built-in Virtual Chassis Ports (VCPs) that house 40-Gbps quad small form-factor plus (QSFP+) transceivers. The 24 built-in 10/100/1000BASE-T Ethernet network ports support 10 Mbps, 100 Mbps, and 1 Gbps speeds. The 24 built-in 100/1000/2500/5000/10000BASE-T Ethernet network ports support 100 Mbps, 1 Gbps, 2.5 Gbps, 5 Gbps, and 10 Gbps speeds. All network ports are equipped for PoE+ and provide up to 95 watts of power. The four VCPs can be used to connect the switches to other devices in a Virtual Chassis configuration.

These switches support AC power supply with front-to-back airflow.

Each switch provides a slot for installing an optional 2-port 40-Gigabit Ethernet QSFP+/100-Gigabit Ethernet QSFP28 uplink module (model number: EX-UM-2QSFP-MR) or a 4-port 1-Gigabit Ethernet/10-Gigabit Ethernet SFP+ uplink module (model number: EX-UM-4SFPP-MR). The 2-port 40-Gigabit Ethernet QSFP+/100-Gigabit Ethernet QSFP28 uplink module can house two QSFP+ transceivers, two QSFP28 transceivers, or a combination of one QSFP+ transceiver and one QSFP28 transceiver. The 4-port 1-Gigabit Ethernet/10-Gigabit Ethernet SFP+ uplink module can house four SFP transceivers, four SFP+ transceivers, or a combination of SFP and SFP+ transceivers in the four ports on the uplink module.

> **NOTE**: The switch supports the 2-port 40-Gigabit Ethernet QSFP+/100-Gigabit Ethernet QSFP28 uplink module (model number: EX-UM-2QSFP-MR) from Junos OS Release 18.4R1 onwards. Starting in Junos OS Release 19.3R1, you can install two 100-Gigabit Ethernet QSFP28 transceivers in the uplink module. In Junos OS Release 18.4R1 through Junos OS Release 19.2R1, the uplink module supported only one 100-Gigabit Ethernet transceiver. If you configure both the ports on the uplink module to operate at 100-Gbps speed, the four QSFP+ ports on the switch are disabled.

> The switch supports the 4-port 1-Gigabit Ethernet/10-Gigabit Ethernet SFP+ uplink module (model number: EX-UM-4SFPP-MR) from Junos OS Release 18.2R1 onwards. Starting in Junos OS Release 19.1R1, you can install SFP transceivers in the uplink module. In Junos OS Release 18.2R1 through Junos OS Release 18.4R1, the uplink module supported only SFP+ transceivers.

Figure 34 on page 68 shows the front panel of 48 port EX4300 switches except EX4300-48MP and EX4300-48MP-S switches. Figure 35 on page 68 shows the front panel of EX4300-48MP and EX4300-48MP-S switches.

Figure 34: Front Panel of 48-Port EX4300 Switches Except EX4300-48MP and EX4300-48MP-S Switches
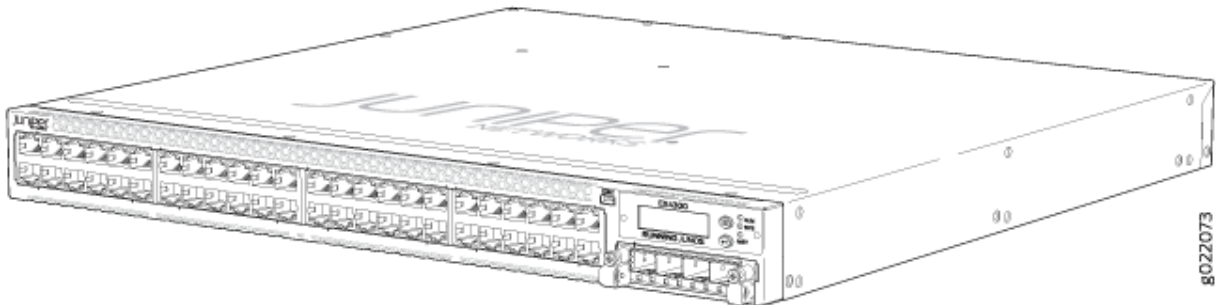
Figure 35: Front Panel of EX4300-48MP and EX4300-48MP-S Switches
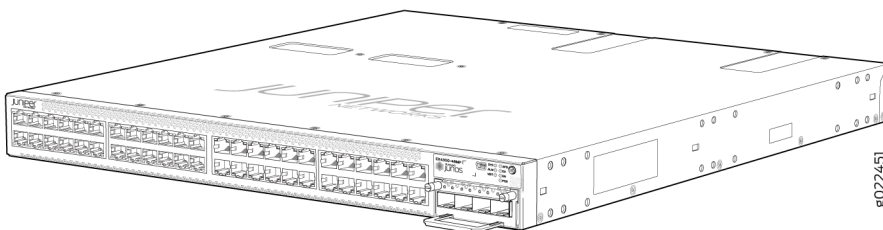
Figure 36 on page 69 shows the rear panel of 48-port EX4300 switches except EX4300-48MP and EX4300-48MP-S switches, with power supplies and fan modules installed. Figure 37 on page 69 shows the rear panel of EX4300-48MP and EX4300-48MP-S switches, with power supplies and fan modules installed.

Figure 36: Rear Panel of 48-Port EX4300 Switches Except EX4300-48MP and EX4300-48MP-S Switches
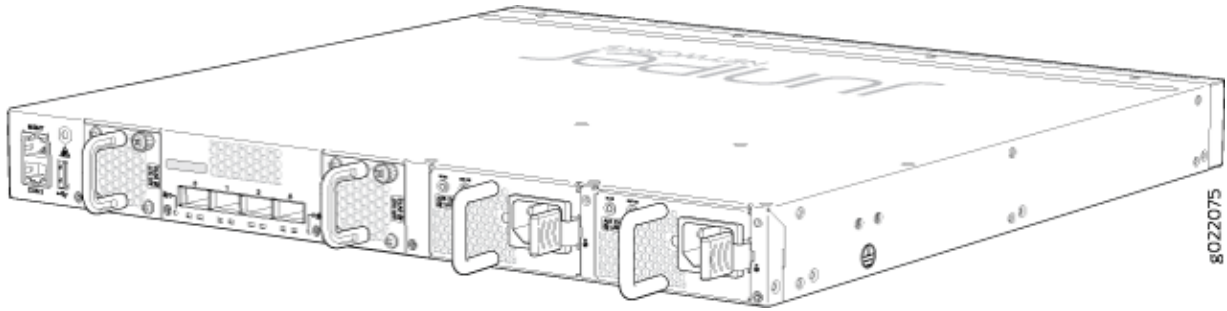
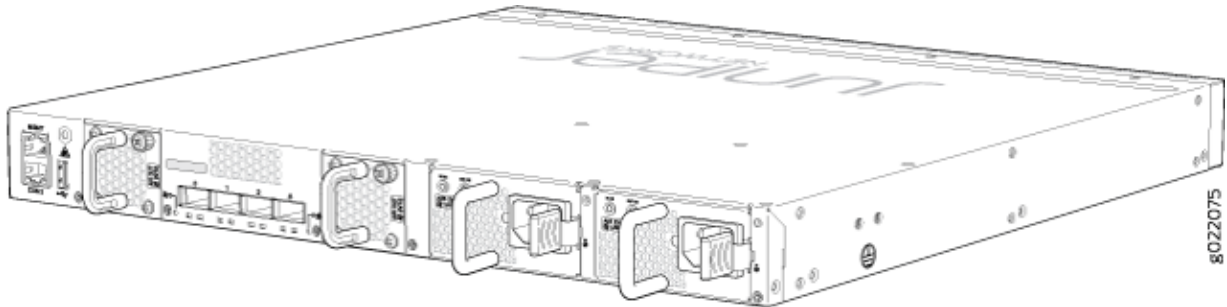
Figure 37: Rear Panel of EX4300-48MP and EX4300-48MP-S Switches
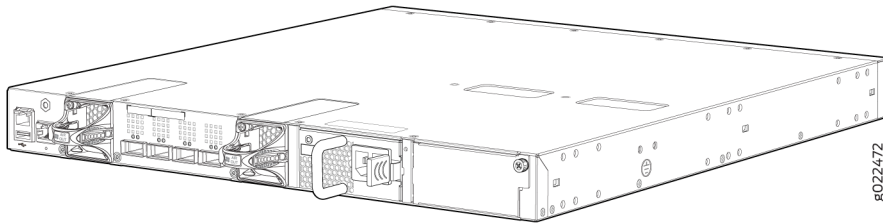
lists the 48-port EX4300 switch models and their components.

Table 4: Components in 48-Port EX4300 Switches

Switch Models	Built-In Ports	Number of PoE-enabled Ports	Fan Modules	Power Supply Shipped by Default	Supported Uplink Modules
EX4300-48T	48 10/100/1000BASE-T Ethernet ports and four QSFP+ ports	0	Two fan modules; each with an **AIR OUT (AFO)** label.	A 350 W AC power supply with the **AIR OUT (AFO)** label.	4-port 10-Gigabit Ethernet SFP+ uplink module (model number: EX-UM-4X4SFP)

Table 4: Components in 48-Port EX4300 Switches *(Continued)*

Switch Models	Built-In Ports	Number of PoE-enabled Ports	Fan Modules	Power Supply Shipped by Default	Supported Uplink Modules
EX4300-48T-S	48 10/100/1000BASE-T Ethernet ports and four QSFP+ ports	0	Fan modules for this model are not shipped by default; you must order two fan modules labeled either **AIR OUT (AFO)** or **AIR IN (AFI)** separately	Power supplies for this model are not shipped by default; you must order either AC power supplies or DC power supplies separately.	4-port 10-Gigabit Ethernet SFP+ uplink module (model number: EX-UM-4X4SFP)
EX4300-48T-AFI	48 10/100/1000BASE-T Ethernet ports and four QSFP+ ports	0	Two fan modules; each with an **AIR IN (AFI)** label.	A 350 W AC power supply with the **AIR IN (AFI)** label.	4-port 10-Gigabit Ethernet SFP+ uplink module (model number: EX-UM-4X4SFP)
EX4300-48T-DC	48 10/100/1000BASE-T Ethernet ports and four QSFP+ ports	0	Two fan modules; each with an **AIR OUT (AFO)** label.	A 550 W DC power supply with the **AIR OUT (AFO)** label.	4-port 10-Gigabit Ethernet SFP+ uplink module (model number: EX-UM-4X4SFP)
EX4300-48T-DC-AFI	48 10/100/1000BASE-T Ethernet ports and four QSFP+ ports	0	Two fan modules; each with an **AIR IN (AFI)** label.	A 550 W DC power supply with the **AIR IN (AFI)** label.	4-port 10-Gigabit Ethernet SFP+ uplink module (model number: EX-UM-4X4SFP)
EX4300-48P	48 10/100/1000BASE-T Ethernet ports and four QSFP+ ports	48	Two fan modules; each with an **AIR OUT (AFO)** label.	A 1100 W AC power supply with the **AIR OUT (AFO)** label.	4-port 10-Gigabit Ethernet SFP+ uplink module (model number: EX-UM-4X4SFP)

Table 4: Components in 48-Port EX4300 Switches *(Continued)*

Switch Models	Built-In Ports	Number of PoE-enabled Ports	Fan Modules	Power Supply Shipped by Default	Supported Uplink Modules
EX4300-48P-S	48 10/100/1000BASE-T Ethernet ports and four QSFP+ ports	48	Fan modules for this model are not shipped by default; you must order two fan modules labeled either **AIR OUT (AFO)** or **AIR IN (AFI)** separately	Power supplies for this model are not shipped by default; you must order either AC power supplies or DC power supplies separately.	4-port 10-Gigabit Ethernet SFP+ uplink module (model number: EX-UM-4X4SFP)

Table 4: Components in 48-Port EX4300 Switches *(Continued)*

Switch Models	Built-In Ports	Number of PoE-enabled Ports	Fan Modules	Power Supply Shipped by Default	Supported Uplink Modules
EX4300-48MP	24 10/100/1000BASE-T Ethernet network ports, 24 100/1000/ 2500/5000/ 10000BASE-T Ethernet network ports, and four built-in QSFP+ ports that can house 40-Gigabit QSFP+ transceivers	48	Two fan modules; each with an **AIR OUT (AFO)** label.	A 1400 W AC power supply with the **AIR OUT (AFO)** label.	2-port 40-Gigabit Ethernet QSFP+/ 100-Gigabit Ethernet QSFP28 uplink module (model number: EX-UM-2QSFP-MR) or 4-port 1-Gigabit Ethernet/ 10-Gigabit Ethernet SFP+ uplink module (model number: EX-UM-4SFPP-MR) **NOTE**: The switch supports the 2-port 40-Gigabit Ethernet QSFP+/ 100-Gigabit Ethernet QSFP28 uplink module (model number: EX-UM-2QSFP-MR) from Junos OS Release 18.4R1 onwards. Starting in Junos OS Release 19.3R1, you can install two 100-Gigabit Ethernet QSFP28 transceivers in the uplink module. In Junos OS Release 18.4R1 through

Table 4: Components in 48-Port EX4300 Switches *(Continued)*

Switch Models	Built-In Ports	Number of PoE-enabled Ports	Fan Modules	Power Supply Shipped by Default	Supported Uplink Modules
					Junos OS Release 19.2R1, the uplink module supported only one 100-Gigabit Ethernet transceiver. If you configure both the ports on the uplink module to operate at 100-Gbps speed, the four QSFP+ ports on the switch are disabled. The switch supports the 4-port 1-Gigabit Ethernet/10-Gigabit Ethernet SFP+ uplink module (model number: EX-UM-4SFPP-MR) from Junos OS Release 18.2R1 onwards. Starting in Junos OS Release 19.1R1, you can install SFP transceivers in the uplink module. In Junos OS Release 18.2R1 through Junos OS Release 18.4R1, the uplink module supported only SFP+ transceivers.

Table 4: Components in 48-Port EX4300 Switches *(Continued)*

| Switch Models	Built-In Ports	Number of PoE-enabled Ports	Fan Modules	Power Supply Shipped by Default	Supported Uplink Modules
EX4300-48MP-S	24 10/100/1000BASE-T Ethernet network ports, 24 100/1000/2500/5000/10000BASE-T Ethernet network ports, and four built-in QSFP+ ports that can house 40-Gigabit QSFP+ transceivers	48	Fan modules for this model are not shipped by default; you must order two fan modules labeled **AIR OUT (AFO)** separately.	Power supplies for this model are not shipped by default; you must order AC power supplies separately.	2-port 40-Gigabit Ethernet QSFP+/100-Gigabit Ethernet QSFP28 uplink module (model number: EX-UM-2QSFP-MR) or 4-port 1-Gigabit Ethernet/10-Gigabit Ethernet SFP+ uplink module (model number: EX-UM-4SFPP-MR) **NOTE**: The switch supports the 2-port 40-Gigabit Ethernet QSFP+/100-Gigabit Ethernet QSFP28 uplink module (model number: EX-UM-2QSFP-MR) from Junos OS Release 18.4R1 onwards. Starting in Junos OS Release 19.3R1, you can install two 100-Gigabit Ethernet QSFP28 transceivers in the uplink module. In Junos OS Release 18.4R1 through Junos OS Release

Table 4: Components in 48-Port EX4300 Switches *(Continued)*

Switch Models	Built-In Ports	Number of PoE-enabled Ports	Fan Modules	Power Supply Shipped by Default	Supported Uplink Modules
					19.2R1, the uplink module supported only one 100-Gigabit Ethernet transceiver. If you configure both the ports on the uplink module to operate at 100-Gbps speed, the four QSFP+ ports on the switch are disabled. The switch supports the 4-port 1-Gigabit Ethernet/10-Gigabit Ethernet SFP+ uplink module (model number: EX-UM-4SFPP-MR) from Junos OS Release 18.2R1 onwards. Starting in Junos OS Release 19.1R1, you can install SFP transceivers in the uplink module. In Junos OS Release 18.2R1 through Junos OS Release 18.4R1, the uplink module supported only SFP+ transceivers.

By default, the built-in QSFP+ ports are dedicated VCPs. In 48-port EX4300 switches except EX4300-48MP and EX4300-48MP-S switches, you can use the QSFP+ ports as network ports or as VCPs. You can also use the SFP+ uplink module ports to connect members of a Virtual Chassis or a VCF across multiple wiring closets by configuring these ports as VCPs.

In EX4300-48MP and EX4300-48MP-S switches, you can use only the built-in QSFP+ ports as VCPs to connect the switch in a Virtual Chassis. You cannot configure the ports on the uplink module in EX4300-48MP and EX4300-48MP-S switches to Virtual Chassis ports (VCPs). You cannot configure the built-in QSFP+ ports as network ports.

> **NOTE**: EX4300-48MP switches can be a part of an EX4300 Virtual Chassis with other EX4300 switches only. If you want to create a Virtual Chassis comprising EX4300-48MP switch and other EX4300 switches, you must connect it to a 40-Gbps port on the other EX4300 switches in the Virtual Chassis configuration. In a Virtual Chassis configuration comprising EX4300-48MP switches, EX4300 switches can be configured only in the line card role.

For more information about Virtual Chassis, see Understanding EX Series Virtual Chassis. For more information about VCFs, see Virtual Chassis Fabric Overview.

Uplink Modules

EX4300 switches provide one slot for installing an optional uplink module. You can use the uplink module ports to connect the switch to other devices. You can also configure these ports on EX4300 switches except EX4300-48MP and EX4300-48MP-S switches as VCPs and use them to interconnect EX4300 switches to form a Virtual Chassis or a VCF configuration by using SFP+ transceivers.

> **NOTE**: You cannot configure the ports on the uplink module in EX4300-48MP and EX4300-48MP-S switches as Virtual Chassis ports (VCPs).

Table 5 on page 77 lists the uplink modules supported on 24-port and 48-port EX4300 switches except EX4300-48MP and EX4300-48MP-S switches. Table 6 on page 77 lists the uplink modules supported on 32-port EX4300 switch models. Table 7 on page 78 lists the uplink module supported on EX4300-48MP and EX4300-48MP-S switches.

Table 5: Uplink Modules for 24-Port and 48-Port EX4300 Switches Except EX4300-48MP and EX4300-48MP-S Switches

Uplink Module	Description	Supported EX4300 Switch Models	First Junos OS Release
4-port 1-Gigabit Ethernet/ 10-Gigabit Ethernet SFP+ uplink module (model number: EX-UM-4X4SFP)	The 4-port 1-Gigabit Ethernet/ 10-Gigabit Ethernet SFP+ uplink module can house up to four SFP transceivers, SFP+ transceivers, or a combination of SFP and SFP+ transceivers. You can also configure ports on this module as VCPs and use them to connect the switch in a Virtual Chassis or a VCF configuration by using SFP+ transceivers.	- EX4300-24T - EX4300-24P - EX4300-48T - EX4300-48T-AFI - EX4300-48P - EX4300-48T-DC - EX4300-48T-DC-AFI	13.2X50-D10
		- EX4300-24T-S - EX4300-24P-S - EX4300-48T-S - EX4300-48P-S	13.2X51-D26

Table 6: Uplink Modules for 32-Port EX4300 Switches

Uplink Module	Description	Supported EX4300 Switch Models	First Junos OS Release
2-port 40-Gigabit Ethernet QSFP+ uplink module (model number: EX-UM-2QSFP)	The 2-port 40-Gigabit Ethernet QSFP+ uplink module can house up to two QSFP+ transceivers. You can also configure the ports on this module as VCPs and use them to connect the switch in a Virtual Chassis or a VCF configuration.	- EX4300-32F - EX4300-32F-DC	13.2X51-D15
		EX4300-32F-S	13.2X51-D26

Table 6: Uplink Modules for 32-Port EX4300 Switches *(Continued)*

Uplink Module	Description	Supported EX4300 Switch Models	First Junos OS Release
8-port 1-Gigabit Ethernet/ 10-Gigabit Ethernet SFP+ uplink module (model number: EX-UM-8X8SFP)	The 8-port 1-Gigabit Ethernet/ 10-Gigabit Ethernet SFP+ uplink module can house up to eight SFP transceivers, SFP+ transceivers, or a combination of SFP and SFP+ transceivers. You can also configure the ports on this module as VCPs and use them to connect the switch in a Virtual Chassis or a VCF configuration by using SFP+ transceivers.	• EX4300-32F • EX4300-32F-DC	13.2X51-D15
		• EX4300-32F-S	13.2X51-D26

Table 7: Uplink Modules for EX4300-48MP and EX4300-48MP-S Switches

Uplink Module	Description	Supported EX4300 Switch Models	First Junos OS Release
2-port 40-Gigabit Ethernet QSFP+/100-Gigabit Ethernet QSFP28 uplink module (model number: EX-UM-2QSFP-MR)	You can install two QSFP+ transceivers, two QSFP28 transceivers, or a combination of one QSFP+ transceiver and one QSFP28 transceiver in this uplink module. **NOTE**: You cannot configure the ports on the uplink module in EX4300-48MP and EX4300-48MP-S switches as Virtual Chassis ports (VCPs).	• EX4300-48MP • EX4300-48MP-S	18.4R1 **NOTE**: Starting in Junos OS Release 19.3R1, you can install two 100-Gigabit Ethernet QSFP28 transceivers in the uplink module. In Junos OS Release 18.4R1 through Junos OS Release 19.2R1, the uplink module supported only one 100-Gigabit Ethernet transceiver. If you configure both the ports on the uplink module to operate at 100-Gbps speed, the four QSFP+ ports on the switch are disabled.

Table 7: Uplink Modules for EX4300-48MP and EX4300-48MP-S Switches *(Continued)*

Uplink Module	Description	Supported EX4300 Switch Models	First Junos OS Release
4-port 1-Gigabit Ethernet/ 10-Gigabit Ethernet SFP+ uplink module (model number: EX-UM-4SFPP-MR)	You can install four SFP transceivers, four SFP+ transceivers, or a combination of SFP and SFP+ transceivers in the four ports of this uplink module. **NOTE**: You cannot configure the ports on the uplink module in EX4300-48MP and EX4300-48MP-S switches as Virtual Chassis ports (VCPs).	• EX4300-48MP • EX4300-48MP-S	18.2R1 **NOTE**: Starting in Junos OS Release 19.1R1, you can install SFP transceivers in the uplink module. In Junos OS Release 18.2R1 through Junos OS Release 18.4R1, the uplink module supported only SFP+ transceivers.

For more information about uplink modules, see *Uplink Modules in EX4300 Switches*.

Virtual Chassis

You can interconnect a maximum of 10 EX4300 switches to form a Virtual Chassis. You can operate these interconnected switches as a single, logical device with a single IP address.

You can use the following ports to configure an EX4300 switch in a Virtual Chassis:

* For 24-port and 48-port EX4300 switches except EX4300-48MP and EX4300-48MP-S switches:

  * QSFP+ ports configured as VCPs

  * SFP+ uplink module ports configured as VCPs

* For 32-port EX4300 switches:

  * QSFP+ ports (built-in) or QSFP+ uplink module ports configured as VCPs

  * SFP+ uplink module ports configured as VCPs

  > **NOTE**: The four built-in SFP+ ports on 32-port EX4300 switches cannot be configured as VCPs.

- For EX4300-48MP and EX4300-48MP-S switches:

  - QSFP+ ports

  By default, the built-in QSFP+ ports are dedicated VCPs. In 48-port EX4300 switches except EX4300-48MP and EX4300-48MP-S switches, you can use the QSFP+ ports as network ports or as VCPs. You can also use the SFP+ uplink module ports to connect members of a Virtual Chassis or a VCF across multiple wiring closets by configuring these ports as VCPs.

  In EX4300-48MP and EX4300-48MP-S switches, you can use only the built-in QSFP+ ports as VCPs to connect the switch in a Virtual Chassis. You cannot configure the ports on the uplink module in EX4300-48MP and EX4300-48MP-S switches to Virtual Chassis ports (VCPs). You cannot configure the built-in QSFP+ ports as network ports.

  > **NOTE**: EX4300-48MP switches can be a part of an EX4300 Virtual Chassis with other EX4300 switches only. If you want to create a Virtual Chassis comprising EX4300-48MP switch and other EX4300 switches, you must connect it to a 40-Gbps port on the other EX4300 switches in the Virtual Chassis configuration. In a Virtual Chassis configuration comprising EX4300-48MP switches, EX4300 switches can be configured only in the line card role.

For more information about Virtual Chassis, see Understanding EX Series Virtual Chassis. For more information about VCFs, see Virtual Chassis Fabric Overview.

Power Supplies

EX4300 switches except EX4300-48MP and EX4300-48MP-S switches support AC or DC power supplies with different airflow directions. EX4300-48MP and EX4300-48MP-S switches support only AC power supplies with front-to-back airflow. Power supplies for the EX4300 switch are fully redundant, load-sharing, and hot-removable and hot-insertable FRUs. All the EX4300 switch models except EX4300-24T-S, EX4300-24P-S, EX4300-32F-S, EX4300-48T-S, EX4300-48P-S, and EX4300-48MP-S switches are shipped with one power supply preinstalled in the rear panel of the switches. EX4300-24T-S, EX4300-24P-S, EX4300-32F-S, EX4300-48T-S, EX4300-48P-S, and EX4300-48MP-S switches are not shipped with preinstalled power supplies; you must order the power supplies separately.

Each power supply has a label—**AIR IN (AFI)** or **AIR OUT (AFO)**—on the faceplate of the power supply that indicates the direction of airflow. **AIR IN (AFI)** labels indicate back-to-front airflow while **AIR OUT (AFO)** labels indicate front-to-back airflow.

Table 8 on page 81 lists the AC and DC power supplies used in EX4300 switches and the direction of airflow in them.

Table 8: Airflow Direction in Power Supplies for EX4300 Switches

Power Supply Rating	Label on Power Supply	Direction of Airflow
350 W AC	**AIR IN (AFI)**	Back-to-front—that is, air intake to cool the chassis is through the vents on the rear panel of the chassis and hot air exhausts through the vents on the front panel of the chassis.
350 W AC	**AIR OUT (AFO)**	Front-to-back—that is, air intake to cool the chassis is through the vents on the front panel of the chassis and hot air exhausts through the vents on the rear panel of the chassis.
550 W DC	**AIR IN (AFI)**	Back-to-front—that is, air intake to cool the chassis is through the vents on the rear panel of the chassis and hot air exhausts through the vents on the front panel of the chassis.
550 W DC	**AIR OUT (AFO)**	Front-to-back—that is, air intake to cool the chassis is through the vents on the front panel of the chassis and hot air exhausts through the vents on the rear panel of the chassis.
715 W AC	**AIR OUT (AFO)**	Front-to-back—that is, air intake to cool the chassis is through the vents on the front panel of the chassis and hot air exhausts through the vents on the rear panel of the chassis.
1100 W AC	**AIR OUT (AFO)**	Front-to-back—that is, air intake to cool the chassis is through the vents on the front panel of the chassis and hot air exhausts through the vents on the rear panel of the chassis.

Table 8: Airflow Direction in Power Supplies for EX4300 Switches *(Continued)*

Power Supply Rating	Label on Power Supply	Direction of Airflow
1400 W AC **NOTE**: Only EX4300-48MP and EX4300-48MP-S switches support 1400 W AC power supply.	**AIR OUT (AFO)**	Front-to-back—that is, air intake to cool the chassis is through the vents on the front panel of the chassis and hot air exhausts through the vents on the rear panel of the chassis.

For more information, see *Cooling System and Airflow in an EX4300 Switch*.

> ⚠️ **CAUTION**: Do not mix:
>
> - AC and DC power supplies in the same chassis.
>
> - Power supplies with different airflow labels (**AIR IN (AFI)** and **AIR OUT (AFO)**) in the same chassis.
>
> - Fan modules with different airflow labels (**AIR IN (AFI)** and **AIR OUT (AFO)**) in the same chassis.
>
> - Power supplies and fan modules with different airflow labels (**AIR IN (AFI)** and **AIR OUT (AFO)**) in the same chassis.

Fan Modules

In the EX4300 switches the fan modules are hot-insertable and hot-removable field-replaceable units (FRUs).

All the EX4300 switch models, except EX4300-24T-S, EX4300-24P-S, EX4300-32F-S, EX4300-48T-S, EX4300-48P-S, and EX4300-48MP-S switches are shipped with two fan modules preinstalled in the rear panel of the switch. EX4300-24T-S, EX4300-24P-S, EX4300-32F-S, EX4300-48T-S, EX4300-48P-S, and EX4300-48MP-S switches are not shipped with preinstalled fan modules; you must order the fan modules separately.

The fan modules are available in two models that have different airflow directions—back-to-front airflow, indicated by the label **AIR IN (AFI)** and front-to-back airflow, indicated by the label **AIR OUT (AFO)**. See *Cooling System and Airflow in an EX4300 Switch*.

> **CAUTION**: Do not mix:
>
> - Fan modules with different airflow labels (**AIR IN (AFI)** and **AIR OUT (AFO)**) in the same chassis.
>
> - Power supplies with different airflow labels (**AIR IN (AFI)** and **AIR OUT (AFO)**) in the same chassis.
>
> - Fan modules and power supplies with different airflow labels (**AIR IN (AFI)** and **AIR OUT (AFO)**) in the same chassis.
>
> - AC and DC power supplies in the same chassis.

EX4300 Switch Components

Figure 38 on page 83 shows the components on the front panel of a 24-port EX4300 switch (with an SFP+ uplink module installed).

Figure 38: Components on the Front Panel of a 24-Port EX4300 Switch
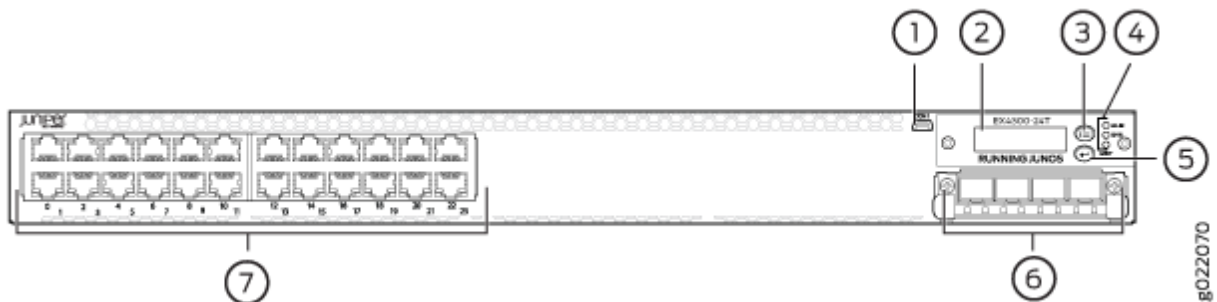
1—	Mini-USB console port	5—	LCD panel Enter button
2—	LCD panel	6—	SFP+ uplink module (optional)
3—	LCD panel Menu button	7—	Network ports
4—	Chassis status LEDs		

Figure 39 on page 84 shows the components on the front panel of a 32-port EX4300 switch.

Figure 39: Components on the Front Panel of a 32-Port EX4300 Switch
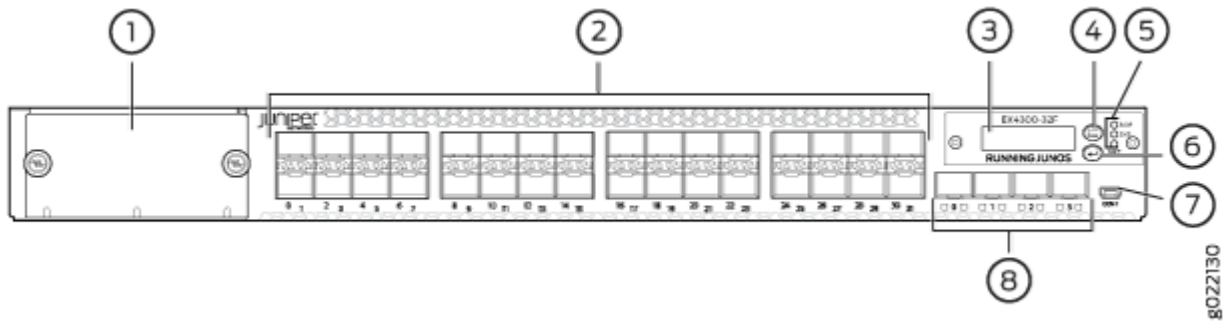
1—	Cover panel for uplink module slot	5—	Chassis status LEDs
2—	SFP network ports	6—	LCD panel Enter button
3—	LCD panel	7—	Mini-USB console port
4—	LCD panel Menu button	8—	SFP+ uplink ports

Figure 40 on page 84 shows the components on the front panel of a 48-port EX4300 switches except EX4300-48MP and EX4300-48MP-S switches (with an SFP+ uplink module installed).

Figure 40: Components on the Front Panel of 48-Port EX4300 Switches Except EX4300-48MP and EX4300-48MP-S Switches
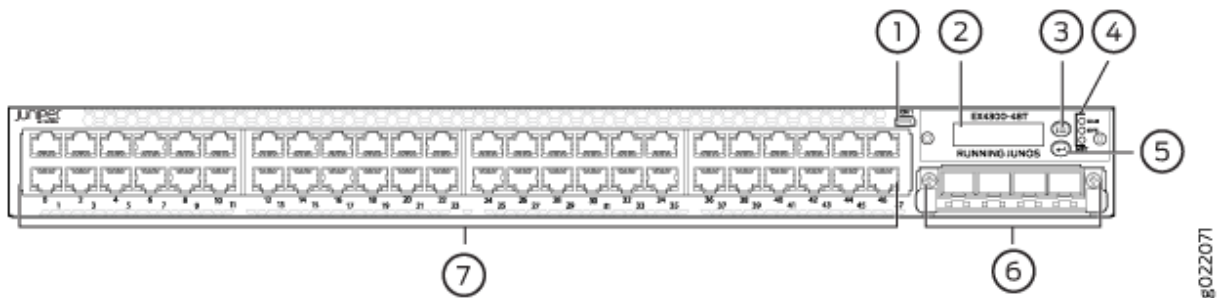
1—	Mini-USB console port	5—	LCD panel Enter button
2—	LCD panel	6—	SFP+ uplink module (optional)
3—	LCD panel Menu button	7—	Network ports
4—	Chassis status LEDs		

Figure 41 on page 85 shows the components on the front panel of EX4300-48MP and EX4300-48MP-S switches (with a 4-port 1-Gigabit Ethernet SFP/10-Gigabit Ethernet SFP+ uplink module installed).

Figure 41: Components on the Front Panel of EX4300-48MP and EX4300-48MP-S Switches
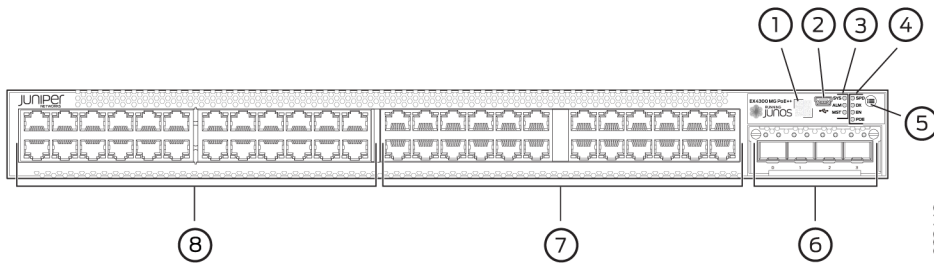
1– QR code	5– Factory Reset/Mode button
2– Mini-USB console port	6– 4-port 1-Gigabit Ethernet SFP/10-Gigabit Ethernet SFP+ uplink module (optional)
3– Chassis status LEDs	7– 100/1000/2500/5000/10000 Ethernet Network Ports
4– Port status mode LEDs	8– 10/100/1000BASE-T Ethernet Network Ports

Figure 42 on page 85 shows the components on the rear panel of a 24-port and 48-port EX4300 switch except EX4300-48MP and EX4300-48MP-S switches (with two AC power supplies and two fan modules installed).

Figure 42: Components on the Rear Panel of a 24-Port and 48-Port EX4300 Switch Except EX4300-48MP and EX4300-48MP-S Switches
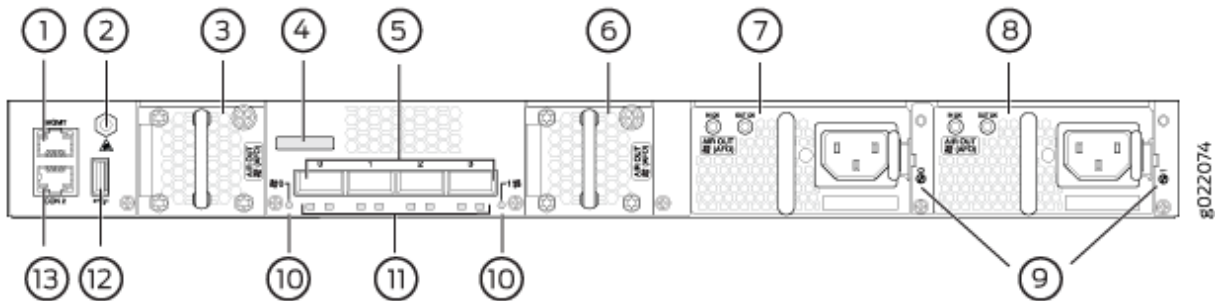
1– Management port	8– AC power supply in slot 1
2– ESD point	9– Power supply slot numbers
3– Fan module in slot 0	10– Fan module slot numbers and LEDs
4– Serial number label	11– QSFP+ port LEDs
5– QSFP+ ports	12– USB port
6– Fan module in slot 1	13– Console port
7– AC power supply in slot 0	

> **NOTE**: DC power supplies are installed in the power supply slots in models that use DC power.

shows the components on the rear panel of a 32-port EX4300 switch (with two AC power supplies and two fan modules installed).

Figure 43: Components on the Rear Panel of a 32-Port EX4300 Switch
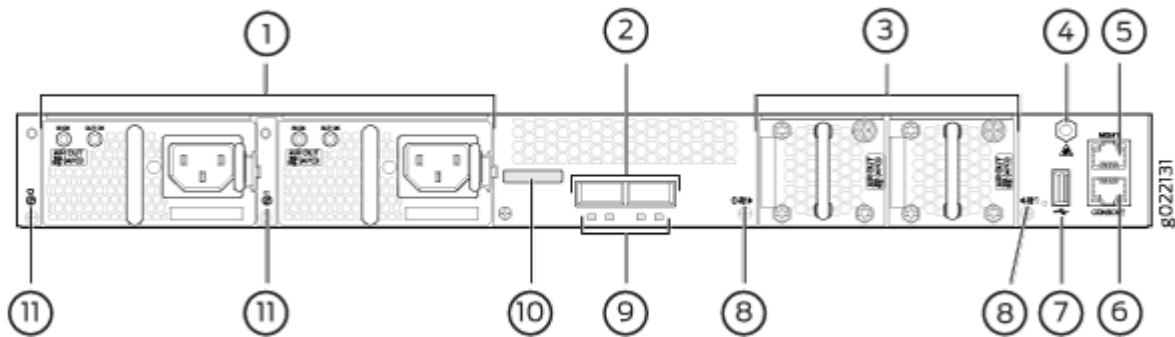
1– AC power supplies in slot 0 and slot 1	7– USB port
2– QSFP+ ports	8– Fan module slot numbers and LEDs
3– Fan modules in slot 0 and slot 1	9– QSFP+ port LEDs
4– ESD point	10– Serial number label
5– Management port	11– Power supply slot numbers
6– Console port	

> **NOTE**: DC power supplies are installed in the power supply slots in models that use DC power.

shows the components on the rear panel of EX4300-48MP and EX4300-48MP-S switches (with one AC power supply and two fan modules installed).

Figure 44: Components on the Rear Panel of EX4300-48MP and EX4300-48MP-S Switches
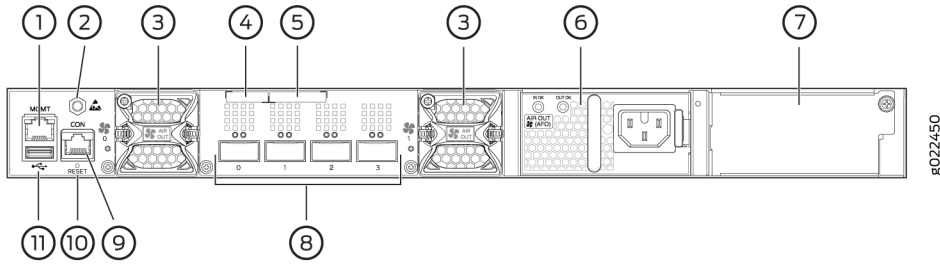
1– Management port	7–	Empty slot for AC power supply
2– ESD point	8–	QSFP+ ports (dedicated Virtual Chassis ports)
3– Fan module	9–	Console port
4– Serial number label	10–	Reset button
5– CLEI code label	11–	USB port
6– AC power supply in slot 0		

NOTE: The protective earthing terminal is located on the left side of the chassis. See *Connect Earth Ground to an EX Series Switch*.

2

PART

Planning

CHAPTER 7

Site Preparation

IN THIS CHAPTER

Plan a Virtual Chassis Fabric Deployment

A Virtual Chassis Fabric (VCF) architecture supports up to 20 interconnected devices that are managed as a logical single device. Supported platforms vary depending on the QFX Series switch chosen for the spine. See *Understanding Virtual Chassis Fabric Components* and *Virtual Chassis Fabric Hardware Overview* for supported configurations. Although the architecture has a powerful auto-provisioning option, which allows you to plug and play the devices, careful planning of the deployment can avoid unexpected results.

For example, if you perform any configuration level commands on one of the devices (including assigning IP addresses or host names) you no longer can use auto-provisioning.

Use the following checklist to plan your deployment:

Table 9: Deployment Checklist

Item or Task	For More Information	Performed By	Date
Components			
Determine the number of devices in the VCF and the role of each device. **NOTE**: A VCF is not constrained to a single building; the limits for the optic cable are the only consideration.	*Understanding Virtual Chassis Fabric Components*		
Environment			
Evaluate the provisioning options and determine the configuration method that applies to your deployment.	*Understanding Virtual Chassis Fabric Configuration*		
Power			
Measure the distance between external power sources and switch installation site.			
Calculate the power consumption and requirements.	*QFX5110 AC Power Specifications* *AC Power Specifications for a QFX5100 Device* *AC Power Specifications for a QFX3600 or QFX3600-I Device* *AC Power Specifications for a QFX3500 Device* *AC Power Supply Specifications for EX4300 Switches*		
Rack or Cabinet			

Table 9: Deployment 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.	*QFX5110 Rack Requirements* *Rack Requirements for a QFX5100 Device* *Cabinet Requirements for a QFX5100 Device* *Rack Requirements for a QFX3600 or QFX3600-I Device* *Cabinet Requirements for a QFX3600 or QFX3600-I Device* *Rack Requirements for a QFX3500 Device* *Cabinet Requirements for a QFX3500 Device* *Rack Requirements for EX4300 Switches* *Cabinet Requirements for EX4300 Switches*		

Table 9: Deployment Checklist *(Continued)*

Item or Task	For More Information	Performed By	Date
Plan rack or cabinet location, including required space clearances.	*QFX5110 Clearance Requirements for Airflow and Hardware Maintenance* *Clearance Requirements for Airflow and Hardware Maintenance for a QFX5100 Device* *Clearance Requirements for Airflow and Hardware Maintenance for a QFX3600 or QFX3600-I Device* *Clearance Requirements for Airflow and Hardware Maintenance for a QFX3500 Device* *Clearance Requirements for Airflow and Hardware Maintenance for EX4300 Switches*		
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.	*Cable Specifications for QSFP+ and QSFP28 Transceivers* *Cable Specifications for Console and Management Connections for the QFX Series*		
Plan the cable routing and management.			

QFX5110 Site Preparation Checklist

The checklist in Table 10 on page 93 summarizes the tasks you need to perform when preparing a site for a QFX5110 installation.

Table 10: Site Preparation Checklist

Item or Task	For More Information	Performed By	Date
Architecture			
Determine whether the QFX5110 device will operate: • standalone • as a member in a Virtual Chassis • as a spine or leaf in a Virtual Chassis Fabric (VCF)	• *Planning a Virtual Chassis Deployment using QFX Devices* • *Plan a Virtual Chassis Fabric Deployment*		
Environment			
Verify that environmental factors such as temperature and humidity do not exceed switch tolerances.	*QFX5110 Environmental Requirements and Specifications*		
Power			
Measure the distance between external power sources and switch installation site.			
Calculate the power consumption and requirements.	*QFX5110 AC Power Specifications* and *QFX5110 DC Power Specifications*		
Rack			

Table 10: Site Preparation Checklist *(Continued)*

Item or Task	For More Information	Performed By	Date
Verify that your rack meets the minimum requirements for the installation of the switch.	*QFX5110 Rack Requirements*		
Plan rack location, including required space clearances.	*QFX5110 Clearance Requirements for Airflow and Hardware Maintenance*		
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.	*QFX5110 Network Cable and Transceiver Planning*		
Plan the cable routing and management.			

RELATED DOCUMENTATION

General Safety Guidelines and Warnings

General Site Guidelines

Site Preparation Checklist for a QFX5100 Device

The checklist in Table 11 on page 95 summarizes the tasks you need to perform when preparing a site for QFX5100 deviceinstallation.

Table 11: Site Preparation Checklist

Item or Task	For More Information	Performed By	Date
Architecture			
Determine whether the QFX5100 device will operate: • standalone • as a member in a Virtual Chassis • as a spine or leaf in a Virtual Chassis Fabric (VCF) • as a node in a QFabric	• *Plan a Virtual Chassis Fabric Deployment* • *Planning a QFX3000-G QFabric System Deployment* • *Planning a QFX3000-M QFabric System Deployment*		
Environment			
Verify that environmental factors such as temperature and humidity do not exceed switch tolerances.	*Environmental Requirements and Specifications for a QFX5100 Device*		
Power			
Measure the distance between external power sources and switch installation site.			
Calculate the power consumption and requirements.	*AC Power Specifications for a QFX5100 Device*		
Rack or Cabinet			

Table 11: 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 a QFX5100 Device* *Cabinet Requirements for a QFX5100 Device*		
Plan rack or cabinet location, including required space clearances.	*Clearance Requirements for Airflow and Hardware Maintenance for a QFX5100 Device*		
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.	• *Port Panel of a QFX5100-24Q Device* • *Port Panel of a QFX5100-24Q-AA Device* • *Port Panel of QFX5100-48S and QFX5100-48SH Devices* • *Port Panel of QFX5100-48T and QFX5100-48TH Devices* • *Port Panel of a QFX5100-96S Device*		
Plan the cable routing and management.			

RELATED DOCUMENTATION

General Safety Guidelines and Warnings

Site Preparation Checklist for a QFX3600 or QFX3600-I Device

The checklist in summarizes the tasks you need to perform when preparing a site for QFX3600 or QFX3600-I device installation.

Table 12: 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 device tolerances.	*Environmental Requirements and Specifications for QFX3600 and QFX3600-I Devices*		
Power			
Measure distance between external power sources and device installation site.			
Calculate the power consumption and requirements.	*AC Power Specifications for a QFX3600 or QFX3600-I Device* *DC Power Specifications for a QFX3600 or QFX3600-I Device*		
Rack or Cabinet			
Verify that your rack or cabinet meets the minimum requirements for the installation of the switch.	*Rack Requirements for a QFX3600 or QFX3600-I Device* *Cabinet Requirements for a QFX3600 or QFX3600-I Device*		

Table 12: Site Preparation Checklist *(Continued)*

Item or Task	For More Information	Performed By	Date
Plan rack or cabinet location, including required space clearances.	*Clearance Requirements for Airflow and Hardware Maintenance for a QFX3600 or QFX3600-I Device*		
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.	*Determining Interface Support for the QFX3600 Device* *Determining Transceiver Support for QFabric Systems*		
Plan the cable routing and management.			

RELATED DOCUMENTATION

General Safety Guidelines and Warnings

General Site Guidelines

Installing and Connecting a QFX3600 or QFX3600-I Device

Site Preparation Checklist for a QFX3500 Device

The checklist in Table 13 on page 99 summarizes the tasks you need to perform when preparing a site for QFX3500 device installation.

Table 13: 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 device tolerances.	*Environmental Requirements and Specifications for a QFX3500 Device*		
Power			
Measure distance between external power sources and device installation site.			
Calculate the power consumption and requirements.	*AC Power Specifications for a QFX3500 Device*		
Rack or Cabinet			
Verify that your rack or cabinet meets the minimum requirements for the installation of the device.	*Rack Requirements for a QFX3500 Device* *Cabinet Requirements for a QFX3500 Device*		
Plan rack or cabinet location, including required space clearances.	*Clearance Requirements for Airflow and Hardware Maintenance for a QFX3500 Device*		
Secure the rack or cabinet to the floor and building structure.			
Cables			

Table 13: Site Preparation Checklist *(Continued)*

Item or Task	For More Information	Performed By	Date
Acquire cables and connectors: • Determine the number of cables needed based on your planned configuration. • Review the maximum distance allowed for each cable. Choose the length of cable based on the distance between the hardware components being connected.	*Determining Interface Support for the QFX3500 Device* *Determining Transceiver Support for QFabric Systems* *Cable Specifications for Console and Management Connections for the QFX Series*		
Plan the cable routing and management.			

RELATED DOCUMENTATION

General Safety Guidelines and Warnings

General Site Guidelines

Installing and Connecting a QFX3500 Device

Mounting a QFX3500 Device in a Rack or Cabinet

Site Preparation Checklist for EX4300 Switches

The checklist in summarizes the tasks you need to perform when preparing a site for EX4300 switch installation.

Table 14: Site Preparation Checklist

Item or Task	For More Information	Performed by	Date
Environment			

Table 14: Site Preparation Checklist *(Continued)*

Item or Task	For More Information	Performed by	Date
Verify that environmental factors such as temperature and humidity do not exceed switch tolerances.	*Environmental Requirements and Specifications for EX Series Switches*		
Power			
Measure the distance between external power sources and the switch installation site.			
Locate sites for connection of system grounding.			
Calculate the power consumption and requirements.	• *AC Power Supply Specifications for EX4300 Switches* • *DC Power Supply Specifications for EX4300 Switches*		
Hardware Configuration			
Choose the number and types of switches you want to install.	*EX4300 Switches Hardware Overview*		
Rack or Cabinet			
Verify that your rack or cabinet meets the minimum requirements for the installation of the switch.	• *Rack Requirements* • *Cabinet Requirements*		
Plan rack or cabinet location, including required space clearances.	*Clearance Requirements for Airflow and Hardware Maintenance for EX4300 Switches*		

Table 14: Site Preparation Checklist *(Continued)*

Item or Task	For More Information	Performed by	Date
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

QFX5110 Environmental Requirements and Specifications

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

Follow these environmental guidelines:

• 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 device to protect the hardware components.

Table 15 on page 103 provides the required environmental conditions for normal switch operation for all QFX5110 models.

Table 15: QFX5110 Environmental Tolerances

Description	Tolerance
Altitude	No performance degradation to 6562 feet (2000 meters)
Relative humidity	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 3, short-term events can be up to 96 hours in duration but not more than 15 days per year.
Temperature	• 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)
Seismic	Designed to comply with Zone 4 earthquake requirements per NEBS GR-63-CORE, Issue 3.

NOTE: Install QFX Series devices 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

QFX5110 Clearance Requirements for Airflow and Hardware Maintenance

Environmental Requirements and Specifications for a QFX5100 Device

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

Follow these environmental guidelines:

- 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 device to protect the hardware components.

Table 16 on page 104 provides the required environmental conditions for normal switch operation.

Table 16: QFX5100 Switch Environmental Tolerances

Description	Tolerance
Altitude	No performance degradation to 6,562 feet (2000 meters)
Relative humidity	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 3, short-term events can be up to 96 hours in duration but not more than 15 days per year.

Table 16: QFX5100 Switch Environmental Tolerances *(Continued)*

Description	Tolerance
Temperature	• Normal operation ensured in temperature range of 32° F through 104° F (0° C through 40° C) NOTE: Customers with QFX5100-48T switches should ensure the room temperature does not exceed a 2° C increase or decrease per minute. • Nonoperating storage temperature in shipping container: –40° F through 158° F (–40° C through 70° C)
Seismic	Designed to comply with Zone 4 earthquake requirements per NEBS GR-63-CORE, Issue 3.

NOTE: Install QFX Series devices 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 a QFX5100 Device

QFX5100 Standalone Installation Overview

Environmental Requirements and Specifications for QFX3600 and QFX3600-I Devices

The QFX3600 and QFX3600-I devices must be installed in a rack or cabinet housed in a dry, clean, well-ventilated, and temperature-controlled environment.

Follow these environmental guidelines:

• The site must be as dust-free as possible, because dust can clog air intake vents and filters, reducing the efficiency of the device cooling system.

- Maintain ambient airflow for normal device operation. If the airflow is blocked or restricted, or if the intake air is too warm, the device might overheat, leading to the device temperature monitor shutting down the device to protect the hardware components.

Table 17 on page 106 provides the required environmental conditions for normal device operation.

Table 17: QFX3600 and QFX3600-I Device Environmental Tolerances

Description	Tolerance
Altitude	No performance degradation to 10,000 feet (3048 meters)
Relative humidity	Normal operation ensured in relative humidity range of 5% through 85%, noncondensing
Temperature	- Normal operation ensured in temperature range of 32° F through 104° F (0° C through 40° C) - Short-term operation ensured in temperature range of 23° F through 131° F (–5° C through 55° C) NOTE: As defined in NEBS GR-63-CORE, Issue 3, short-term events can be up to 96 hours in duration but not more than 15 days per year. - Nonoperating storage temperature in shipping container: –40° F through 158° F (–40° C through 70° C)
Seismic	Designed to comply with Zone 4 earthquake requirements per NEBS GR-63-CORE, Issue 3.

NOTE: Install QFX Series devices 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 a QFX3600 or QFX3600-I Device

Installing and Connecting a QFX3600 or QFX3600-I Device

Environmental Requirements and Specifications for a QFX3500 Device

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

Follow these environmental guidelines:

- The site must be as dust-free as possible, because dust can clog air intake vents and filters, reducing the efficiency of the device cooling system.

- Maintain ambient airflow for normal device operation. If the airflow is blocked or restricted, or if the intake air is too warm, the device might overheat, leading to the device temperature monitor shutting down the device to protect the hardware components.

provides the required environmental conditions for normal device operation.

Table 18: QFX3500 Device Environmental Tolerances

Description	Tolerance
Altitude	No performance degradation to 10,000 feet (3048 meters)
Relative humidity	Normal operation ensured in relative humidity range of 5% through 85%, noncondensing
Temperature	- Normal operation ensured in temperature range of 32° F through 104° F (0° C through 40° C) - Short-term operation ensured in temperature range of 23° F through 131° F (–5° C through 55° C) **NOTE**: As defined in NEBS GR-63-CORE, Issue 3, short-term events can be up to 96 hours in duration but not more than 15 days per year. - Nonoperating storage temperature in shipping container: –40° F through 158° F (–40° C through 70° C)
Seismic	Designed to comply with Zone 4 earthquake requirements per NEBS GR-63-CORE, Issue 3.

> **NOTE**: Install QFX Series devices 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.

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 19 on page 109 provides the required environmental conditions for normal switch operation.

Table 19: 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 the relative humidity range 10% through 85% (noncondensing)	Normal operation ensured in the temperature range 32° F (0° C) through 104° F (40° C) at altitudes up to 5,000 ft (1,524 m). For information about extended temperature SFP transceivers supported on EX2200 switches, 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 the relative humidity range 10% through 85% (noncondensing)	Normal operation ensured in the temperature range 32° F (0° C) through 113° F (45° C)	Complies with Zone 4 earthquake requirements as per GR-63, Issue 4.
EX2300-C	No performance degradation up to 5,000 feet (1524 meters)	Normal operation ensured in the relative humidity range 10% through 85% (noncondensing)	Normal operation ensured in the temperature range 32° F (0° C) through 104° F (40° C)	Complies with Zone 4 earthquake requirements as per GR-63, Issue 4.
EX2300 (except EX2300-C switches)	No performance degradation up to 13,000 feet (3962 meters) at 104° F (40° C) as per GR-63	Normal operation ensured in the relative humidity range 10% through 85% (noncondensing)	Normal operation ensured in the temperature range 32° F (0° C) through 113° F (45° C)	Complies with Zone 4 earthquake requirements as per GR-63, Issue 4.

Table 19: EX Series Switch Environmental Tolerances *(Continued)*

Switch or device	Environment Tolerance			
	Altitude	Relative Humidity	Temperature	Seismic
EX3200	No performance degradation up to 10,000 feet (3048 meters)	Normal operation ensured in the relative humidity range 10% through 85% (noncondensing)	Normal operation ensured in the temperature range 32° F (0° C) through 113° F (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 the relative humidity range 10% through 85% (noncondensing)	Normal operation ensured in the temperature range 32° F (0° C) through 113° F (45° C)	Complies with Zone 4 earthquake requirements as per GR-63, Issue 4.
EX3400	No performance degradation up to 10,000 feet (3048 meters)	Normal operation ensured in the relative humidity range 10% through 85% (noncondensing)	Normal operation ensured in the temperature range 32° F (0° C) through 113° F (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 the relative humidity range 10% through 85% (noncondensing)	Normal operation ensured in the temperature range 32° F (0° C) through 113° F (45° C)	Complies with Zone 4 earthquake requirements as per GR-63, Issue 4.

Table 19: EX Series Switch Environmental Tolerances *(Continued)*

Switch or device	Environment Tolerance			
	Altitude	Relative Humidity	Temperature	Seismic
EX4300	EX4300 switches except the EX4300-48MP model— No performance degradation up to 10,000 feet (3048 meters) EX4300-48MP model— No performance degradation up to 6,000 feet (1829 meters)	EX4300 switches except the EX4300-48MP model — Normal operation ensured in the relative humidity range 10% through 85% (noncondensing) EX4300-48MP model— Normal operation ensured in the relative humidity range 5% through 90% (noncondensing)	Normal operation ensured in the temperature range 32° F (0° C) through 113° F (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 the relative humidity range 10% through 85% (noncondensing)	Normal operation ensured in the temperature range 32° F (0° C) through 113° F (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 the relative humidity range 10% through 85% (noncondensing)	• EX4550-32F switches— Normal operation ensured in the temperature range 32° F (0° C) through 113° F (45° C) • EX4550-32T switches— Normal operation is ensured in the temperature range 32° F through 104° F (40° C)	Complies with Zone 4 earthquake requirements as per GR-63, Issue 4.

Table 19: 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 the relative humidity range 5% through 90%, noncondensing • Short-term operation ensured in the relative humidity range 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 the temperature range 32° F (0° C) through 113° F (45° C) • Nonoperating storage temperature in shipping container: – 40° F (– 40° C) through 158° F (70° C)	Complies with Zone 4 earthquake requirements per NEBS GR-63-CORE, Issue 4.
EX4650	No performance degradation to 6,000 feet (1829 meters)	Normal operation ensured in the relative humidity range 10% through 85% (condensing)	Normal operation is ensured in the temperature range 32° F (0° C) through 104° F (40° C)	Complies with Zone 4 earthquake requirements as per GR-63, Issue 4.
EX6210	No performance degradation up to 10,000 feet (3048 meters)	Normal operation ensured in the relative humidity range 10% through 85% (noncondensing)	Normal operation is ensured in the temperature range 32° F (0° C) through 104° F (40° C)	Complies with Zone 4 earthquake requirements as per GR-63, Issue 4.

Table 19: EX Series Switch Environmental Tolerances *(Continued)*

Switch or device	Environment Tolerance			
	Altitude	Relative Humidity	Temperature	Seismic
EX8208	No performance degradation up to 10,000 feet (3048 meters)	Normal operation ensured in the relative humidity range 10% through 85% (noncondensing)	Normal operation is ensured in the temperature range 32° F (0° C) through 104° F (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 the relative humidity range 10% through 85% (noncondensing)	Normal operation is ensured in the temperature range 32° F (0° C) through 104° F (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 the relative humidity range 5% through 90% (noncondensing)	Normal operation is ensured in the temperature range 32° F (0° C) through 104° F (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 the relative humidity range 5% through 90% (noncondensing)	Normal operation is ensured in the temperature range 32° F (0° C) through 104° F (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 19: 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 the relative humidity range 5% through 90% (noncondensing)	Normal operation is ensured in the temperature range 32° F (0° C) through 104° F (40° C) Nonoperating storage temperature in shipping container: – 40° F (– 40° C) through 158° F (70° C)	Complies with Zone 4 earthquake requirements as per GR-63.
EX9251	No performance degradation up to 10,000 ft (3048 m)	Normal operation ensured in relative humidity range of 5% to 90%, noncondensing	Normal operation ensured in temperature range of 32° F (0° C) to 104° F (40° C) Nonoperating storage temperature in shipping container: – 40° F (– 40° C) to 158° F (70° C)	Complies with Telcordia Technologies Zone 4 earthquake requirements
XRE200	No performance degradation up to 10,000 feet (3048 meters)	Normal operation ensured in the relative humidity range 10% through 85% (noncondensing)	Normal operation ensured in the temperature range 41° F (5° C) through 104° F (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.

CHAPTER 8

Rack and Cabinet Requirements

QFX5110 Rack Requirements

QFX5110 switches are designed to be installed on four-post racks.

Rack requirements consist of:

• Rack type

• Mounting bracket hole spacing

• Rack size and strength

provides the rack requirements and specifications for the QFX5110.

Table 20: Rack Requirements for the QFX5110

Rack Requirement	Guidelines
Rack type	Use a 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.
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.
Rack size and strength	• Ensure that the rack complies with the standards for a 19-in. or 23-in. rack as defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310–D) published by the Electronics Industry Association. • A 600-mm rack as defined in the four-part *Equipment Engineering (EE); European telecommunications standard for equipment practice* (document numbers ETS 300 119-1 through 119-4) published by the European Telecommunications Standards Institute. The horizontal spacing between the rails in a rack that complies with this standard is usually wider than the device's mounting brackets, which measure 19 in. (48.26 cm) from outer edge to outer edge. Use approved wing devices to narrow the opening between the rails as required. • Ensure that the rack rails are spaced widely enough to accommodate the switch chassis' external dimensions. The outer edges of the front-mounting brackets extend the width to 19 in. (48.26 cm). • For four-post installations, the front and rear rack rails must be spaced between 23.5 in. (59.7 cm) to 30.6 in. (77.7 cm) front-to-back. • The rack must be strong enough to support the weight of the switch. • Ensure that the spacing of rails and adjacent racks allows for proper clearance around the switch and rack.

Table 20: Rack Requirements for the QFX5110 *(Continued)*

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

Rack Requirements for a QFX5100 Device

All QFX5100 devices are designed to be installed on four-post racks. The QFX5100-96S device can also be installed on two-post racks.

Rack requirements consist of:

- Rack type

- Mounting bracket hole spacing

- Rack size and strength

provides the rack requirements and specifications for the QFX5100 device.

Table 21: Rack Requirements for the QFX5100 Device

Rack Requirement	Guidelines
Rack type (all product SKUs)	Use a 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.

Table 21: Rack Requirements for the QFX5100 Device *(Continued)*

Rack Requirement	Guidelines
Rack type (QFX5100-96S only)	Use a 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.
Mounting bracket hole spacing (all product SKUs)	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.
Rack size and strength (all product SKUs)	- Ensure that the rack complies with the standards for a 19-in. or 23-in. rack as defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310–D) published by the Electronics Industry Association. - A 600-mm rack as defined in the four-part *Equipment Engineering (EE); European telecommunications standard for equipment practice* (document numbers ETS 300 119-1 through 119-4) published by the European Telecommunications Standards Institute. The horizontal spacing between the rails in a rack that complies with this standard is usually wider than the device's mounting brackets, which measure 19 in. (48.26 cm) from outer edge to outer edge. Use approved wing devices to narrow the opening between the rails as required. - Ensure that the rack rails are spaced widely enough to accommodate the switch chassis' external dimensions. The outer edges of the front-mounting brackets extend the width to 28.5 in. (72.4 cm) to 31.5 in. (80 cm). - For four-post installations, the front and rear rack rails must be spaced between 28.5 in. (72.4 cm) to 31.5 in. (80 cm) front-to-back. - The rack must be strong enough to support the weight of the switch. - Ensure that the spacing of rails and adjacent racks allows for proper clearance around the switch and rack.

Table 21: Rack Requirements for the QFX5100 Device *(Continued)*

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

RELATED DOCUMENTATION

Chassis Physical Specifications for a QFX5100 Device

Rack-Mounting and Cabinet-Mounting Warnings

Clearance Requirements for Airflow and Hardware Maintenance for a QFX5100 Device

Mount a QFX5100 Device in a Rack or Cabinet

Rack Requirements for a QFX3600 or QFX3600-I Device

QFX3600 and QFX3600-I devices are designed to be installed 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

provides the rack requirements and specifications for a QFX3600 or QFX3600-I device.

Table 22: Rack Requirements for a QFX3600 or QFX3600-I Device

Rack Requirement	Guidelines
Rack type	Use a two-post 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./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.
Rack size and strength	• Ensure that the rack complies with the standards for a 19-in. rack as defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310–D) published by the Electronics Industry Association. • Ensure that the rack rails are spaced widely enough to accommodate the device chassis' external dimensions. The outer edges of the mounting brackets extend the width to 19.2 in. (48.8 cm). • On four-post racks, the front and rear rack rails must be spaced between 19.3 in. (49 cm) and 36 in. (91.4 cm) front-to-back. • The rack must be strong enough to support the weight of the device. • Ensure that the spacing of rails and adjacent racks allows for proper clearance around the device 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.

The following types of mounting brackets are supplied with each switch:

• One pair of mounting brackets for front-mounting or rear-mounting the switch on two posts of a rack

- One pair of mounting brackets for mid-mounting the switch (front or rear facing) on two posts of a rack

- One pair of fixed rail mounting brackets for front-mounting or rear-mounting the switch on four posts of a rack

- One pair of adjustable rail mounting brackets for front-mounting or rear-mounting the switch on four posts of a rack

RELATED DOCUMENTATION

Chassis Physical Specifications for QFX3600 and QFX3600-I Devices

Rack-Mounting and Cabinet-Mounting Warnings

Clearance Requirements for Airflow and Hardware Maintenance for a QFX3600 or QFX3600-I Device

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

Rack Requirements for a QFX3500 Device

A QFX3500 device is designed to be installed on four-post racks.

Rack requirements consist of:

- Rack type

- Mounting bracket hole spacing

- Rack size and strength

- Rack connection to the building structure

provides the rack requirements and specifications for the QFX3500 device.

Table 23: Rack Requirements for the QFX3500 Device

Rack Requirement	Guidelines
Rack type	Use a four-post rack. You can mount the device on a 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.
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 device can be mounted in any rack that provides holes spaced at that distance.
Rack size and strength	- Ensure that the rack complies with the standards for a 19-in. rack as defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310–D) published by the Electronics Industry Association. - Ensure that the rack rails are spaced widely enough to accommodate the device chassis' external dimensions. The outer edges of the front-mounting brackets extend the width to 19 in. (48.26 cm). - The front and rear rack rails must be spaced between 28 in. (71.1 cm) and 36 in. (91.4 cm) front-to-back. - The rack must be strong enough to support the weight of the device. - Ensure that the spacing of rails and adjacent racks allows for proper clearance around the device 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.

RELATED DOCUMENTATION

Chassis Physical Specifications for a QFX3500 Chassis

Rack-Mounting and Cabinet-Mounting Warnings

Clearance Requirements for Airflow and Hardware Maintenance for a QFX3500 Device

Mounting a QFX3500 Device in a Rack or Cabinet

Rack Requirements

You can mount the device 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.

provides the rack requirements and specifications.

Table 24: Rack Requirements and Specifications

Rack Requirement	Guidelines
Rack type	A U is the standard rack unit defined by the Electronic Components Industry Association (http://www.ecianow.org). You can mount the device on a rack that provides bracket holes or hole patterns spaced at 1U (1.75 in. or 4.45 cm) increments and meets the size and strength requirements to support the weight.
Mounting bracket hole spacing	The holes in the mounting brackets are spaced at 1U (1.75 in. or 4.45 cm) so that the device can be mounted in any rack that provides holes spaced at that distance.

Table 24: Rack Requirements and Specifications *(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 by the Electronic Components Industry Association (http://www.ecianow.org). • Rack rails are spaced widely enough to accommodate the external dimensions of the device chassis. Ensure also that the outer edges of the front mounting brackets extend the width of the chassis to 19 in. (48.2 cm). • Rack is strong enough to support the weight of the device. • Spacing of rails and adjacent racks provides for proper clearance around the device and rack.
Rack connection to building structure	Secure the rack as follows: • Secure the rack to the building structure. • If your geographical area is earthquake-prone, secure the rack to the floor. • Secure the rack to the ceiling brackets as well as wall or floor brackets for maximum stability.

RELATED DOCUMENTATION

Rack-Mounting and Cabinet-Mounting Warnings

Cabinet Requirements for a QFX5100 Device

You can mount the QFX5100 device in an enclosure or cabinet that contains a four-post 19-in. open rack as defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310-D) published by the Electronics Industry Association.

Cabinet requirements consist of:

• Cabinet size and clearance

- Cabinet airflow requirements

provides the cabinet requirements and specifications for the QFX5100 device.

Table 25: Cabinet Requirements for the QFX5100 Device

Cabinet Requirement	Guidelines
Cabinet size and clearance	The minimum cabinet size for accommodating a QFX5100 device is 36 in. (91.4 cm) deep. Large cabinets improve airflow and reduce the chance of overheating.
Cabinet airflow requirements	When you mount the switch in a cabinet, ensure that ventilation through the cabinet is sufficient to prevent overheating. - Ensure that the cool air supply you provide through the cabinet adequately dissipates the thermal output of the switch (or switches). - Ensure that the cabinet allows the chassis hot exhaust air to exit the cabinet without recirculating into the switch. An open cabinet (without a top or doors) that employs hot air exhaust extraction from the top allows 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. - The QFX5100 device fans exhaust hot air either through the vents on the port panel or through the fans and power supplies. Install the switch in the cabinet in a way that maximizes the open space on the FRU side of the chassis. This maximizes the clearance for critical airflow. - 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 allows for the proper clearance around the switch and cabinet.

Cabinet Requirements for a QFX3600 or QFX3600-I Device

You can mount a QFX3600 or QFX3600-I device in a cabinet that contains a four-post 19-in. rack as defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310-D) published by the former Electronics Industry Association.

Cabinet requirements consist of:

- Cabinet size and clearance

- Cabinet airflow requirements

provides the cabinet requirements and specifications for a QFX3600 or QFX3600-I device.

Table 26: Cabinet Requirements for a QFX3600 or QFX3600-I Device

Cabinet Requirement	Guidelines
Cabinet size and clearance	The minimum cabinet size for accommodating a QFX3600 device is 28 in. (71.1 cm) deep. Large cabinets improve airflow and reduce the chance of overheating.
Cabinet airflow requirements	When you mount the device in a cabinet, ensure that ventilation through the cabinet is sufficient to prevent overheating. • Ensure that the cool air supply you provide through the cabinet adequately dissipates the thermal output of the device (or devices). • Ensure that the cabinet allows the chassis hot exhaust air to exit the cabinet without recirculating into the device. An open cabinet (without a top or doors) that employs hot air exhaust extraction from the top allows 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. • The device fans exhaust hot air through the rear of the chassis. Install the device in the cabinet in a way that maximizes the open space on the fan tray side of the chassis. This maximizes the clearance for critical airflow. • 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 allows for the proper clearance around the device and cabinet.

RELATED DOCUMENTATION

Clearance Requirements for Airflow and Hardware Maintenance for a QFX3600 or QFX3600-I Device

Rack Requirements for a QFX3600 or QFX3600-I Device

Cabinet Requirements for a QFX3500 Device

You can mount the QFX3500 device in a cabinet that contains a four-post 19-in. rack as defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310-D) published by the Electronics Industry Association.

Cabinet requirements consist of:

- Cabinet size and clearance

- Cabinet airflow requirements

provides the cabinet requirements and specifications for the QFX3500 device.

Table 27: Cabinet Requirements for the QFX3500 Device

Cabinet Requirement	Guidelines
Cabinet size and clearance	The minimum cabinet size for accommodating a QFX3500 device is 36 in. (91.4 cm) deep. Large cabinets improve airflow and reduce the chance of overheating.

Table 27: Cabinet Requirements for the QFX3500 Device *(Continued)*

Cabinet Requirement	Guidelines
Cabinet airflow requirements	When you mount the device in a cabinet, ensure that ventilation through the cabinet is sufficient to prevent overheating. • Ensure that the cool air supply you provide through the cabinet adequately dissipates the thermal output of the device (or devices). • Ensure that the cabinet allows the chassis hot exhaust air to exit the cabinet without recirculating into the device. An open cabinet (without a top or doors) that employs hot air exhaust extraction from the top allows 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. • The device fans exhaust hot air through the rear of the chassis. Install the device in the cabinet in a way that maximizes the open space on the fan tray side of the chassis. This maximizes the clearance for critical airflow. • 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 allows for the proper clearance around the device and cabinet.

RELATED DOCUMENTATION

Clearance Requirements for Airflow and Hardware Maintenance for a QFX3500 Device

Rack Requirements for a QFX3500 Device

Mounting a QFX3500 Device in a Rack or Cabinet

Cabinet Requirements

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

Cabinet requirements consist of:

• Cabinet size.

• Clearance requirements.

- Cabinet airflow requirements.

Table 28 on page 129 provides the cabinet requirements and specifications.

Table 28: Cabinet Requirements and Specifications

Cabinet Requirement	Guidelines
Cabinet size	- The minimum cabinet size is 36 in. (91.4 cm) deep. Large cabinets improve airflow and reduce chances of overheating.
Cabinet clearance	- The outer edges of the front mounting brackets extend the width of the chassis to 19 in. (48.2 cm). - The minimum total clearance inside the cabinet is 30.7 in. (78 cm) between the inside of the front door and the inside of the rear door.
Cabinet airflow requirements	When you mount the device in a cabinet, ensure that ventilation through the cabinet is sufficient to prevent overheating, as follows: - Ensure adequate cool air supply to dissipate the thermal output of the device or devices. - Ensure that the hot air exhaust of the chassis exits the cabinet without recirculating into the device. 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 device 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 secure 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 proper clearance exists around the device and cabinet. - A cabinet larger than the minimum required provides better airflow and reduces the chance of overheating.

QFX5110 Clearance Requirements for Airflow and Hardware Maintenance

When planning the site for installing a QFX5110, you must allow sufficient clearance around the installed chassis (see Figure 45 on page 130).

Figure 45: Clearance Requirements for Airflow and Hardware Maintenance for a QFX5110
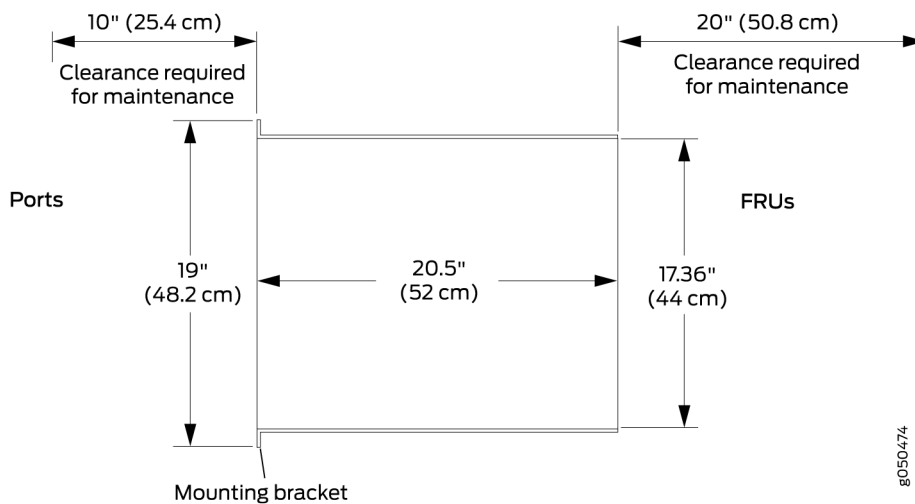
- For the cooling system to function properly, the airflow around the chassis must be unrestricted. See *QFX5110 Cooling System and Airflow Description* for more information about the airflow through the chassis.

- If you are mounting a QFX5110 in a rack with other equipment, ensure that the exhaust from other equipment does not blow into the intake vents of the chassis.

- Leave at least 24 in. (61 cm) both in front of and behind the QFX5110. For service personnel to remove and install hardware components, you must leave adequate space at the front and back of the switch. NEBS GR-63 recommends that you allow at least 30 in. (76.2 cm) in front of the rack or cabinet and 24 in. (61 cm) behind the rack or cabinet.

RELATED DOCUMENTATION

QFX5110 Rack Requirements

General Site Guidelines

Rack-Mounting and Cabinet-Mounting Warnings

Clearance Requirements for Airflow and Hardware Maintenance for a QFX5100 Device

When planning the site for installing a QFX5100 device, you must allow sufficient clearance around the installed chassis (see Figure 46 on page 131).

Figure 46: Clearance Requirements for Airflow and Hardware Maintenance for a QFX5100 Device
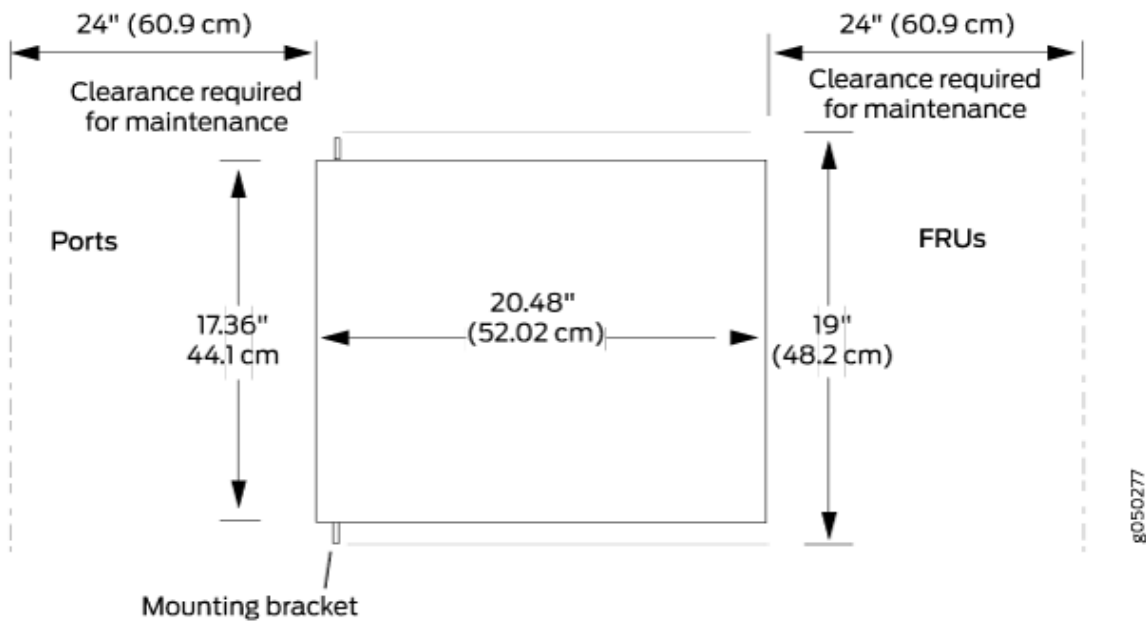
- For the cooling system to function properly, the airflow around the chassis must be unrestricted. See *Cooling System and Airflow in a QFX5100 Device* for more information about the airflow through the chassis.

- If you are mounting a QFX5100 device in a rack or cabinet with other equipment, ensure that the exhaust from other equipment does not blow into the intake vents of the chassis.

- Leave at least 24 in. (61 cm) both in front of and behind the QFX5100 device. For service personnel to remove and install hardware components, you must leave adequate space at the front and back of the switch. NEBS GR-63 recommends that you allow at least 30 in. (76.2 cm) in front of the rack or cabinet and 24 in. (61 cm) behind the rack or cabinet.

Clearance Requirements for Airflow and Hardware Maintenance for a QFX3600 or QFX3600-I Device

When planning the site for installing a QFX3600 or QFX3600-I device, you must allow sufficient clearance around the installed device (see).

Figure 47: Clearance Requirements for Airflow and Hardware Maintenance for a QFX3600 or QFX3600-I Device
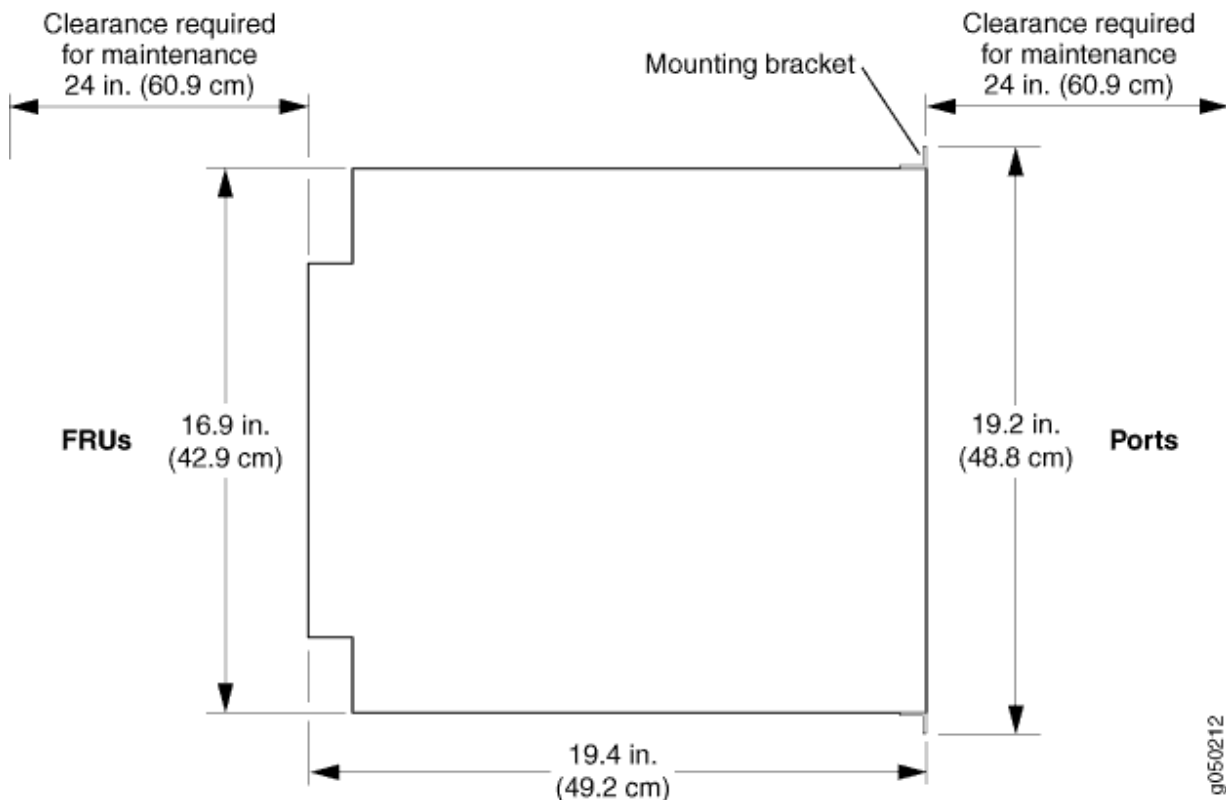
- For the cooling system to function properly, the airflow around the chassis must be unrestricted. See *Cooling System and Airflow for QFX3600 and QFX3600-I Devices* for more information about the airflow through the chassis.

- If you are mounting a QFX3600 or QFX3600-I device in a rack or cabinet with other equipment, ensure that the exhaust from other equipment does not blow into the intake vents of the chassis.

- Leave at least 24 in. (61 cm) both in front of and behind the QFX3600 or QFX3600-I device. For service personnel to remove and install hardware components, you must leave adequate space at the front and back of the device. NEBS GR-63 recommends that you allow at least 30 in. (76.2 cm) in front of the rack or cabinet and 24 in. (61 cm) behind the rack or cabinet.

Rack Requirements for a QFX3600 or QFX3600-I Device

Cabinet Requirements for a QFX3600 or QFX3600-I Device

General Site Guidelines

Rack-Mounting and Cabinet-Mounting Warnings

Clearance Requirements for Airflow and Hardware Maintenance for a QFX3500 Device

When planning the site for installing a QFX3500 device, you must allow sufficient clearance around the installed chassis (see Figure 48 on page 133).

Figure 48: Clearance Requirements for Airflow and Hardware Maintenance for a QFX3500 Device
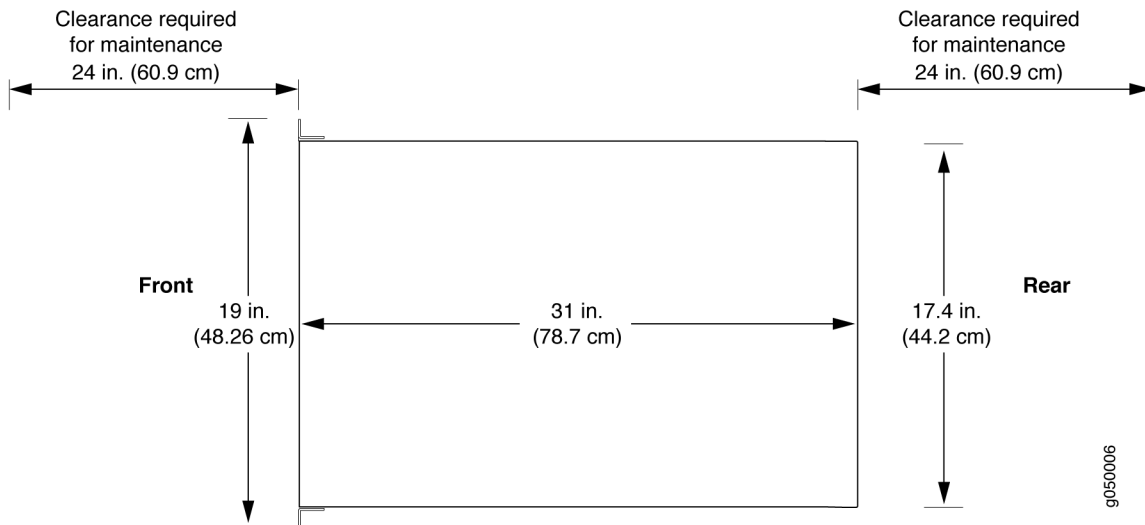
- For the cooling system to function properly, the airflow around the chassis must be unrestricted. See *Cooling System and Airflow for a QFX3500 Device* for more information about the airflow through the chassis.

- If you are mounting a QFX3500 device in a rack or cabinet with other equipment, ensure that the exhaust from other equipment does not blow into the intake vents of the chassis.

- Leave at least 24 in. (61 cm) both in front of and behind the QFX3500 device. For service personnel to remove and install hardware components, you must leave adequate space at the front and back of

the device. NEBS GR-63 recommends that you allow at least 30 in. (76.2 cm) in front of the rack or cabinet and 24 in. (61 cm) behind the rack or cabinet.

Rack Requirements for a QFX3500 Device

Cabinet Requirements for a QFX3500 Device

General Site Guidelines

Rack-Mounting and Cabinet-Mounting Warnings

Clearance Requirements for Airflow and Hardware Maintenance for EX4300 Switches

When planning the site for installing an EX4300 switch, you must ensure 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 49 on page 135, Figure 50 on page 136, and Figure 51 on page 137 for reference.

Figure 49: Front-to-Back Airflow on 24-Port and 48-Port EX4300 Switches
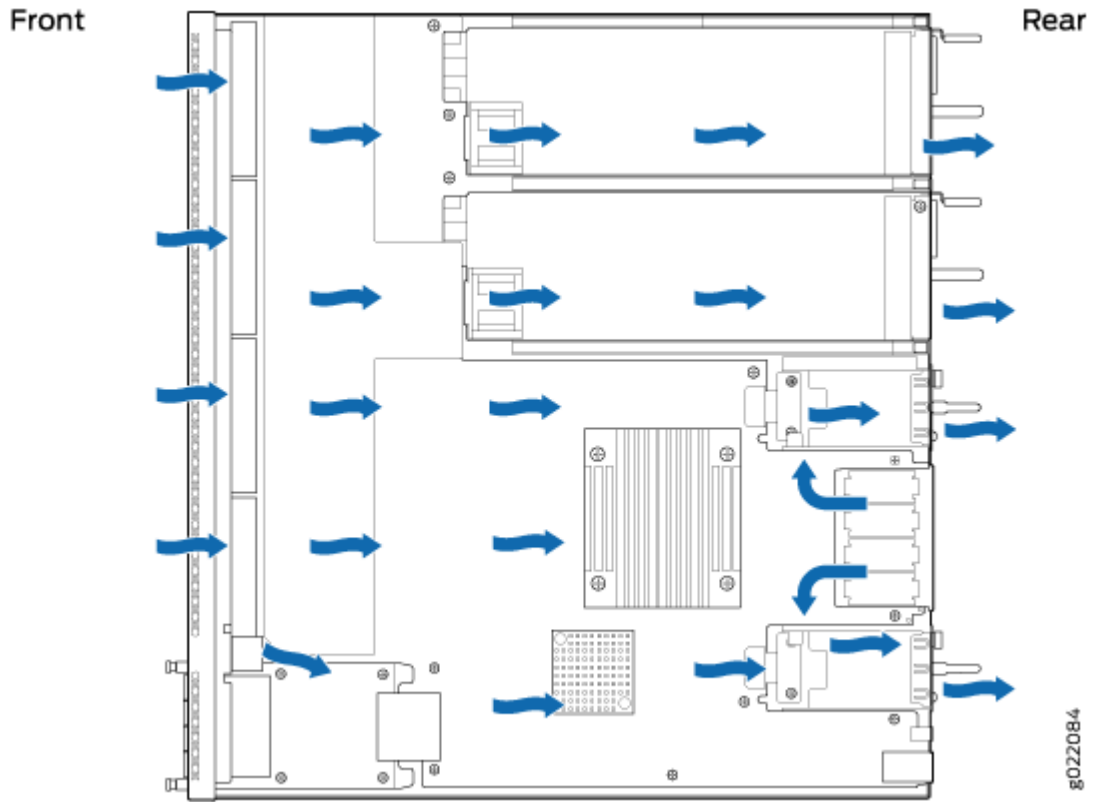
Figure 50: Front-to-Back Airflow on 32-Port EX4300 Switches
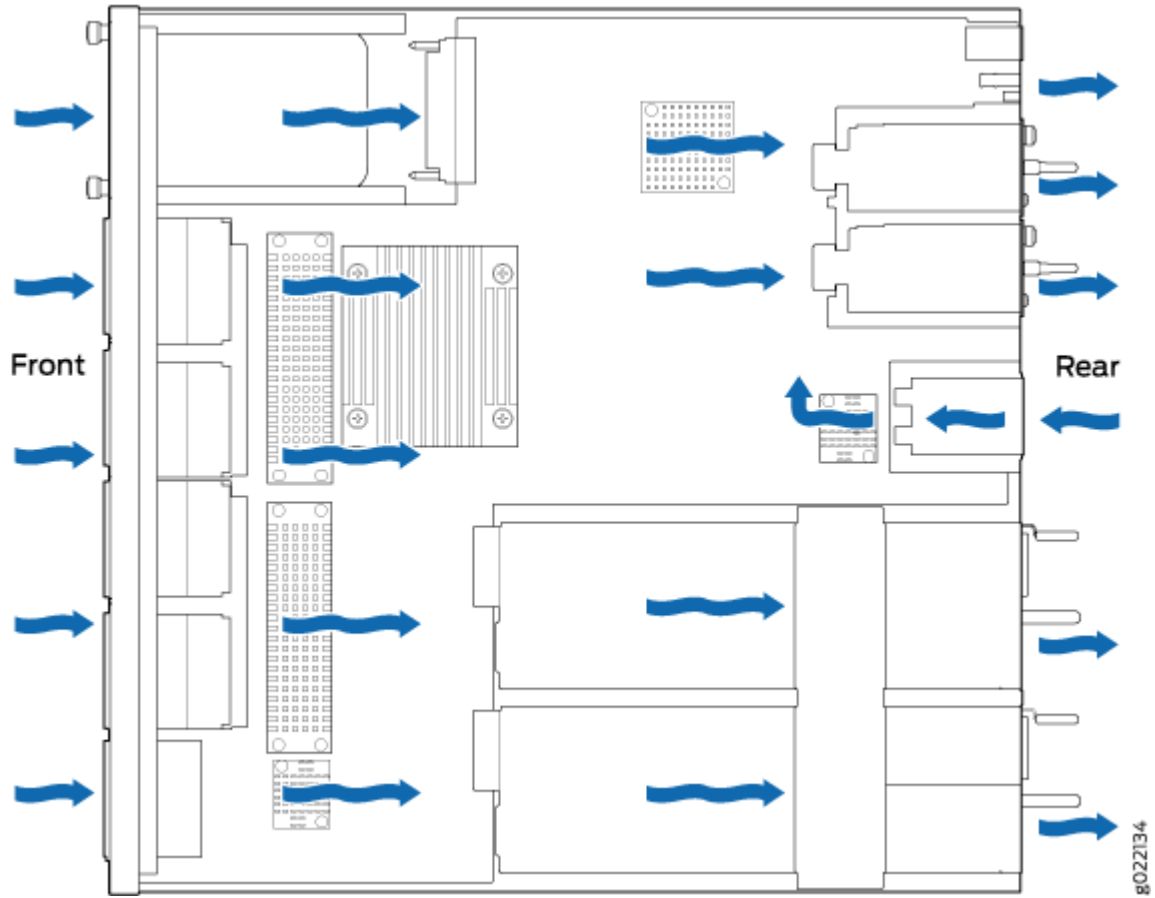
Figure 51: Back-to-Front Airflow on 24-Port and 48-Port EX4300 Switches
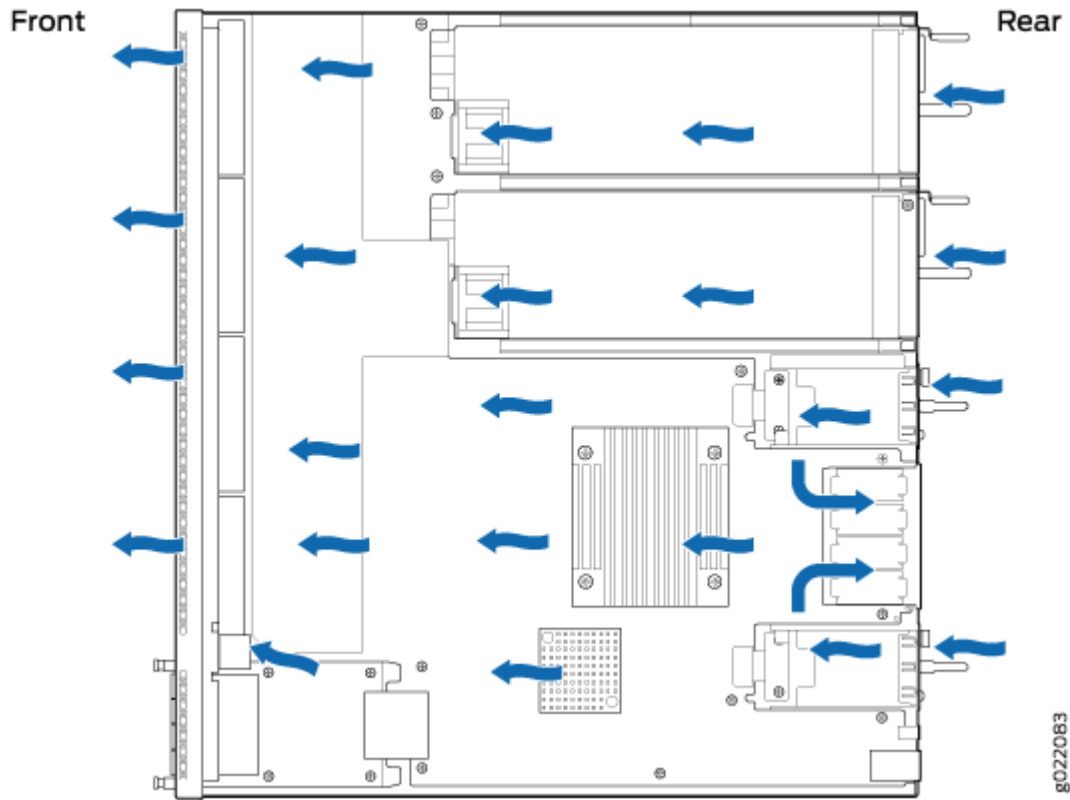
- If you are mounting the switch on a rack or cabinet along with other equipment, ensure that the exhaust from other equipment does not blow into the intake vents of the chassis.

- Leave at least 6 in. (15.2 cm) clearance in 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 52 on page 138, Figure 53 on page 138, and Figure 54 on page 139.

Figure 52: Clearance Requirements for Airflow and Hardware Maintenance for an EX4300 Switches Except EX4300-32F and EX4300-48MP Switches

24 in. (61 cm)
Clearance required for maintenance

6 in. (15.2 cm)
For grounding lug

24 in. (61 cm)
Clearance required for maintenance

Front

Rear

17.36 in.
44.1 cm

16.38 in.
(41.6 cm)

19 in.
(48.2 cm)

Mounting bracket

6 in. (15.2 cm)
For airflow

6 in. (15.2 cm)
For airflow

g022087
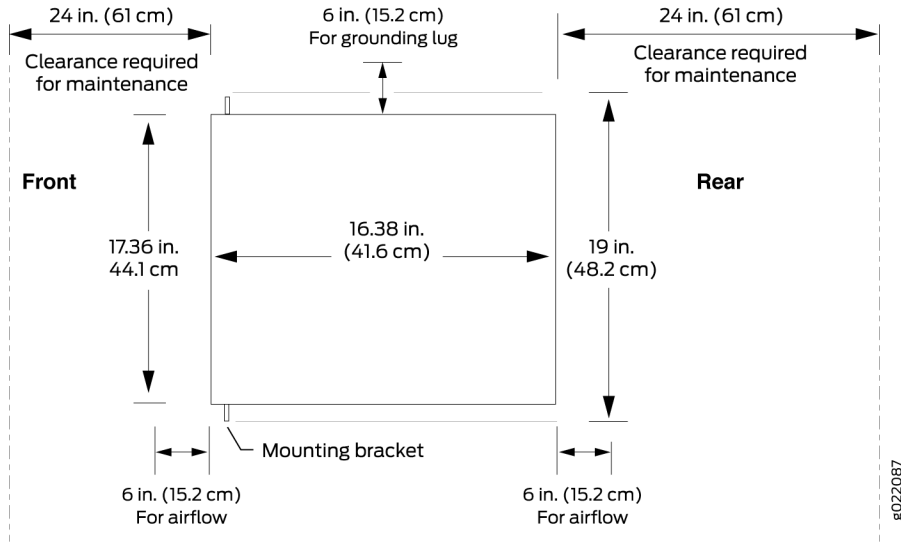
Figure 53: Clearance Requirements for Airflow and Hardware Maintenance for EX4300-32F Switches

24 in. (61 cm)
Clearance required for maintenance

6 in. (15.2 cm)
For grounding lug

24 in. (61 cm)
Clearance required for maintenance

Front

Rear

17.36 in.
44.1 cm

17.87 in.
(45.4 cm)

19 in.
(48.2 cm)

Mounting bracket

6 in. (15.2 cm)
For airflow

6 in. (15.2 cm)
For airflow

g022652
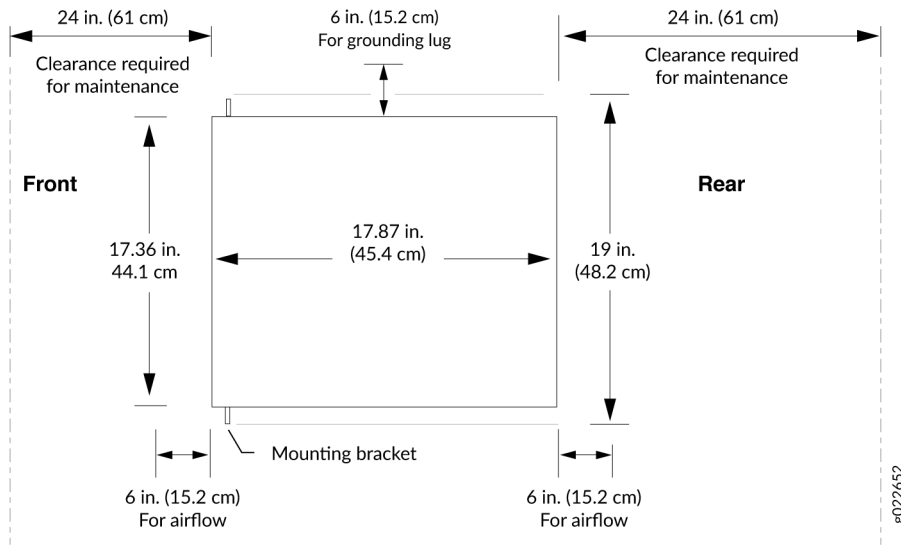
Figure 54: Clearance Requirements for Airflow and Hardware Maintenance for EX4300-48MP Switches
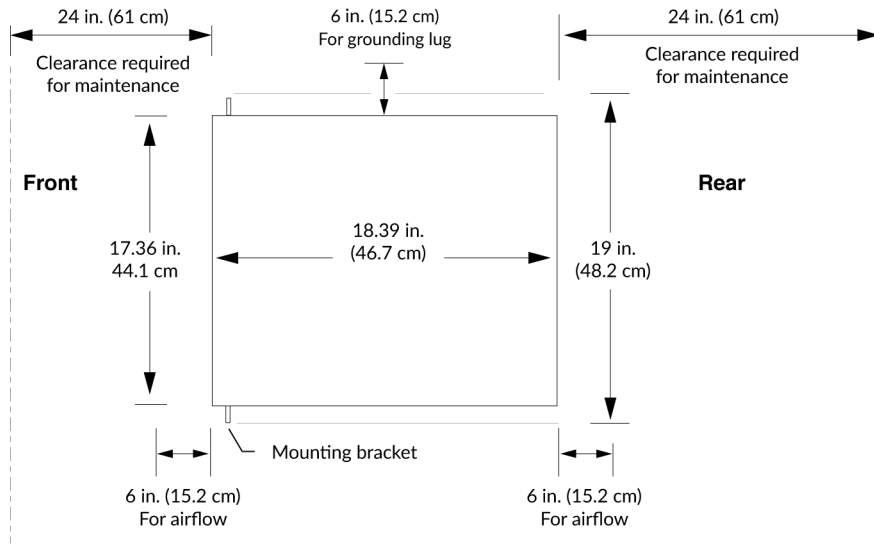
RELATED DOCUMENTATION

Chassis Physical Specifications for EX4300 Switches

Rack-Mounting and Cabinet-Mounting Warnings

General Site Guidelines

Cooling System and Airflow in an EX4300 Switch

CHAPTER 9

Port and Interface Specifications

IN THIS CHAPTER

Console Port Connector Pinout Information

The console port on a Juniper Networks device 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.

provides the pinout information for the RJ-45 console connector.

> **NOTE**: We no longer include the RJ-45 console cable with the DB-9 adapter as part of the device package. If the console cable and adapter are not included in your device package, or if you need a different type of adapter, you can order the following separately:
>
> - RJ-45 to DB-9 adapter (JNP-CBL-RJ45-DB9)
>
> - RJ-45 to USB-A adapter (JNP-CBL-RJ45-USBA)
>
> - RJ-45 to USB-C adapter (JNP-CBL-RJ45-USBC)
>
> If you want to use RJ-45 to USB-A or RJ-45 to USB-C adapter you must have X64 (64-Bit) Virtual COM port (VCP) driver installed on your PC. See, https://ftdichip.com/drivers/vcp-drivers/ to download the driver.

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

Table 29: Console Port Connector Pinout Information

Pin	Signal	Description
1	NC	No connect
2	NC	No connect
3	TxD Output	Transmit data
4	GND	Signal ground
5	GND	Signal ground
6	RxD Input	Receive data
7	DCD Input	Data carrier detect
8	NC	No connect

Console Port Connector Pinouts for the QFX Series

The console port (labeled **CON** or **CONSOLE**) 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. You can also use a RJ45 to USB 2.0 Type-A cable and a RJ45 to USB 2.0 Type-C cable.

provides the pinout information for the RJ-45 console connector.

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

NOTE: We no longer include the RJ-45 console cable with the DB-9 adapter as part of the device package. If the console cable and adapter are not included in your device package, or if you need a different type of adapter, you can order the following separately:

- RJ-45 to DB-9 adapter (JNP-CBL-RJ45-DB9)

- RJ-45 to USB-A adapter (JNP-CBL-RJ45-USBA)

- RJ-45 to USB-C adapter (JNP-CBL-RJ45-USBC)

If you want to use RJ-45 to USB-A or RJ-45 to USB-C adapter you must have X64 (64-Bit) Virtual COM port (VCP) driver installed on your PC. See, https://ftdichip.com/drivers/vcp-drivers/ to download the driver.

Table 30: Console Port Connector Pinouts for the QFX Series

Pin	Signal	Description
3	TxD Output	Transmit data
4	Signal Ground	Signal ground
5	Signal Ground	Signal ground
6	RxD Input	Receive data
7	DCD Input	Data carrier detect

Management Port Connector Pinouts for the QFX Series

The 1000BASE-T RJ-45 management ports use an RJ-45 connector to connect either to the control plane and management network in a QFabric system, or to a management device for out-of-band management.

Table 31 on page 143 provides the pinout information of the RJ-45 management port connector. An RJ-45 cable is supplied with the QFX Series device.

> **NOTE**: The RJ-45 pinout information in Table 31 on page 143 also applies to the QFX5100-48T device 10GBASE-T access ports.

Table 31: RJ-45 Management Port Connector Pinouts for the QFX Series

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
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

Management Port LEDs on a QFX3100 Director Device

Mini-USB Port Pinout Specifications

If your management host (laptop or PC) does not have a DB-9 plug connector pin or an RJ-45 connector pin but has a USB port, you can connect your management host to the Mini-USB Type-B console port by using a cable that has a standard Type-A USB connector on one end and a Mini-USB Type-B (5-pin) connector on the other end.

The Mini-USB Type-B console port uses a Mini-USB Type-B connector to connect to a console management device. The default baud rate for the console port is 9600 baud.

Table 32 on page 144 provides the pinout information of the Mini-USB Type-B console port.

Table 32: Mini-USB Type-B Console Port Pinout Information

Pin	Signal	Description
1	VCC	+5 VDC
2	D-	Data -
3	D+	Data +
X	N/C	Could be not connected (N/C), connected to ground (GND), or used as an attached device presence indicator
4	GND	Ground

USB Port Specifications for an EX Series Switch

Juniper Networks tested and officially supports the following USB flash drives 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 primary boot record. Microsoft Windows formatting, by default, does not use a primary boot record. See the documentation for your USB flash drive for information about how your USB flash drive is formatted.

USB Port Specifications for the QFX Series

The following Juniper Networks USB flash drives have been tested and are officially supported for the USB port in the QFX Series:

- RE-USB-1G-S—1-gigabyte (GB) USB flash drive (except QFX3100 Director device)

- RE-USB-2G-S—2-GB USB flash drive (except QFX3100 Director device)

- RE-USB-4G-S—4-GB USB flash drive

> ⚠️ **CAUTION**: Any USB memory product not listed as supported for the QFX Series has not been tested by Juniper Networks. The use of any unsupported USB memory

product could expose your device 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.

CAUTION: Remove the USB flash drive before upgrading Junos OS or rebooting a QFX Series device. Failure to do so could expose your device to unpredictable behavior.

NOTE: Executing the `request system snapshot` CLI command on a QFX3500 device requires an external USB flash drive with at least 4 GB of free space. We recommend using the RE-USB-4G-S flash drive.

NOTE: USB flash drives used with the QFX Series device must support USB 2.0 or later.

Transceiver and Cable Specifications

IN THIS CHAPTER

Determining Transceiver Support for the QFX5110

The port panel of the QFX5110-48S supports 48 logical 10-Gigabit Ethernet ports. These data ports (**0** through **47**) support either 1-Gigabit small form-factor pluggable (SFP) or 10-Gigabit Ethernet Ethernet small form-factor pluggable plus (SFP+) transceivers. You can also use SFP+ DAC cables and 10-Gigabit active optical cables (AOC) in any access port.

The remaining 4 QSFP28 ports (**48** through **51**) support speeds of 40 Gbps or 100 Gbps. Each port can be configured as an independent 100-Gigabit Ethernet port or as an independent 40-Gigabit Ethernet port. These port are usually used as uplinks. In 40-Gigabit Ethernet mode, these ports can be channelized using QSP+ to SFP+ DAC breakout (DACBO) cables.

You can find information about the optical transceivers supported on your Juniper device by using the Hardware Compatibility Tool. In addition to transceiver and connection type, the optical and cable characteristics–where applicable–are documented for each transceiver. The Hardware Compatibility

Tool enables you to search by product, displaying all the transceivers supported on that device, or category, by interface speed or type. The list of supported transceivers for the QFX5110 is located at https://pathfinder.juniper.net/hct/product/#prd=QFX5110.

> **CAUTION**: The Juniper Networks Technical Assistance Center (JTAC) provides complete support for Juniper-supplied optical modules and cables. However, JTAC does not provide support for third-party optical modules and cables that are not qualified or supplied by Juniper Networks. If you face a problem running a Juniper device that uses third-party optical modules or cables, JTAC may help you diagnose host-related issues if the observed issue is not, in the opinion of JTAC, related to the use of the third-party optical modules or cables. Your JTAC engineer will likely request that you check the third-party optical module or cable and, if required, replace it with an equivalent Juniper-qualified component.
>
> Use of third-party optical modules with high-power consumption (for example, coherent ZR or ZR+) can potentially cause thermal damage to or reduce the lifespan of the host equipment. Any damage to the host equipment due to the use of third-party optical modules or cables is the users' responsibility. Juniper Networks will accept no liability for any damage caused due to such use.

Determining Interface Support for the QFX5100 Device

All product SKUs of the QFX5100 supply quad small form-factor pluggable plus (QSFP+) ports for use as uplinks, as access ports, or as Virtual Chassis ports (VCPs). These 40 GbE ports support QSFP+ transceivers, QSFP+ direct-attach copper (DAC) cables, and DAC breakout cables (DACBO). The QFX5100-48S has 6 QSFP+ ports; the QFX5100-96S has 8 QSFP+ ports; the QFX5100-24Q has 24 built-in QSFP+ ports that can all be used as uplinks. The You can also add two QFX-EM-4Q expansion modules to the QFX5100-24Q for additional QSFP+ uplink ports. Each QSFP+ port on a QFX5100-24Q can be configured to operate as 10-Gigabit Ethernet interface by using a breakout cable or as a single 40-Gigabit Ethernet interface. See *Configuring the QSFP+ Port Type on QFX5100 Devices* for more information.

On all QFX5100 product SKUs, the ports are enabled by default and the default config adds the ports to the default VLAN.

Downlink ports are product SKU-specific:

- *QFX5100-96S*–has 96 small form-factor pluggable plus (SFP+) ports that support SFP and SFP+ transceivers, as well as DAC cables.

- *QFX5100-48S*–has 48 SFP+ ports that support SFP and SFP+ transceivers, as well as DAC cables.

- *QFX5100-48T*–has 6 QSFP+ uplink ports.

- *QFX5100-24Q*–has 24 QSFP+ access ports that can be configured to operate as 10-Gigabit Ethernet interfaces or as a single 40-Gigabit Ethernet interface.

- *QFX5100-24Q-AA*–has 24 QSFP+ access ports that can be configured to operate as 10-Gigabit Ethernet interfaces or as a single 40-Gigabit Ethernet interface.

Figure 55 on page 149 shows the location of SFP+ and QSFP+ ports for the QFX5100-96S, Figure 56 on page 149 shows these ports for the QFX5100-48S device, Figure 57 on page 150 shows the RJ45 and QSFP+ ports for the QFX5100-48T device, and Figure 58 on page 150 shows the location of QSFP+ ports for the QFX5100-24Q device.

Figure 55: Port Panel QFX5100-96S Device
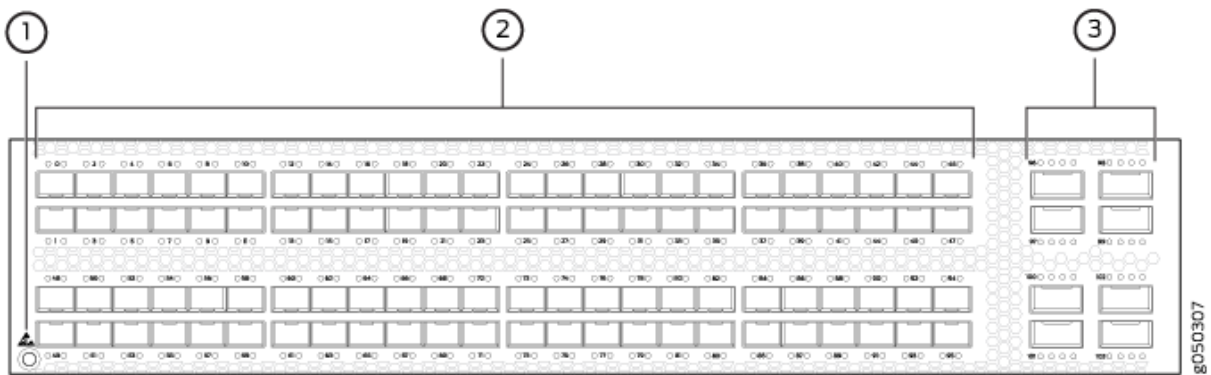
1–	Electrostatic discharge (ESD) terminal	3–	QSFP+ uplink ports (8)
2–	SFP+ access ports (96)		

Figure 56: Port Panel QFX5100-48S Device
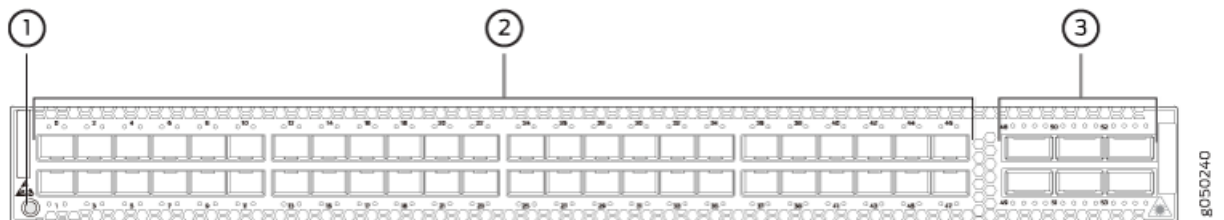
1–	Electrostatic discharge (ESD) terminal	3–	QSFP+ uplink ports (6)
2–	SFP+ access ports (48)		

Figure 57: Port Panel QFX5100-48T Device

1–	Electrostatic discharge (ESD) terminal	3–	QSFP+ uplink ports (6)
2–	RJ45 access ports (48)		
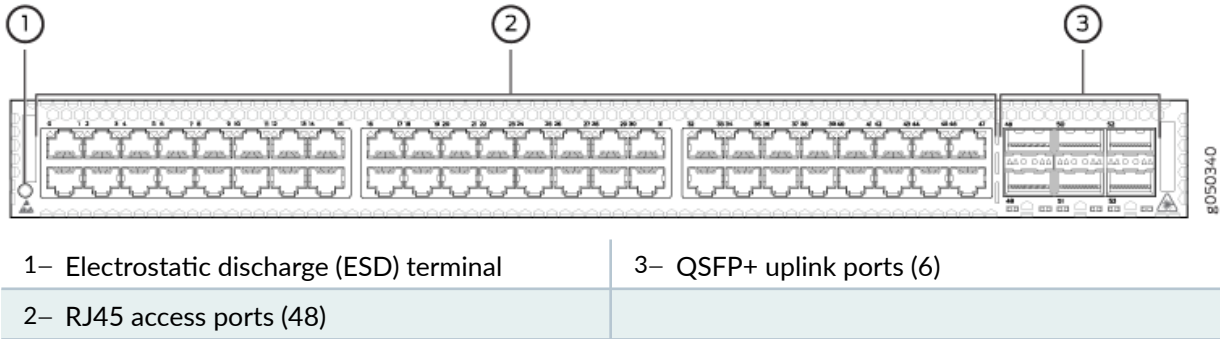
Figure 58: Port Panel QFX5100-24Q Device

1–	Electrostatic discharge (ESD) terminal	3–	Expansion module bays with cover panels (2)
2–	QSFP+ access or uplink ports (24)		
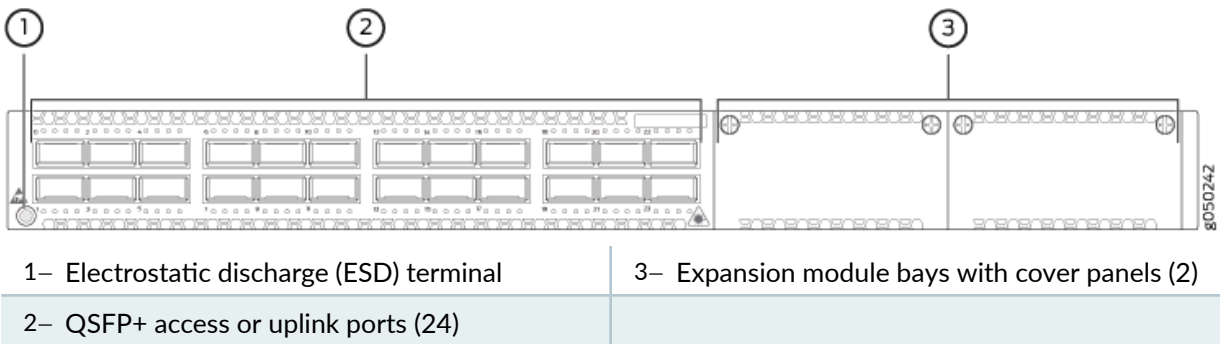
Figure 59: Port Panel QFX5100-24Q-AA Device
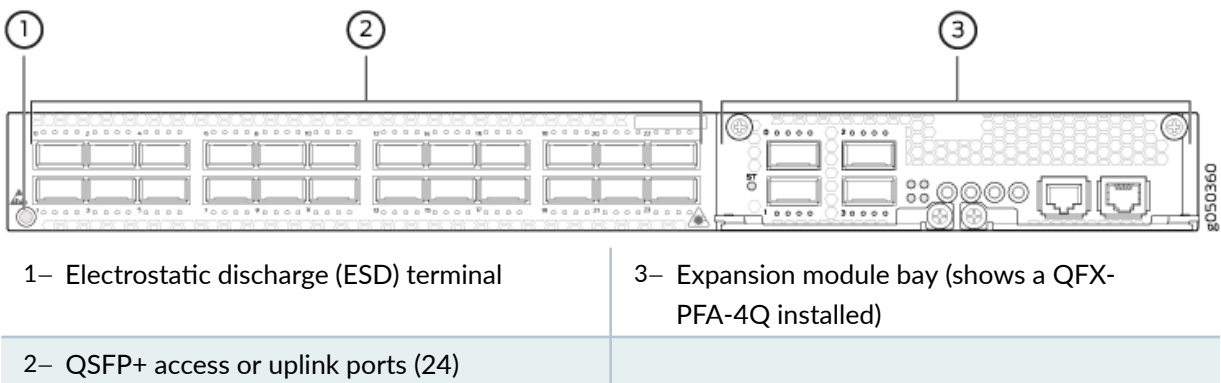
1–	Electrostatic discharge (ESD) terminal	3–	Expansion module bay (shows a QFX-PFA-4Q installed)
2–	QSFP+ access or uplink ports (24)		

You can find information about the optical transceivers supported on your Juniper device by using the Hardware Compatibility Tool. In addition to transceiver and connection type, the optical and cable characteristics–where applicable–are documented for each transceiver. The Hardware Compatibility Tool enables you to search by product, displaying all the transceivers supported on that device, or

category, by interface speed or type. The list of supported transceivers for the QFX5100 is located at https://pathfinder.juniper.net/hct/product/#prd=QFX5100.

> ⚠️ **CAUTION**: If you face a problem running a Juniper Networks device that uses 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.

Determining Interface Support for the QFX3600 Device

The QFX3600 device provides 16 QSFP+ ports, which support QSFP+ transceivers and QSFP+ DAC or DAC breakout cables.

On a QFX3600 Node device in a QFabric system, four ports (labeled **Q0** through **Q3**) operate as 40-Gbps data uplink (`fte`) ports for uplink connections between your QFX3600 Node device and your Interconnect device. Twelve ports (labeled **Q4** through **Q15**) operate in 10-Gigabit Ethernet (`xe`) mode to support 48 10-Gigabit Ethernet interfaces for connections to either endpoint systems or external networks. Optionally, you can choose to configure ports **Q0** through **Q7** to operate as 40-Gbps data uplink (`fte`) ports, and ports **Q2** through **Q15** to operate in 10-Gigabit Ethernet (`xe`) or 40-Gigabit Ethernet (`xle`) mode. See *Configuring the Port Type on QFX3600 Node Devices* for more information.

On a QFX3600 standalone switch, ports **Q0** through **Q15** operate as 40-Gigabit Ethernet (`xle`) ports. Optionally, you can choose to configure ports **Q0** through **Q15** to operate as 10-Gigabit Ethernet (`xe`) ports. See Configuring the Port Type on QFX3600 Standalone Switches for more information.

> **NOTE**: On a QFX3600 standalone switch, you can either configure up to 63 or 64 10-Gigabit Ethernet ports on ports **Q0** through **Q15**, depending on the Junos OS release running on the switch. See the Channelizing Interfaces topic for your specific Junos OS release for further details.

You can use SFP transceivers to connect the QFX3600 device to a management network, or the control plane and management network of a QFabric system. The 1000BASE-SX Gigabit Ethernet SFP module (QFX-SFP-1GE-SX) is supported in the SFP management ports labeled **C0S** and **C1S**. The QFX3600 device also has two 1000BASE-T RJ-45 management ports (labeled **C0** and **C1**), which can be used to connect the QFX3600 device to a management network, or the control plane and management network of a QFabric system.

> **NOTE**: The QSFP+ DAC cables consist of a cable assembly terminated with QSFP+ transceivers on either end. If you use the QSFP+ DAC cable as the data plane connection between a QFX3600-I Interconnect device and a QFX3600 or QFX3500 Node device, the interface is automatically configured to operate at 40 Gbps. If you use the QSFP+ DAC cable to interconnect a QFX3600 Node device with another device, the interface is automatically configured to operate as four 10-Gigabit Ethernet interfaces over one cable.

You can find information about the optical transceivers supported on your Juniper device by using the Hardware Compatibility Tool. In addition to transceiver and connection type, the optical and cable characteristics–where applicable–are documented for each transceiver. The Hardware Compatibility Tool enables you to search by product, displaying all the transceivers supported on that device, or category, by interface speed or type. The list of supported transceivers for the QFX3600 and QFX3600-I Interconnect device is located at https://pathfinder.juniper.net/hct/product/#prd=QFX3600.

> ⚠️ **CAUTION**: If you face a problem running a Juniper Networks device that uses 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.

RELATED DOCUMENTATION

Front Panel of a QFX3600 Device

Rear Panel of QFX3600 and QFX3600-I Devices

Determining Interface Support for the QFX3500 Device

The 48 small form-factor pluggable plus (SFP+) access ports in the QFX3500 device support SFP and SFP+ transceivers, as well as SFP+ direct-attach copper (DAC) cables.

The four quad small form-factor pluggable plus (QSFP+) uplink ports in the QFX3500 device support QSFP+ transceivers, as well as QSFP+ DAC and DAC breakout cables. When the QFX3500 device is operating as a standalone switch, each QSFP+ port can be configured to operate as 10-Gigabit Ethernet interfaces or a single 40-Gigabit Ethernet interface. By default, the uplink ports on a standalone switch are configured as 10-Gigabit Ethernet interfaces.

> **NOTE**: Ports **Q1** through **Q3** support four of the 10-Gigabit Ethernet interfaces. Together, the three QSFP+ ports provide up to 12 10-Gigabit Ethernet interfaces. Port **Q0** also supports 10-Gigabit Ethernet interfaces, but the number of interfaces supported depends on the release of Junos OS running on the switch. Some Junos OS releases support three 10-Gigabit Ethernet interfaces, others support four. See the topic on Channelizing Interface for your specific release.

shows the uplink ports and lists the interfaces created on each port when they are configured as 10-Gigabit Ethernet interfaces.

Figure 60: QSFP+ Uplink Port Locations
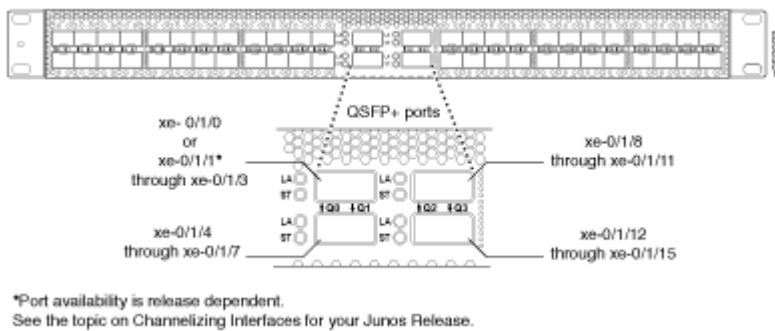
If your QFX3500 device has an SFP management board instead of the 1000BASE-T RJ-45 management board, you can use the SFP transceivers to connect the QFX3500 device to a management network, or the control plane and management network of a QFabric system. The 1000BASE-SX Gigabit Ethernet SFP module (QFX-SFP-1GE-SX) is supported in the SFP management ports in the following software releases:

- Junos OS 12.1X49-D1 or later for the QFX3500 device as a standalone switch

- Junos OS 12.2X50-D10 or later for the QFX3500 Node device in a QFabric system

You can find information about the optical transceivers supported on your Juniper device by using the Hardware Compatibility Tool. In addition to transceiver and connection type, the optical and cable characteristics–where applicable–are documented for each transceiver. The Hardware Compatibility Tool enables you to search by product, displaying all the transceivers supported on that device, or category, by interface speed or type. The list of supported transceivers for the QFX3500 is located at https://pathfinder.juniper.net/hct/product/#prd=QFX3500.

> **CAUTION**: If you face a problem running a Juniper Networks device that uses 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.

RELATED DOCUMENTATION

Front Panel of a QFX3500 Device

Pluggable Transceivers Supported on EX4300 Switches

You can find the list of transceivers supported on EX4300 switches except EX4300-48MP and EX4300-48MP-S switches and information about those transceivers at the Hardware Compatibility Tool page for EX4300.

You can find the list of transceivers supported on EX4300-48MP and EX4300-48MP-S switches and information about those transceivers at the Hardware Compatibility Tool page for EX4300 Multigigabit.

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

> **CAUTION**: The Juniper Networks Technical Assistance Center (JTAC) provides complete support for Juniper-supplied optical modules and cables. However, JTAC does not provide support for third-party optical modules and cables that are not qualified or supplied by Juniper Networks. If you face a problem running a Juniper device that uses third-party optical modules or cables, JTAC may help you diagnose host-related issues if the observed issue is not, in the opinion of JTAC, related to the use of the third-party optical modules or cables. Your JTAC engineer will likely request that you check the third-party optical module or cable and, if required, replace it with an equivalent Juniper-qualified component.
>
> Use of third-party optical modules with high-power consumption (for example, coherent ZR or ZR+) can potentially cause thermal damage to or reduce the lifespan of the host equipment. Any damage to the host equipment due to the use of third-party

optical modules or cables is the users' responsibility. Juniper Networks will accept no liability for any damage caused due to such use.

The Gigabit Ethernet transceivers installed in EX4300 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 ports configured as Virtual Chassis ports (VCPs).

RELATED DOCUMENTATION

Remove a Transceiver

Install a Transceiver

Remove a QSFP28 Transceiver

Install a QSFP28 Transceiver

Cable Specifications for QSFP+, QSFP28, and QSFP-DD Transceivers

The 40-Gigabit Ethernet QSFP+, 100-Gigabit Ethernet QSFP28, and 400G (QDD-400G-DR4 and QDD-400G-SR4P2) transceivers that are used in QFX Series switches use 12-ribbon multimode fiber crossover cables with socket MPO-12 (UPC/APC) connectors. The fiber can be either OM3 or OM4. These cables are not sold by Juniper Networks.

CAUTION: To maintain agency approvals, use only a properly constructed, shielded cable.

TIP: Ensure that you order cables with the correct polarity. Vendors refer to these crossover cables as *key up to key up*, *latch up to latch up*, *Type B*, or *Method B*. If you are using patch panels between two QSFP+ or QSFP28 transceivers, ensure that the proper polarity is maintained through the cable plant.

Table 33 on page 156 describes the signals on each fiber. Table 34 on page 156 shows the pin-to-pin connections for proper polarity.

Table 33: QSFP+ and QSFP28 Optical Module Receptacle Pinouts

Fiber	Signal
1	Tx0 (Transmit)
2	Tx1 (Transmit)
3	Tx2 (Transmit)
4	Tx3 (Transmit)
5	Unused
6	Unused
7	Unused
8	Unused
9	Rx3 (Receive)
10	Rx2 (Receive)
11	Rx1 (Receive)
12	Rx0 (Receive)

Table 34: QSFP+ MPO Fiber-Optic Crossover Cable Pinouts

Pin	Pin
1	12
2	11

Table 34: QSFP+ MPO Fiber-Optic Crossover Cable Pinouts *(Continued)*

Pin	Pin
3	10
4	9
5	8
6	7
7	6
8	5
9	4
10	3
11	2
12	1

Cable Specifications for Console and Management Connections for the QFX Series

lists the specifications for the cables that connect the QFX Series switch to a management device.

> **NOTE**: The QFX Series can be configured with small form-factor pluggable (SFP) management ports that support 1000BASE-SX transceivers. QFX5130 switches come with a RJ-45

management port, and support 10-Gbps speed. See the Hardware Compatibility Tool for more information about the fiber-optic cables required for use with these transceivers.

Table 35: Cable Specifications for Console and Management Connections for the QFX Series

Port on QFX Series Device	Cable Specification	Maximum Length	Device Receptacle
Console port	RS-232 (EIA-232) serial cable	7 feet (2.13 meters)	RJ-45
Management port	Category 5 cable or equivalent suitable for 1000BASE-T operation	328 feet (100 meters)	RJ-45

NOTE: We no longer include the RJ-45 console cable with the DB-9 adapter as part of the device package. If the console cable and adapter are not included in your device package, or if you need a different type of adapter, you can order the following separately:

- RJ-45 to DB-9 adapter (JNP-CBL-RJ45-DB9)

- RJ-45 to USB-A adapter (JNP-CBL-RJ45-USBA)

- RJ-45 to USB-C adapter (JNP-CBL-RJ45-USBC)

If you want to use RJ-45 to USB-A or RJ-45 to USB-C adapter you must have X64 (64-Bit) Virtual COM port (VCP) driver installed on your PC. See, https://ftdichip.com/drivers/vcp-drivers/ to download the driver.

How to Calculate the Fiber-Optic Cable Power Budget for QFX Series Switches

Calculate the fiber-optic data 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 the 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 referenced to 1 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

How to Calculate the Fiber-Optic Cable Power Margin for QFX Series Switches

Before you calculate the power margin, calculate the power budget. See *How to Calculate the Fiber-Optic Cable Power Budget for QFX Series Switches*.

Calculate the fiber-optic data 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) is 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 power margin (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.

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 (here, the link is 2 km long and multimode, and the power margin (P_M) is 13 dBm).

Table 36: Estimated Values for Factors Causing Link Loss

Link-Loss Factor	Estimated Link Loss Value	Sample Link Loss Calculation Values
Higher-order mode losses	Multimode—0.5 dBm	0.5 dBm
	Single-mode—None	0 dBm
Modal and chromatic dispersion	Multimode—None, if the sum of bandwidth and distance is less than 500 MHz/km	0 dBm
	Single-mode—None	0 dBm
Connector	0.5 dBm	This example assumes five connectors. Loss for five connectors: 5 (0.5 dBm) = 2.5 dBm.
Splice	0.5 dBm	This example assumes two splices. Loss for two splices: 2 (0.5 dBm) = 1 dBm.
Fiber attenuation	Multimode—1 dBm/km	This example assumes the link is 2 km long. Fiber attenuation for 2 km: 2 km (1 dBm/km) = 2 dBm.
	Single-mode—0.5 dBm/km	This example assumes the link is 2 km long. Fiber attenuation for 2 km: 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 x (0.5 dBm) – 2 (0.5 dBm) – 2 km (1.0 dBm/km) – 1 dB [CRM] = P_M

13 dB m – 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 specifications for your receiver to find the maximum receiver input power.

Management Cable Specifications

lists the specifications for the cables that connect the console and management ports to management devices.

Table 37: Specifications of Cables to Connect to Management Devices

Ports	Cable Specifications	Receptacle	Additional Information
RJ-45 Console port	Rollover cable	RJ-45	*Connect a Device to a Management Console Using an RJ-45 Connector*
Management Ethernet port	Ethernet cable with an RJ-45 connector	RJ-45	*Connect a Device to a Network for Out-of-Band Management*
Mini-USB Type-B Console port	Mini-USB cable with standard-A and Mini-USB Type-B (5-pin) connector	Mini-USB	

Overview of 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 cables, including multimode and single-mode fiber-optic cable.

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), higher-order mode loss (HOL) occurs. (Cladding consists of layers of lower-refractive index material in close contact with a core material of higher refractive index.) 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. Single-mode fiber is consequently more expensive than multimode fiber.

Exceeding the maximum transmission distances can result in significant signal loss, which causes unreliable transmission.

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 transmissions. 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 usually limits the maximum bit rate and link length. Chromatic dispersion or attenuation is not a factor.

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, you can consider its effect 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 power loss.

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

IN THIS SECTION

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. The QFX Series uses various types of network cables, including multimode and single-mode fiber-optic cables.

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

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 reflect 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 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.

For information about the maximum transmission distance and supported wavelength range for the types of single-mode and multimode fiber-optic cables that are connected to the QFX Series, see the Hardware Compatibility Tool. Exceeding the maximum transmission distances can result in significant signal loss, which causes unreliable transmission.

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 the 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.

CHAPTER 11

Planning QFX5100 Power Requirements

IN THIS CHAPTER

AC Power Specifications for a QFX5100 Device

Table 38 on page 166 describes the AC power specifications for a QFX5100 device.

Table 38: AC Power Specifications for a QFX5100 Device

Item	
AC input voltage	
AC input line frequency	
AC input current rating	
Typical power consumption	
QFX5100-24Q	230 W
QFX5100-48S and QFX5100-48SH	230 W
QFX5100-48T and QFX5100-48TH	322 W

Table 38: AC Power Specifications for a QFX5100 Device *(Continued)*

Item	
QFX5100-96S	315 W

Maximum power consumption

QFX5100-24Q	365 W
QFX5100-48S and QFX5100-48SH	365 W
QFX5100-48T and QFX5100-48TH	395 W
QFX5100-96S	470 W

AC Power Cord Specifications for a QFX Series Device

Detachable AC power cords are shipped with the chassis, if you include them as part of your order. The coupler is type C13 as described by International Electrotechnical Commission (IEC) standard 60320. The plug 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 14.75 feet (approximately 4.5 meters) in length, to comply with National Electrical Code (NEC) Sections 400-8 (NFPA 75, 5-2.2) and 210-52, and Canadian Electrical Code (CEC) Section 4-010(3). The cords that can be ordered for the QFX Series switches are in compliance.

lists AC power cord specifications provided for each country or region.

Table 39: AC Power Cord Specifications

Country/ Region	Electrical Specifications	Plug Standards	Shipped Juniper Model Number	Spare Juniper Model Number	Graphic
Australia	250 VAC, 10 A, 50 Hz	AS/NZ 3109-1996	CG_CBL-C13-06-AU CG_CBL-C13-09-AU	CBL-EX-PWR-C13-AU	
China	250 VAC, 10 A, 50 Hz	GB 1002-1996	CG_CBL-C13-06-CH	CBL-EX-PWR-C13-CH	
Europe (except Italy, Switzerland, and United Kingdom)	250 VAC, 10 A, 50 Hz	CEE (7) VII	CG_CBL-C13-06-EU	CBL-EX-PWR-C13-EU	
Italy	250 VAC, 10 A, 50 Hz	CEI 23-16/VII	CG_CBL-C13-06-IT	CBL-EX-PWR-C13-IT	
Japan	125 VAC, 12 A, 50 Hz or 60 Hz	JIS C8303	CG_CBL-C13-06-JP	CBL-EX-PWR-C13-JP	
North America	(QFX10002-36Q, QFX10002-72Q only) 125 VAC, 13 A, 60 Hz (all models) 250 VAC, 13 A, 60 Hz (all models) 250 VAC, 13 A, 60 Hz	CAN/CSA No. 49-92 NEMA L6-15 NEMA 6-15	CG_CBL-C13-06-US	CBL-EX-PWR-C13-US CBL-PW-C13-250-US CBL-PWR-C13-250-US	
South Korea	250 VAC, 10 A, 60 Hz 250 VAC, 13 A, 60 Hz	KSC 8305; K60884-1	CG_CBL-C13-06-KR	CBL-EX-PWR-C13-KR	

Table 39: AC Power Cord Specifications *(Continued)*

Country/ Region	Electrical Specifications	Plug Standards	Shipped Juniper Model Number	Spare Juniper Model Number	Graphic
Switzerland	250 VAC, 10 A, 50 Hz	SEV 1011 SEV 1991; EN 60320 C13	CG_CBL-C13-06-SZ	CBL-EX-PWR-C13-SZ	
United Kingdom	250 VAC, 10 A, 50 Hz	BS 1363/A	CG_CBL-C13-06-UK	CBL-EX-PWR-C13-UK	

DC Power Specifications for a QFX5100 Device

describes the DC power specifications for DC product SKUs of the QFX5100 device.

Table 40: DC Power Specifications for a QFX5100 Device

Item	Product SKUs	Specifications
DC input voltage	QFX5100-24Q QFX5100-48S QFX5100-48T	• Rated operating voltage: –48 VDC to -60 VDC • Operating voltage range: -40 VDC through –72 VDC
	QFX5100-96S	• Rated operating voltage: VDC -48 VDC to -60 VDC • Operating voltage range: –40 VDC through -72 VDC

Table 40: DC Power Specifications for a QFX5100 Device *(Continued)*

Item	Product SKUs	Specifications
DC input current rating	QFX5100-24Q QFX5100-48S QFX5100-48T QFX5100-96S	10 A maximum
Typical power consumption	QFX5100-48S QFX5100-48T QFX5100-24Q	300 W
	QFX5100-96S	315 W
Maximum power consumption	QFX5100-24Q QFX5100-48S QFX5100-48T	385 W
	QFX5100-96S	470 W

CHAPTER 12

Planning QFX5110 Power Requirements

IN THIS CHAPTER

QFX5110 AC Power Specifications

Table 41 on page 171 describes the AC power specifications for QFX5110 switches. The typical and maximum power consumption values are calculated using small form-factor plus (SFP+) direct attach copper (DAC) cables on all network ports and all 100GBASE-SR4 transceivers in the uplink ports. Traffic is run at 25° C ambient.

Table 41: AC Power Specifications for QFX5110 Models

Item	QFX5110-48S Specification	QFX5110-32Q Specification
AC input voltage	Operating range: 90 VAC to 264 VAC	Operating range: 90 VAC to 264 VAC
AC input line frequency	50–60 Hz	50–60 Hz
AC input current rating	3.6 A at 90 VAC	3.6 A at 90 VAC
Idle power consumption	150 W	250 W

Table 41: AC Power Specifications for QFX5110 Models *(Continued)*

Item	QFX5110-48S Specification	QFX5110-32Q Specification
Typical power consumption	190 W (input current of 0.973 A at 220 VAC)	148 W
Maximum power consumption	226 W	200 W

AC Power Cord Specifications for a QFX Series Device

Detachable AC power cords are shipped with the chassis, if you include them as part of your order. The coupler is type C13 as described by International Electrotechnical Commission (IEC) standard 60320. The plug 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 14.75 feet (approximately 4.5 meters) in length, to comply with National Electrical Code (NEC) Sections 400-8 (NFPA 75, 5-2.2) and 210-52, and Canadian Electrical Code (CEC) Section 4-010(3). The cords that can be ordered for the QFX Series switches are in compliance.

Table 42 on page 172 lists AC power cord specifications provided for each country or region.

Table 42: AC Power Cord Specifications
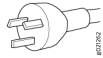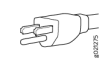
Country/ Region	Electrical Specifications	Plug Standards	Shipped Juniper Model Number	Spare Juniper Model Number	Graphic
Australia	250 VAC, 10 A, 50 Hz	AS/NZ 3109-1996	CG_CBL-C13-06-AU CG_CBL-C13-09-AU	CBL-EX-PWR-C13-AU	

Table 42: AC Power Cord Specifications *(Continued)*

Country/ Region	Electrical Specifications	Plug Standards	Shipped Juniper Model Number	Spare Juniper Model Number	Graphic
China	250 VAC, 10 A, 50 Hz	GB 1002-1996	CG_CBL-C13-06-CH	CBL-EX-PWR-C13-CH	
Europe (except Italy, Switzerland, and United Kingdom)	250 VAC, 10 A, 50 Hz	CEE (7) VII	CG_CBL-C13-06-EU	CBL-EX-PWR-C13-EU	
Italy	250 VAC, 10 A, 50 Hz	CEI 23-16/VII	CG_CBL-C13-06-IT	CBL-EX-PWR-C13-IT	
Japan	125 VAC, 12 A, 50 Hz or 60 Hz	JIS C8303	CG_CBL-C13-06-JP	CBL-EX-PWR-C13-JP	
North America	(QFX10002-36Q, QFX10002-72Q only) 125 VAC, 13 A, 60 Hz (all models) 250 VAC, 13 A, 60 Hz (all models) 250 VAC, 13 A, 60 Hz	CAN/CSA No. 49-92 NEMA L6-15 NEMA 6-15	CG_CBL-C13-06-US	CBL-EX-PWR-C13-US CBL-PW-C13-250-US CBL-PWR-C13-250-US	
South Korea	250 VAC, 10 A, 60 Hz 250 VAC, 13 A, 60 Hz	KSC 8305; K60884-1	CG_CBL-C13-06-KR	CBL-EX-PWR-C13-KR	
Switzerland	250 VAC, 10 A, 50 Hz	SEV 1011 SEV 1991; EN 60320 C13	CG_CBL-C13-06-SZ	CBL-EX-PWR-C13-SZ	

Table 42: AC Power Cord Specifications *(Continued)*

Country/Region	Electrical Specifications	Plug Standards	Shipped Juniper Model Number	Spare Juniper Model Number	Graphic
United Kingdom	250 VAC, 10 A, 50 Hz	BS 1363/A	CG_CBL-C13-06-UK	CBL-EX-PWR-C13-UK	

QFX5110 DC Power Specifications

describes the QFX5110 DC power specifications. The typical and maximum power consumption values are calculated using dummy transceivers on all ports. Traffic is run at 25° C ambient.

Table 43: DC Power Specifications for QFX5110

Item	Specifications
DC input voltage	• Rated operating voltage: –39 VDC to –60 VDC • Operating voltage range: –40 VDC through –72 VDC
DC input current rating	–8.2 A at 39 VDC
Idle power consumption	
• QFX5110-48S • QFX5110-32Q	• 150 W • 250 W
Typical power consumption	

Table 43: DC Power Specifications for QFX5110 *(Continued)*

Item	Specifications
• QFX5110-48S • QFX5110-32Q	• 190 W • 280 W
Maximum power consumption	
• QFX5110-48S • QFX5110-32Q	• 248 W • 335 W

CHAPTER 13

Planning QFX3600 Power Requirements

IN THIS CHAPTER

AC Power Specifications for a QFX3600 or QFX3600-I Device

Table 44 on page 176 describes the AC power specifications for a QFX3600 or QFX3600-I device.

Table 44: AC Power Specifications for a QFX3600 or QFX3600-I Device

Item	Specification
AC input voltage	Operating range: ● 100–240 VAC
AC input line frequency	50–60 Hz
AC input current rating	● 4 A at 100VAC ● 2 A at 240 VAC
Typical power consumption	255 W
Maximum power consumption	345 W

AC Power Cord Specifications for a QFX Series Device

AC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

General Safety Guidelines and Warnings
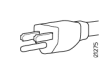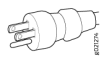
General Electrical Safety Guidelines and Warnings

AC Power Cord Specifications for a QFX Series Device

Detachable AC power cords are shipped with the chassis, if you include them as part of your order. The coupler is type C13 as described by International Electrotechnical Commission (IEC) standard 60320. The plug 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 14.75 feet (approximately 4.5 meters) in length, to comply with National Electrical Code (NEC) Sections 400-8 (NFPA 75, 5-2.2) and 210-52, and Canadian Electrical Code (CEC) Section 4-010(3). The cords that can be ordered for the QFX Series switches are in compliance.

Table 45 on page 177 lists AC power cord specifications provided for each country or region.

Table 45: AC Power Cord Specifications

Country/ Region	Electrical Specifications	Plug Standards	Shipped Juniper Model Number	Spare Juniper Model Number	Graphic
Australia	250 VAC, 10 A, 50 Hz	AS/NZ 3109-1996	CG_CBL-C13-06-AU CG_CBL-C13-09-AU	CBL-EX-PWR-C13-AU	
China	250 VAC, 10 A, 50 Hz	GB 1002-1996	CG_CBL-C13-06-CH	CBL-EX-PWR-C13-CH	

Table 45: AC Power Cord Specifications *(Continued)*

Country/Region	Electrical Specifications	Plug Standards	Shipped Juniper Model Number	Spare Juniper Model Number	Graphic
Europe (except Italy, Switzerland, and United Kingdom)	250 VAC, 10 A, 50 Hz	CEE (7) VII	CG_CBL-C13-06-EU	CBL-EX-PWR-C13-EU	
Italy	250 VAC, 10 A, 50 Hz	CEI 23-16/VII	CG_CBL-C13-06-IT	CBL-EX-PWR-C13-IT	
Japan	125 VAC, 12 A, 50 Hz or 60 Hz	JIS C8303	CG_CBL-C13-06-JP	CBL-EX-PWR-C13-JP	
North America	(QFX10002-36Q, QFX10002-72Q only) 125 VAC, 13 A, 60 Hz (all models) 250 VAC, 13 A, 60 Hz (all models) 250 VAC, 13 A, 60 Hz	CAN/CSA No. 49-92 NEMA L6-15 NEMA 6-15	CG_CBL-C13-06-US	CBL-EX-PWR-C13-US CBL-PW-C13-250-US CBL-PWR-C13-250-US	
South Korea	250 VAC, 10 A, 60 Hz 250 VAC, 13 A, 60 Hz	KSC 8305; K60884-1	CG_CBL-C13-06-KR	CBL-EX-PWR-C13-KR	
Switzerland	250 VAC, 10 A, 50 Hz	SEV 1011 SEV 1991; EN 60320 C13	CG_CBL-C13-06-SZ	CBL-EX-PWR-C13-SZ	
United Kingdom	250 VAC, 10 A, 50 Hz	BS 1363/A	CG_CBL-C13-06-UK	CBL-EX-PWR-C13-UK	

DC Power Specifications for a QFX3600 or QFX3600-I Device

describes the DC power specifications for a QFX3600 or QFX3600-I device.

Table 46: DC Power Specifications for a QFX3600 or QFX3600-I Device

Item	Specifications
DC input voltage	• Minimum operating voltage: –40 VDC • Nominal operating voltage: –48 VDC • Operating voltage range: –40 VDC through –72 VDC
DC input current rating	8 A maximum at nominal operating voltage (–48 VDC)
Typical power consumption	341 W
Maximum power consumption	252 W

RELATED DOCUMENTATION

DC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

DC Power Supply LEDs on a QFX3500, QFX3600, or QFX3600-I Device

CHAPTER 14

Planning QFX3500 Power Requirements

IN THIS CHAPTER

AC Power Specifications for a QFX3500 Device

Table 47 on page 180 describes the AC power specifications for a QFX3500 device.

Table 47: AC Power Specifications for a QFX3500 Device

Item	Specification
AC input voltage	Operating range: • 100–127 VAC • 200–240 VAC
AC input line frequency	50–60 Hz
AC input current rating	• 7.8 A at 100–127 VAC • 3.8 A at 200–240 VAC
Typical power consumption	230 W
Maximum power consumption	365 W

AC Power Cord Specifications for a QFX Series Device

AC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

General Safety Guidelines and Warnings

General Electrical Safety Guidelines and Warnings

AC Power Cord Specifications for a QFX Series Device

Detachable AC power cords are shipped with the chassis, if you include them as part of your order. The coupler is type C13 as described by International Electrotechnical Commission (IEC) standard 60320. The plug 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 14.75 feet (approximately 4.5 meters) in length, to comply with National Electrical Code (NEC) Sections 400-8 (NFPA 75, 5-2.2) and 210-52, and Canadian Electrical Code (CEC) Section 4-010(3). The cords that can be ordered for the QFX Series switches are in compliance.

Table 48 on page 181 lists AC power cord specifications provided for each country or region.

Table 48: AC Power Cord Specifications
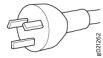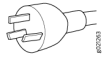
Country/ Region	Electrical Specifications	Plug Standards	Shipped Juniper Model Number	Spare Juniper Model Number	Graphic
Australia	250 VAC, 10 A, 50 Hz	AS/NZ 3109-1996	CG_CBL-C13-06-AU CG_CBL-C13-09-AU	CBL-EX-PWR-C13-AU	
China	250 VAC, 10 A, 50 Hz	GB 1002-1996	CG_CBL-C13-06-CH	CBL-EX-PWR-C13-CH	

Table 48: AC Power Cord Specifications *(Continued)*

Country/ Region	Electrical Specifications	Plug Standards	Shipped Juniper Model Number	Spare Juniper Model Number	Graphic
Europe (except Italy, Switzerland, and United Kingdom)	250 VAC, 10 A, 50 Hz	CEE (7) VII	CG_CBL-C13-06-EU	CBL-EX-PWR-C13-EU	
Italy	250 VAC, 10 A, 50 Hz	CEI 23-16/VII	CG_CBL-C13-06-IT	CBL-EX-PWR-C13-IT	
Japan	125 VAC, 12 A, 50 Hz or 60 Hz	JIS C8303	CG_CBL-C13-06-JP	CBL-EX-PWR-C13-JP	
North America	(QFX10002-36Q, QFX10002-72Q only) 125 VAC, 13 A, 60 Hz (all models) 250 VAC, 13 A, 60 Hz (all models) 250 VAC, 13 A, 60 Hz	CAN/CSA No. 49-92 NEMA L6-15 NEMA 6-15	CG_CBL-C13-06-US	CBL-EX-PWR-C13-US CBL-PW-C13-250-US CBL-PWR-C13-250-US	
South Korea	250 VAC, 10 A, 60 Hz 250 VAC, 13 A, 60 Hz	KSC 8305; K60884-1	CG_CBL-C13-06-KR	CBL-EX-PWR-C13-KR	
Switzerland	250 VAC, 10 A, 50 Hz	SEV 1011 SEV 1991; EN 60320 C13	CG_CBL-C13-06-SZ	CBL-EX-PWR-C13-SZ	
United Kingdom	250 VAC, 10 A, 50 Hz	BS 1363/A	CG_CBL-C13-06-UK	CBL-EX-PWR-C13-UK	

DC Power Specifications for a QFX3500 Device

Table 49 on page 183 describes the DC power specifications for a QFX3500 device.

Table 49: DC Power Specifications for a QFX3500 Device

Item	Specifications
DC input voltage	• Minimum operating voltage: –40 VDC • Nominal operating voltage: –48 VDC • Operating voltage range: –40 VDC through –72 VDC
DC input current rating	7 A maximum at nominal operating voltage (–48 VDC)
Typical power consumption	250 W
Maximum power consumption	385 W

RELATED DOCUMENTATION

DC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

DC Power Supply LEDs on a QFX3500, QFX3600, or QFX3600-I Device

Planning EX4300 Power Requirements

IN THIS CHAPTER

AC Power Supply in EX4300 Switches

IN THIS SECTION

The AC power supply in EX4300 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.

All the EX4300 switches that are powered by AC power supplies, except EX4300-24T-S, EX4300-24P-S, EX4300-32F-S, EX4300-48T-S, EX4300-48P-S, and EX4300-48MP-S switches are shipped with one AC power supply installed in the rear panel of the switches. EX4300-24T-S, EX4300-24P-S, EX4300-32F-S, EX4300-48T-S, EX4300-48P-S, and EX4300-48MP-S switches are not shipped with power supplies; you must order the power supplies separately.

> **NOTE**: EX4300 switches except EX4300-48MP and EX4300-48MP-S switches support 350 W, 715 W, and 1100 W AC power supplies. EX4300-48MP and EX4300-48MP-S switches support 715 W, 1100 W, and 1400 W AC power supplies.

This topic describes the AC power supplies.

> **CAUTION**: Do not mix:
>
> - AC and DC power supplies in the same chassis
>
> - Power supplies with different airflow labels (**AIR IN (AFI)** and **AIR OUT (AFO)**) in the same chassis.
>
> - Fan modules with different airflow labels (**AIR IN (AFI)** and **AIR OUT (AFO)**) in the same chassis.
>
> - Power supplies and fan modules with different airflow labels (**AIR IN (AFI)** and **AIR OUT (AFO)**) in the same chassis.

Characteristics of an AC Power Supply

The AC power supplies for EX4300 switches are available in 350 W, 715 W, 1100 W, and 1400 W models. Figure 61 on page 185 shows an AC power supply for EX4300 switches. The AC power supplies support Power over Ethernet (PoE+) in EX4300-24P, EX4300-24P-S, EX4300-48P, EX4300-48P-S, EX4300-48MP, and EX4300-48MP-S models.

Figure 61: AC Power Supply for EX4300 Switches
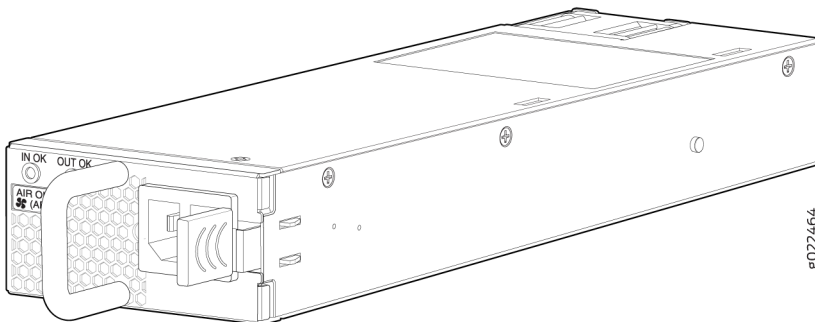
Table 50 on page 186 lists the details of the 350 W, 715 W, 1100 W, and 1400 W AC power supplies used in EX4300 switches.

Table 50: Details of the AC Power Supplies in EX4300 Switches

Details		350 W AC Power Supply	715 W AC Power Supply	1100 W AC Power Supply	1400 W AC Power Supply
Model number		• JPSU-350-AC-AFO-A • JPSU-350-AC-AFI-A	JPSU-715-AC-AFO-A	JPSU-1100-AC-AFO-A	JPSU-1400W-AC-AFO
Field-replaceable unit (FRU) type		Hot-insertable and hot-removable	Hot-insertable and hot-removable	Hot-insertable and hot-removable	Hot-insertable and hot-removable
Power supply weight		2.43 lb (1.1 kg)	2.43 lb (1.1 kg)	2.43 lb (1.1 kg)	3.06 lb (1.39 kg)
Minimum installed in chassis		1	1	1	1
Maximum installed in chassis		2	2	2	2
Power supply slots		Install in power supply slots labeled **PSU 0** and **PSU 1** in the rear panel of the chassis.	Install in power supply slots labeled **PSU 0** and **PSU 1** in the rear panel of the chassis.	Install in power supply slots labeled **PSU 0** and **PSU 1** in the rear panel of the chassis.	Install in power supply slots labeled **PSU 0** and **PSU 1** in the rear panel of the chassis.
AC appliance Inlet **NOTE**: Each AC appliance inlet requires a dedicated AC power feed.	Number	1	1	1	1
	Type	IEC-320-C13	IEC-320-C13	IEC-320-C15	IEC-320-C15

Table 50: Details of the AC Power Supplies in EX4300 Switches *(Continued)*

Details		350 W AC Power Supply	715 W AC Power Supply	1100 W AC Power Supply	1400 W AC Power Supply
	Rating	2 A **NOTE**: EX4300-48MP and EX4300-48MP-S switches do not support this power supply.	• EX4300 switches except EX4300-48MP and EX4300-48MP-S switches— 11–5 A • EX4300-48MP and EX4300-48MP-S switches— 10 A	• EX4300 switches except EX4300-48MP and EX4300-48MP-S switches— 12–6 A • EX4300-48MP and EX4300-48MP-S switches— 15 A	12–8 A
Fans		Internal	Internal	Internal	Internal
Airflow		• Front-to-back, indicated by label **AIR OUT (AFO)** • Back-to-front, indicated by label **AIR IN (AFI)**	Front-to-back, indicated by label **AIR OUT (AFO)**	Front-to-back, indicated by label **AIR OUT (AFO)**	Front-to-back, indicated by label **AIR OUT (AFO)**
AC power cord retainer		1	1	1	1
Power supply status LEDs		**IN OK** and **OUT OK**	**IN OK** and **OUT OK**	**IN OK** and **OUT OK**	**IN OK** and **OUT OK**

Table 50: Details of the AC Power Supplies in EX4300 Switches *(Continued)*

Details	350 W AC Power Supply	715 W AC Power Supply	1100 W AC Power Supply	1400 W AC Power Supply
Operating range	• Low line: 100–120 VAC • High line: 200–240 VAC	• Low line: 100–120 VAC • High line: 200–240 VAC	• Low line: 115–120 VAC • High line: 200–240 VAC	• Low line: 100–140 VAC • High line: 200–240 VAC

NOTE: In EU countries, Egypt, Nigeria, Saudi Arabia, Serbia, South Korea, and South Africa, you must ensure that the redundant power supply is installed in the switch chassis.

To prevent electrical injury while installing or removing AC power supplies, carefully follow instructions in *Installing an AC Power Supply in an EX4300 Switch* and *Removing an AC Power Supply from an EX4300 Switch*.

AC Power Supply Airflow

Each power supply has its own fan and is cooled by its own internal cooling system.

Each power supply has a label **AIR OUT (AFO)** or **AIR IN (AFI)** on the faceplate of the power supply that indicates the direction of airflow in the power supply.

lists the AC power supply models and the direction of airflow in them.

Table 51: Airflow Direction in AC Power Supply Models for EX4300 Switches

Model	Label on Power Supply	Direction of Airflow
JPSU-350-AC-AFO-A	**AIR OUT (AFO)**	Front-to-back—that is, air intake to cool the chassis is through the vents on the front panel of the chassis and hot air exhausts through the vents on the rear panel of the chassis.

Table 51: Airflow Direction in AC Power Supply Models for EX4300 Switches *(Continued)*

Model	Label on Power Supply	Direction of Airflow
JPSU-350-AC-AFI-A	**AIR IN (AFI)**	Back-to-front—that is, air intake to cool the chassis is through the vents on the rear panel of the chassis and hot air exhausts through the vents on the front panel of the chassis.
JPSU-715-AC-AFO-A	**AIR OUT (AFO)**	Front-to-back—that is, air intake to cool the chassis is through the vents on the front panel of the chassis and hot air exhausts through the vents on the rear panel of the chassis.
JPSU-1100-AC-AFO-A	**AIR OUT (AFO)**	Front-to-back—that is, air intake to cool the chassis is through the vents on the front panel of the chassis and hot air exhausts through the vents on the rear panel of the chassis.
JPSU-1400W-AC-AFO	**AIR OUT (AFO)**	Front-to-back—that is, air intake to cool the chassis is through the vents on the front panel of the chassis and hot air exhausts through the vents on the rear panel of the chassis.

N+0 Redundancy Configuration of AC Power Supplies

In an *N*+0 redundancy configuration, lower priority PoE ports may be impacted if a power supply fails.

Table 52 on page 189 lists the *N*+0 power calculation for 24-port EX4300 switches that use 350 W, 715 W, and 1100 W power supplies.

Table 52: N+0 AC Power Calculations for 24-Port EX4300 Switches

Power Supply Rating		Total Power (in watts)	Usable System Power (in watts)	Backup Power (in watts)	Base Power (in watts)	Available PoE Power (in watts)	Ports Enabled for PoE+
PSU_0	PSU_1	$PSU_0(W) + PSU_1(W)$					
350 W AC	–	350	350	0	150	200	6
350 W AC	350 W AC	700	665	0	150	515	17

Table 52: N+0 AC Power Calculations for 24-Port EX4300 Switches *(Continued)*

Power Supply Rating		Total Power (in watts) $PSU_0(W)$ + $PSU_1(W)$	Usable System Power (in watts)	Backup Power (in watts)	Base Power (in watts)	Available PoE Power (in watts)	Ports Enabled for PoE+
PSU_0	PSU_1						
350 W AC	715 W AC	1065	993.5	0	150	720	24
715 W AC	–	715	715	0	150	565	18
715 W AC	715 W AC	1430	1358.5	0	150	720	24
715 W AC	1100 W AC	1815	1705	0	150	720	24
1100 W AC	–	1100	1100	0	150	720	24
1100 W AC	1100 W AC	2200	2090	0	150	720	24
1100 W AC	350 W AC	1450	1340	0	150	720	24

lists the *N*+0 power calculation for 32-port EX4300 switches that use the 350 W power supply.

> **NOTE**: 32-port EX4300 switches does not support Power over Ethernet (PoE).

Table 53: N+0 AC Power Calculations for 32-Port EX4300 Switches

Power Supply Rating		Total Power (in watts) $PSU_0(W)$ + $PSU_1(W)$	Usable System Power (in watts)	Backup Power (in watts)	Base Power (in watts)
PSU_0	PSU_1				
350 W AC	–	350	350	0	164

Table 53: N+0 AC Power Calculations for 32-Port EX4300 Switches *(Continued)*

Power Supply Rating		Total Power (in watts) $PSU_0(W) + PSU_1(W)$	Usable System Power (in watts)	Backup Power (in watts)	Base Power (in watts)
PSU_0	PSU_1				
350 W AC	350 W AC	700	665	0	164

Table 54 on page 191 lists the *N*+0 power calculation for 48-port EX4300 switches except EX4300-48MP and EX4300-48MP-S switches that use 350 W, 715 W, and 1100 W power supplies.

Table 54: N+0 AC Power Calculations for 48-Port EX4300 Switches Except EX4300-48MP and EX4300-48MP-S Switches

Power Supply Rating		Total Power (in watts) $PSU_0(W) + PSU_1(W)$	Usable System Power (in watts)	Backup Power (in watts)	Base Power (in watts)	Available PoE Power (in watts)	Ports Enabled for PoE+
PSU_0	PSU_1						
350 W AC	–	350	350	0	175	175	5
350 W AC	350 W AC	700	665	0	175	490	16
350 W AC	715 W AC	1065	993.5	0	175	818	27
715 W AC	–	715	715	0	175	540	18
715 W AC	715 W AC	1430	1358.5	0	175	1183	39
715 W AC	1100 W AC	1815	1705	0	175	1440	48
1100 W AC	–	1100	1100	0	175	925	30
1100 W AC	1100 W AC	2200	2090	0	175	1440	48
1100 W AC	350 W AC	1450	1340	0	175	1165	38

Table 55 on page 192 lists the *N*+0 power calculation for EX4300-48MP and EX4300-48MP-S switches that use 715 W, 1100 W, and 1400 W power supplies.

> **NOTE**: When operating at low line configuration, the 1400 W power supply operates as 1100 W power supply.

Table 55: N+0 AC Power Calculations for EX4300-48MP and EX4300-48MP-S Switches

Power Supply Rating		Total Power (in watts) $PSU_0(W) + PSU_1(W)$	Usable System Power (in watts)	Backup Power (in watts)	Base Power (in watts)	Available PoE Power (in watts)	Ports Enabled for PoE+	Ports Enabled for PoE++
PSU_0	PSU_1							
715 W AC	–	715	679	0	300	379	12	3
715 W AC	715 W AC	1430	1358	0	300	1058	35	11
715 W AC	1100 W AC	1815	1615	0	300	1315	43	13
715 W AC	1400 W AC	2115	1615	0	300	1315	43	13
1100 W AC	–	1100	1045	0	300	745	24	7
1100 W AC	1100 W AC	2200	1670	0	300	1370	45	14
1100 W AC	1400 W AC	2500	1670	0	300	1370	45	14
1400 W AC	–	1400 W AC	1330	0	300	1030	34	10

Table 55: N+0 AC Power Calculations for EX4300-48MP and EX4300-48MP-S Switches *(Continued)*

Power Supply Rating		Total Power (in watts) PSU$_0$(W) + PSU$_1$(W)	Usable System Power (in watts)	Backup Power (in watts)	Base Power (in watts)	Available PoE Power (in watts)	Ports Enabled for PoE+	Ports Enabled for PoE++
PSU$_0$	PSU$_1$							
1400 W AC	1400 W AC	2800	2000	0	300	1700	48	17

N+N Redundancy Configuration of AC Power Supplies

You can configure your switch for $N+N$ redundancy, in which N power supplies can be removed or fail and the remaining N power supplies continue to supply power to the switch without interruption.

lists the $N+N$ power calculation for 24-port EX4300 switches that use 350 W, 715 W, and 1100 W power supplies.

Table 56: N+N AC Power Calculations for 24-Port EX4300 Switches

Power Supply Rating		Total Power (in watts)	Usable System Power (in watts)	Backup Power (in watts)	Base Power (in watts)	Available PoE Power (in watts)	Ports enabled for PoE+
PSU$_0$	PSU$_1$						
350 W AC	–	350	350	0	150	200	6
350 W AC	350 W AC	700	350	350	150	200	6
350 W AC	715 W AC	1065	350	350	150	200	6
715 W AC	–	715	715	0	150	565	18
715 W AC	715 W AC	1430	715	715	150	565	18

Table 56: N+N AC Power Calculations for 24-Port EX4300 Switches *(Continued)*

Power Supply Rating		Total Power (in watts)	Usable System Power (in watts)	Backup Power (in watts)	Base Power (in watts)	Available PoE Power (in watts)	Ports enabled for PoE+
PSU$_0$	PSU$_1$						
715 W AC	1100 W AC	1815	715	715	150	565	18
1100 W AC	–	1100	1100	0	150	720	24
1100 W AC	1100 W AC	2200	1100	1100	150	720	24
1100 W AC	350 W AC	1450	350	350	150	200	6

Table 57 on page 194 lists the *N+N* power calculation for 32-port EX4300 switches that use 350 W power supplies.

NOTE: 32-port EX4300 switches does not support Power over Ethernet (PoE).

Table 57: N+N AC Power Calculations for 32-Port EX4300 Switches

Power Supply Rating		Total Power (in watts)	Usable System Power (in watts)	Backup Power (in watts)	Base Power (in watts)
PSU$_0$	PSU$_1$				
350 W AC	–	350	350	0	177
350 W AC	350 W AC	700	350	350	177

Table 58 on page 195 lists the *N+N* power calculation for 48-port EX4300 switches except EX4300-48MP and EX4300-48MP-S switches that use 350 W, 715 W, and 1100 W power supplies.

Table 58: N+N AC Power Calculations for 48-Port EX4300 Switches Except EX4300-48MP and EX4300-48MP-S Switches

Power Supply Rating		Total Power (in watts)	Usable System Power (in watts)	Backup Power (in watts)	Base Power (in watts)	Available PoE Power (in watts)	Ports enabled for PoE+
PSU_0	PSU_1						
350 W AC	–	350	350	0	175	175	5
350 W AC	350 W AC	700	350	350	175	175	5
350 W AC	715 W AC	1065	350	350	175	175	5
715 W AC	–	715	715	0	175	540	18
715 W AC	715 W AC	1430	715	715	175	540	18
715 W AC	1100 W AC	1815	715	715	175	540	18
1100 W AC	–	1100	1100	0	175	925	30
1100 W AC	1100 W AC	2200	1100	1100	175	925	30
1100 W AC	350 W AC	1450	350	350	175	175	5

Table 59 on page 196 lists the *N+N* power calculation for EX4300-48MP and EX4300-48MP-S switches that use 715 W, 1100 W, and 1400 W power supplies.

NOTE: When operating at low line configuration, the 1400 W power supply operates as 1100 W power supply.

Table 59: N+N AC Power Calculations for EX4300-48MP and EX4300-48MP-S Switches

Power Supply Rating		Total Power (in watts)	Usable System Power (in watts)	Backup Power (in watts)	Base Power (in watts)	Available PoE Power (in watts)	Ports enabled for PoE+	Ports enabled for PoE++
PSU$_0$	PSU$_1$							
715 W AC	–	715	679	0	300	379	12	3
715 W AC	715 W AC	1430	679	679	300	379	12	3
715 W AC	1100 W AC	1815	679	679	300	379	12	3
715 W AC	1400 W AC	2115	679	679	300	379	12	3
1100 W AC	–	1100	1045	0	300	745	24	7
1100 W AC	1100 W AC	2200	1045	1045	300	745	24	7
1100 W AC	1400 W AC	2500	1045	1045	300	745	24	7
1400 W AC	–	1400	1330	0	300	1030	34	10
1400 W AC	1400 W AC	2800	1330	1330	300	1030	34	10

AC Power Cord Specifications for an EX4300 Switch
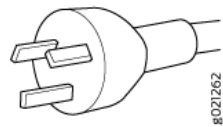
Each AC power supply has a single AC appliance inlet that requires a dedicated AC power feed. A detachable AC power cord is supplied with each AC power supply. The 350 W AC and the 715 W AC power supplies are shipped with AC power cords with the C13 coupler type and the 1100 W AC power supplies and 1400 W AC power supplies are shipped with AC power cord with the C15 coupler type as described by International Electrotechnical Commission (IEC) standard 60320. The plug 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 14.75 ft (4.5 m) in length, to comply with National Electrical Code (NEC) Section 400-8 (NFPA 75, 5-2.2) and Canadian Electrical Code (CEC) Section 4-010(3).
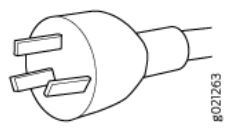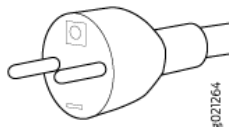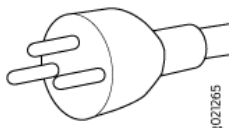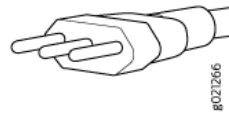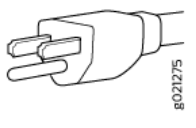
The tables in this topic list the AC power cords specifications provided for different power supplies for each country or region.

- Table 60 on page 197—Power cords for 350 W AC for EX4300 switches except EX4300-48MP and EX4300-48MP-S switches and 715 W AC power supplies for EX4300 switches

- Table 61 on page 200—Specifications of power cords used to connect EX4300 switches to C13 power

- Table 62 on page 200—Power cords for 1100 W AC power supplies for EX4300 switches and 1400 W AC power supplies for EX4300-48MP and EX4300-48MP-S Switches
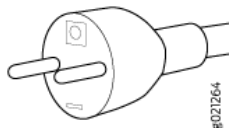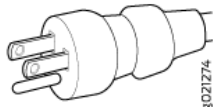
Table 60: AC Power Cord Specifications for 350 W Power Supplies for EX4300 Switches Except EX4300-48MP and EX4300-48MP-S Switches and 715 W AC Power Supplies for EX4300 Switches

Country/ Region	Electrical Specifications	Plug Standards	Juniper Model Number	Graphic
Argentina	250 VAC, 10 A, 50 Hz	IRAM 2073 Type RA/3	CBL-EX-PWR-C13-AR	No graphic available
Australia	250 VAC, 10 A, 50 Hz	AS/NZS 3112 Type SAA/3	CBL-EX-PWR-C13-AU	

Table 60: AC Power Cord Specifications for 350 W Power Supplies for EX4300 Switches Except EX4300-48MP and EX4300-48MP-S Switches and 715 W AC Power Supplies for EX4300 Switches *(Continued)*

Country/ Region	Electrical Specifications	Plug Standards	Juniper Model Number	Graphic
Brazil	250 VAC, 10 A, 50 Hz	NBR 14136 Type BR/3	CBL-EX-PWR-C13-BR	No graphic available
China	250 VAC, 10 A, 50 Hz	GB 1002-1996 Type PRC/3	CBL-EX-PWR-C13-CH	
Europe (except Italy, Switzerland, and United Kingdom)	250 VAC, 10 A, 50 Hz	CEE (7) VII Type VIIG	CBL-EX-PWR-C13-EU	
India	250 VAC, 10 A, 50 Hz	IS 1293 Type IND/3	CBL-EX-PWR-C13-IN	No graphic available
Israel	250 VAC, 10 A, 50 Hz	SI 32/1971 Type IL/3G	CBL-EX-PWR-C13-IL	
Italy	250 VAC, 10 A, 50 Hz	CEI 23-16 Type I/3G	CBL-EX-PWR-C13-IT	
Japan	125 VAC, 12 A, 50 Hz or 60 Hz	SS-00259 Type VCTF	CBL-EX-PWR-C13-JP	

Table 60: AC Power Cord Specifications for 350 W Power Supplies for EX4300 Switches Except EX4300-48MP and EX4300-48MP-S Switches and 715 W AC Power Supplies for EX4300 Switches *(Continued)*

Country/ Region	Electrical Specifications	Plug Standards	Juniper Model Number	Graphic
Korea	250 VAC, 10 A, 50 Hz or 60 Hz	CEE (7) VII Type VIIGK	CBL-EX-PWR-C13-KR	
North America	125 VAC, 13 A, 60 Hz	NEMA 5-15 Type N5-15	CBL-EX-PWR-C13-US	
South Africa	250 VAC, 10 A, 50 Hz	SABS 164/1:1992 Type ZA/3	CBL-EX-PWR-C13-SA	
Switzerland	250 VAC, 10 A, 50 Hz	SEV 6534-2 Type 12G	CBL-EX-PWR-C13-SZ	No graphic available
Taiwan	125 VAC, 10 A, 50 Hz	NEMA 5-15P Type N5-15P	CBL-EX-PWR-C13-TW	
United Kingdom	250 VAC, 10 A, 50 Hz	BS 1363/A Type BS89/13	CBL-EX-PWR-C13-UK	

Table 61: Specifications of Power Cords Used to Connect EX4300 Switches to C13 Power Strips

Country/Region	Electrical Specifications	Juniper Model Number
Europe	250 VAC, 10 A, 50 Hz	CBL-PWR-C15-C14-EU
North America	125 VAC, 15 A, 60 Hz	CBL-PWR-C15-C14-US

Table 62: AC Power Cord Specifications for 1100 W AC Power Supplies for EX4300 Switches and 1400 W AC Power Supplies for EX4300-48MP and EX4300-48MP-S Switches

Country/Region	Electrical Specifications	Plug Standards	Juniper Model Number
Argentina	250 VAC, 10 A, 50 Hz	IRAM 2073 Type RA/3	CBL-PWR-C15M-HITEMP-AR
Australia	250 VAC, 10 A, 50 Hz	AS/NZZS 3112-2000 Type SAA/3	CBL-PWR-C15M-HITEMP-AU
Brazil	250 VAC, 10 A, 50 Hz	NBR 14136 Type BR/3	CBL-PWR-C15M-HITEMP-BR
China	250 VAC, 10 A, 50 Hz	GB2099, GB1002 Type PRC/3	CBL-PWR-C15M-HITEMP-CH
Europe (except Italy, Switzerland, and United Kingdom)	250 VAC, 10 A, 50 Hz	CEE (7) VII Type VIIG	CBL-PWR-C15M-HITEMP-EU
Israel	250 VAC, 10 A, 50 Hz	SI 32 Type IL/3G	CBL-PWR-C15M-HITEMP-IL
India	250 VAC, 10 A, 50 Hz	SABS 164/1:1992 Type ZA/3	CBL-PWR-C15M-HITEMP-IN
Italy	250 VAC, 10 A, 50 Hz	CEI 23-16 Type I/3G	CBL-PWR-C15M-HITEMP-IT

Table 62: AC Power Cord Specifications for 1100 W AC Power Supplies for EX4300 Switches and 1400 W AC Power Supplies for EX4300-48MP and EX4300-48MP-S Switches *(Continued)*

Country/Region	Electrical Specifications	Plug Standards	Juniper Model Number
Japan	125 VAC, 15 A, 50 Hz or 60 Hz	JIS 8303 Type 498GJ	CBL-PWR-C15M-HITEMP-JP
Korea	250 VAC, 10 A, 50 Hz	CEE (7) VII Type VIIG	CBL-PWR-C15M-HITEMP-KR
South Africa	250 VAC, 10 A, 50 Hz	SABS 164/1:1992 Type ZA/3	CBL-PWR-C15M-HITEMP-SA
North America	125 VAC, 15 A, 60 Hz	NEMA 5-15 Type N5/15	CBL-PWR-C15M-HITEMP-US
Switzerland	250 VAC, 10 A, 50 Hz	SEV 1011 / 6534-2 Type 12G	CBL-PWR-C15M-HITEMP-SZ
United Kingdom	250 VAC, 10 A, 50 Hz	BS 1363/A Type BS89/13	CBL-PWR-C15M-HITEMP-UK

⚠️ **CAUTION**: The AC power cord for the EX4300 switch is intended for use with this switch only. Do not use the cord with any other product.

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

RELATED DOCUMENTATION

Connecting AC Power to an EX4300 Switch

DC Power Supply in EX4300 Switches

The DC power supply in EX4300 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.

NOTE: EX4300-24T, EX4300-24P, EX4300-32F, EX4300-48T, EX4300-48T-AFI, EX4300-48P, EX4300-48MP, and EX4300-48MP-S models do not support DC power. EX4300-24T-S, EX4300-24P-S, EX4300-32F-S, EX4300-32F-DC, EX4300-48T-S, EX4300-48T-DC, EX4300-48T-DC-AFI, and EX4300-48P-S models support DC power.

All the EX4300 switches that are powered by DC power supplies except EX4300-24T-S, EX4300-24P-S, EX4300-32F-S, EX4300-48T-S, and EX4300-48P-S switches are shipped with one DC power supply installed in the rear panel of the switches. EX4300-24T-S, EX4300-24P-S, EX4300-32F-S, EX4300-48T-S, and EX4300-48P-S switches are not shipped with power supplies; you must order the power supplies separately.

This topic describes the DC power supplies.

CAUTION: Do not mix:

- AC and DC power supplies in the same chassis

- Power supplies with different airflow labels (**AIR IN (AFI)** and **AIR OUT (AFO)**) in the same chassis.

- Fan modules with different airflow labels (**AIR IN (AFI)** and **AIR OUT (AFO)**) in the same chassis.

- Power supplies and fan modules with different airflow labels (**AIR IN (AFI)** and **AIR OUT (AFO)**) in the same chassis.

Characteristics of a DC Power Supply

EX4300 switches support 550 W DC power supply (see Figure 62 on page 203).

Figure 62: DC Power Supply for an EX4300 Switch
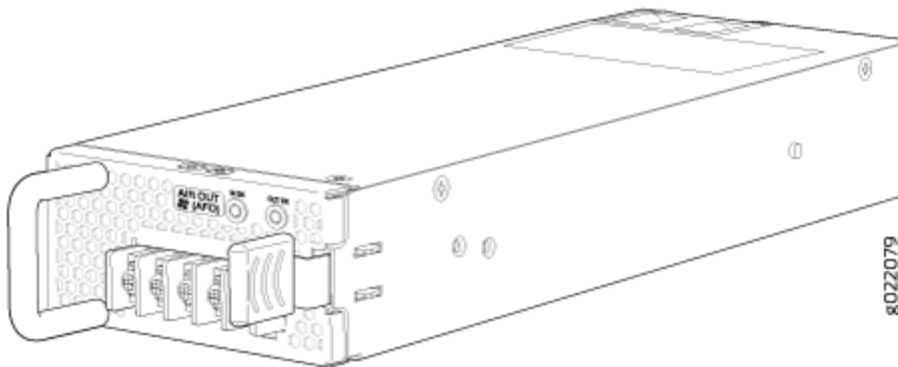
You can install up to two DC power supplies in an EX4300 switch. Power supplies are installed in the power supply slots labeled **PSU 0** and **PSU 1** in the rear panel of the chassis.

Table 63 on page 203 lists the details of the 550 W DC power supplies used in EX4300 switches.

Table 63: Details of the DC Power Supplies in EX4300 Switches

Details	550 W DC Power Supply
Model number	- JPSU-550-DC-AFO-A - JPSU-550-DC-AFI-A
Field-replaceable unit (FRU) type	Hot-insertable and hot-removable
Power supply weight	2.43 lb (1.1 kg)
Minimum installed in chassis	1

Table 63: Details of the DC Power Supplies in EX4300 Switches *(Continued)*

Details	550 W DC Power Supply
Maximum installed in chassis	2
Power supply slots	Install in power supply slots labeled **PSU 0** and **PSU 1** in the rear panel of the chassis.
Fans	Internal
Airflow	• Front-to-back, indicated by label **AIR OUT (AFO)** • Back-to-front, indicated by label **AIR IN (AFI)**
Power supply status LEDs	**IN OK** and **OUT OK**
DC input current rating	14.2 A
Operating range	–40.8 through –60 VDC **NOTE**: The minimum input power required to power on the switch is –43.5 +/– 0.5 VDC. After the switch is powered on, the operating range is –40.8 through –60 VDC.

To prevent electrical injury while installing or removing DC power supplies, carefully follow instructions in *Installing a DC Power Supply in an EX4300 Switch* and *Removing an AC Power Supply from an EX4300 Switch*.

DC Power Supply Airflow

Each power supply has its own fan and is cooled by its own internal cooling system.

Each power supply has a label **AIR OUT (AFO)** or **AIR IN (AFI)** on the faceplate of the power supply that indicates the direction of airflow in the power supply.

lists the DC power supply models and the direction of airflow in them.

Table 64: Airflow Direction in DC Power Supply Models for EX4300 Switches

Model	Label on Power Supply	Direction of Airflow
JPSU-550-DC-AFO-A	**AIR OUT (AFO)**	Front-to-back—that is, air intake to cool the chassis is through the vents on the front panel of the chassis and hot air exhausts through the vents on the rear panel of the chassis.
JPSU-550-DC-AFI-A	**AIR IN (AFI)**	Back-to-front—that is, air intake to cool the chassis is through the vents on the rear panel of the chassis and hot air exhausts through the vents on the front panel of the chassis.

N+0 Redundancy Configuration of DC Power Supplies

In an *N*+0 redundancy configuration, no power is reserved for resiliency regardless of number of power supplies installed in the switch.

Depending on the power supplies installed in the switch, you can determine the system power budget.

- If one power supply is installed in the switch:

  System power budget = Output wattage of the installed power supply (PSU(W))

- If two power supplies are installed in the switch:
  System power budget = (Sum of the output wattage of the two power supplies) – (10% of the output wattage of the installed power supply)

  System power budget = $PSU_0(W) + PSU_1(W) - (0.10 \times (PSU(W)))$

lists the *N*+0 power calculation for EX4300 switches that use 550 W DC power supplies.

> **NOTE**: The DC power supply in the switch does not support Power over Ethernet (PoE); you can use either an external power injector or an AC power supply to supply power to PoE devices that you connect to the switch. 32-port EX4300 switches does not support Power over Ethernet (PoE).

Table 65: N+0 DC Power Calculations for EX4300 Switch Configurations

Switch Configuration	Number of Power Supplies	Total Power (in watts)	Usable System Power (in watts)	Backup Power (in watts)	Base Power (in watts)
24-port EX4300 switch	1	550	550	0	150
	2	1100	1045	550	150
32-port EX4300 switch	1	550	550	0	149
	2	1100	550	550	160
48-port EX4300 switch	1	550	550	0	175
	2	1100	1045	550	175

N+N Redundancy Configuration of DC Power Supplies

You can configure your switch for $N+N$ redundancy, in which N power supplies can be removed or fail and the remaining N power supplies continue to supply power for the switch without interruption.

You can configure the power management software to manage switch power for $N+N$ redundancy. When you configure power management for $N+N$ redundancy, half of the total power available (N) is held as reserve power while the other half (N) is available for immediate consumption. If the switch configuration changes and requires additional power, then additional power is drawn from the reserve power, and the switch no longer has $N+N$ power supply redundancy. This condition raises a minor alarm. If the condition is not corrected within 5 minutes, then a major alarm is issued.

For more information about how power management allocates power to chassis components when power is insufficient, see Understanding Power Management on EX Series Switches.

Depending on the power supplies installed in the switch, you can determine the system power budget.

- If one power supply is installed in the switch:

  - System power budget = Output wattage of the installed power supply (PSU(W))

  - Backup power available = 0 W

A minor alarm is raised as switch has no *N+N* power supply redundancy.

- If two power supplies are installed in the switch:

  - System power budget = (Output wattage of one power supply) – (5% of the output wattage of one power supply)

    System power budget = PSU(W) – (0.05 x PSU(W))

  - Backup power available = (Output wattage of one power supply) – (5% of the output wattage of one power supply)

    System power budget = PSU(W) – (0.05 x PSU(W))

lists the *N+N* power calculation for EX4300 switches that use 550 W DC power supplies.

> **NOTE**: The DC power supply in the switch does not support Power over Ethernet (PoE); you can use either an external power injector or an AC power supply to supply power to PoE devices that you connect to the switch. 32-port EX4300 switches does not support Power over Ethernet (PoE).

Table 66: N+N DC Power Calculations for EX4300 Switch Configurations

Switch Configuration	Number of Power Supplies	Total Power (in watts)	Usable System Power (in watts)	Backup Power (in watts)	Base Power (in watts)
24-port EX4300 switch	1	550	550	0	150
	2	1100	550	550	150
32-port EX4300 switch	1	550	550	0	149
	2	1100	550	550	160
48-port EX4300 switch	1	550	550	0	175
	2	1100	550	550	175

RELATED DOCUMENTATION

Installing a DC Power Supply in an EX4300 Switch

CHAPTER 16

Compliance

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

  - CAN/CSA-C22.2 No. 62368-1 Information Technology Equipment

  - UL 60950-1 Information Technology Equipment

  - UL 62368-1 Second Edition

  - EN 60950-1 Information Technology Equipment

- EN 62368-1 Second Edition

- IEC 60950-1 Information Technology Equipment

- IEC 62368-1 Second Edition

- 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

Compliance Statement for Argentina

EQUIPO DE USO IDÓNEO.

Agency Approvals for the QFX Series

The QFX Series complies with the following standards:

- Safety

  - CAN/CSA-C22.2 No. 60950-1 Safety of Information Technology Equipment

  - UL 62368-1 Audio/Video, Information and Communication Technology Equipment- Safety

  - IEC 62368-1: 2014 Audio/Video, Information and Communication Technology Equipment–Safety

  - IEC 60950-1: 2005/A2:2013 Information Technology Equipment -Safety (All country deviations): CB Scheme

  - EN 60825-1 Safety of Laser Products - Part 1: Equipment Classification, Requirements and User's Guide

- Electromagnetic Compatibility (EMC)

  - EN 300 386 V1.6.1 (2012) Telecom Network Equipment–EMC requirements

  - EN 55024: 1998/A1:2001/A2:2003 Information Technology Equipment Immunity Characteristics

  - TEC/SD/DD/EMC-221—India EMC standard

  - EN 301 489-1 V1.92 (2011-09)–EMC and Radio spectrum Matters

  - EN 55024

  - CISPR 24

  - BSMI, Class A

  - CNS 13438

- Electromagnetic Interference (EMI)

  - FCC 47 CFR Part 15, Class A (2009) USA Radiated Emissions

  - EN 55022 Class A (2010) European Radiated Emissions

- VCCI Class A:(2010) Japanese Emissions

  - BSMI CNS 13438 and NCC C6357 Class A Taiwan Radiated Emissions

  - AS/NZS CISPR 22:2009: Class A, Australian/New Zealand Radiated Emissions

- Immunity

  - EN 55024: 1998/A1:2001/A2:2003 Information Technology Equipment Immunity Characteristics

  - EN-61000-3-2 (2006) Power Line Harmonics

  - EN-61000-3-3 (2013) Power Line Voltage Fluctuations

  - EN-61000-4-2 (2009) Electrostatic Discharge

  - EN-61000-4-3 (2007) Radiated Immunity

  - EN-61000-4-4 (2012) Electrical Fast Transients

  - EN-61000-4-5 (2006) Surge

  - EN-61000-4-6 (2009) Immunity to Conducted Disturbances

  - EN-61000-4-11 (2004) Voltage Dips and Sags

Compliance Statement for Argentina

EQUIPO DE USO IDÓNEO.

Compliance Statements for EMC Requirements for EX Series Switches

IN THIS SECTION

● FCC Part 15 Statement | **215**

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.

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.

Taiwan

此為甲類資訊技術設備。於一般家居環境使用時，本設備可能導致射頻干擾，用⬚請採取相應措施。

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.

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

אזהרה

מוצר זה הוא מוצר Class A.
בסביבה ביתית,מוצר זה עלול לגרום הפרעות בתדר רדיו,ובמקרה זה, המשתמש עשוי להידרש
לנקוט אמצעים מתאימים.
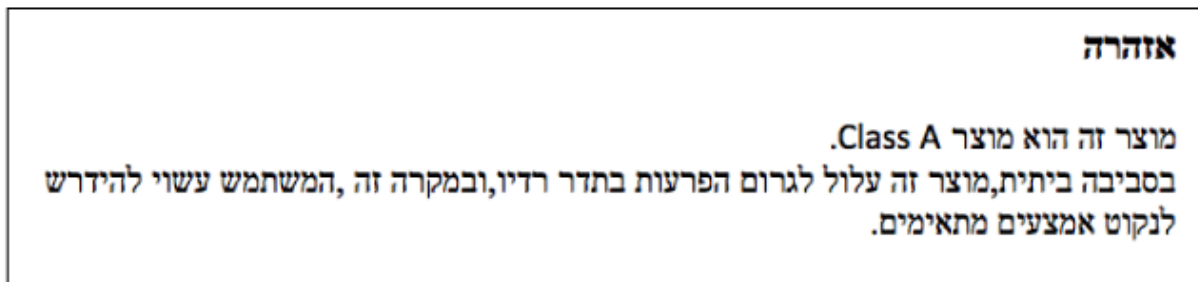
The preceding translates as follows:

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

この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用する
と電波妨害を引き起こすことがあります。この場合には使用者が適切な対策
を講ずるよう要求されることがあります。　　　　　　VCCI-A

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.

Compliance Statements for EMC Requirements for the QFX Series

IN THIS SECTION

This topic describes the EMC requirements for the QFX Series.

Canada

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

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

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

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

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

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

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

European Community

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

Israel

אזהרה

‎.Class A מוצר זה הוא מוצר
‎בסביבה ביתית,מוצר זה עלול לגרום הפרעות בתדר רדיו,ובמקרה זה ,המשתמש עשוי להידרש
‎לנקוט אמצעים מתאימים.
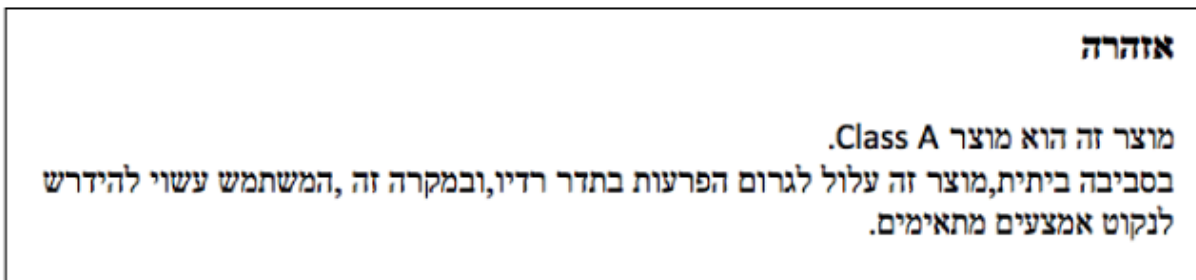
Translation from Hebrew–Warning: This product is Class A. In residential environments, the product may cause radio interference, and in such a situation, the user may be required to take adequate measures.

Japan

この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。　　　　VCCI-A
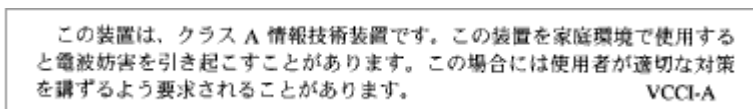
The preceding translates as follows:

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

VCCI-A

Korea

이 기기는 업무용(A급) 전자파적합기기로서 판
매자 또는 사용자는 이 점을 주의하시기 바라
며, 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.

Taiwan

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

Chinese Class A warning   g100090

The preceding translates as follows:

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

United States

The QFX Series 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, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Nonregulatory Environmental Standards

These QFX Series product SKUs are Network Equipment Building System (NEBS) compliant:

- QFX3008-I

- QFX3600-I

- QFX3600

- QFX3500

- QFX5100

- QFX5110

- QFX5200-32C

- QFX10002-36Q and QFX10002-72Q

- QFX10008

- QFX10016

Those device product SKUs meet the following NEBS compliance standards:

- SR-3580 NEBS Criteria Levels (Level 3 Compliance)

- GR-1089-CORE, Issue 6: EMC and Electrical Safety—Generic Criteria for Network Telecommunications Equipment

  - 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.

- 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 a central office (CO).

RELATED DOCUMENTATION

Agency Approvals for the QFX Series

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.

3
PART

Safety

CHAPTER 17

General Safety Information

General Safety Guidelines and Warnings

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.

- Follow the instructions in this guide to properly ground the device 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.

- Some parts of the chassis, including AC and DC power supply surfaces, power supply unit handles, SFB card handles, and fan tray handles might become hot. The following label provides the warning for hot surfaces on the chassis:

- Always ensure that all modules, power supplies, and cover panels are fully inserted and that the installation screws are fully tightened.

Definitions of Safety Warning Levels

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.

Attention Veillez à respecter les consignes indiquées pour éviter toute incommodité ou blessure légère, voire des dégâts graves pour l'appareil.

LASER WARNING: This symbol alerts you to the risk of personal injury from a laser.

Avertissement Ce symbole signale un risque de blessure provoquée par rayon 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 familiarize yourself 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.

Avertissement 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.

Fire Safety Requirements

IN THIS SECTION

In the event of a fire emergency, 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 device. 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.

Qualified Personnel Warning

> **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.

Avertissement 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.

Warning Statement for Norway and Sweden

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

Advarsel Apparatet skal kobles til en jordet stikkontakt.

Varning! Apparaten skall anslutas till jordat nätuttag.

Radiation and Laser Warnings

IN THIS CHAPTER

Radiation from Open Port Apertures Warning

LASER 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.

Avertissement 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 an 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.

Laser and LED Safety Guidelines and Warnings for the QFX Series

IN THIS SECTION

- Class 1M Laser Product Warning | **230**
- Class 1M Laser Radiation Warning | **230**
- Unterminated Fiber-Optic Cable Warning | **230**

In addition to the general guidelines provided in *Laser and LED Safety Guidelines and Warnings*, follow these warnings and guidelines that are specific to QFX Series devices.

QFX Series devices are equipped with laser transmitters:

- SFP and SFP+ transceivers are classified as Class 1 Laser Products (complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice 50, dated July 26, 2001) or Class 1 LED Products.

- QSFP+ and QSFP28 transceivers are classified as Class 1M Laser Products (IEC 60825-1 2001–01).

Observe the following guidelines and warnings:

Class 1M Laser Product Warning

LASER WARNING: Class 1M laser product.

Waarschuwing Laserproducten van Klasse 1M (IEC).

Varoitus Luokan 1M (IEC) lasertuotteita.

Attention Produits laser catégorie 1M (IEC).

Warnung Laserprodukte der Klasse 1M (IEC).

Avvertenza Prodotti laser di Classe 1M (IEC).

Advarsel Klasse 1M (IEC) laserprodukter.

Aviso Produtos laser Classe 1M (IEC).

¡Atención! Productos láser de Clase 1M (IEC).

Varning! Laserprodukter av Klass 1M (IEC).

Class 1M Laser Radiation Warning

LASER WARNING: Class 1M laser radiation when open. Do not view directly with optical instruments.

Unterminated Fiber-Optic Cable Warning

WARNING: Invisible laser radiation might be emitted from the unterminated connector of a fiber-optic cable. To avoid injury to your eye, do not view the fiber optics with a magnifying optical device, such as a loupe, within 100 mm.

Waarschuwing Er kunnen onzichtbare laserstralen worden uitgezonden vanuit het uiteinde van de onafgebroken vezelkabel of connector. Niet in de straal kijken of deze rechtstreeks bekijken met optische instrumenten. Als u de laseruitvoer met bepaalde optische instrumenten bekijkt (zoals bijv. een oogloep, vergrootgras of microscoop) binnen een afstand van 100 mm kan dit gevaar voor uw ogen opleveren.

Varoitus Päättämättömän kuitukaapelin tai -liittimen päästä voi tulla näkymätöntä lasersäteilyä. Älä tuijota sädettä tai katso sitä suoraan optisilla välineillä. Lasersäteen

katsominen tietyillä optisilla välineillä (esim. suurennuslasilla tai mikroskoopilla) 10 cm:n päästä tai sitä lähempää voi olla vaarallista silmille.

Attention Des émissions de radiations laser invisibles peuvent se produire à l'extrémité d'un câble en fibre ou d'un raccord sans terminaison. Ne pas fixer du regard le rayon ou l'observer directement avec des instruments optiques. L'observation du laser à l'aide certains instruments optiques (loupes et microscopes) à une distance inférieure à 100 mm peut poser des risques pour les yeux.

Warnung Eine unsichtbare Laserstrahlung kann vom Ende des nicht angeschlossenen Glasfaserkabels oder Steckers ausgestrahlt werden. Nicht in den Laserstrahl schauen oder diesen mit einem optischen Instrument direkt ansehen. Ein Betrachten des Laserstrahls mit bestimmten optischen Instrumenten, wie z.B. Augenlupen, Vergrößerungsgläsern und Mikroskopen innerhalb eines Abstands von 100 mm kann für das Auge gefährlich sein.

Avvertenza L'estremità del connettore o del cavo ottico senza terminazione può emettere radiazioni laser invisibili. Non fissare il raggio od osservarlo in modo diretto con strumenti ottici. L'osservazione del fascio laser con determinati strumenti ottici (come lupette, lenti di ingrandimento o microscopi) entro una distanza di 100 mm può provocare danni agli occhi.

Advarsel Usynlig laserstråling kan emittere fra enden av den ikke-terminerte fiberkabelen eller koblingen. Ikke se inn i strålen og se heller ikke direkte på strålen med optiske instrumenter. Observering av laserutgang med visse optiske instrumenter (for eksempel øyelupe, forstørrelsesglass eller mikroskoper) innenfor en avstand på 100 mm kan være farlig for øynene.

Aviso Radiação laser invisível pode ser emitida pela ponta de um conector ou cabo de fibra não terminado. Não olhe fixa ou diretamente para o feixe ou com instrumentos ópticos. Visualizar a emissão do laser com certos instrumentos ópticos (por exemplo, lupas, lentes de aumento ou microscópios) a uma distância de 100 mm pode causar riscos à visão.

¡Atención! El extremo de un cable o conector de fibra sin terminación puede emitir radiación láser invisible. No se acerque al radio de acción ni lo mire directamente con instrumentos ópticos. La exposición del ojo a una salida de láser con determinados instrumentos ópticos (por ejemplo, lupas y microscopios) a una distancia de 100 mm puede comportar lesiones oculares.

Varning! Osynlig laserstrålning kan komma från änden på en oavslutad fiberkabel eller -anslutning. Titta inte rakt in i strålen eller direkt på den med optiska instrument. Att titta på laserstrålen med vissa optiska instrument (t.ex. lupper, förstoringsglas och mikroskop) från ett avstånd på 100 mm kan skada ögonen.

RELATED DOCUMENTATION

General Safety Guidelines and Warnings

Radiation from Open Port Apertures Warning

Installation Instructions Warning

Grounded Equipment Warning

CHAPTER 19

Installation and Maintenance Safety Information

Installation Instructions Warning

> ⚡ **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.
>
> **Avertissement** 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.

QFX5100 Installation Safety Guidelines

The weight of a 1 U fully loaded QFX5100 switch chassis is approximately 30.8 lb (14 kg); the 2 U product SKU is approximately 32 lbs (14.5 kg). Observe the following guidelines for lifting and moving a QFX5100 switch:

> ⚠ **CAUTION**: If you are installing the QFX5100 switch above 60 in. (152.4 cm) from the floor, either remove the power supplies, fan modules, and any expansion modules before attempting to install the switch, or ask someone to assist you during the installation.

- Before installing a QFX5100 switch, read the guidelines in *Site Preparation Checklist for a QFX5100 Device* to verify that the intended site meets the specified power, environmental, and clearance requirements.

- Before lifting or moving the QFX5100 switch, disconnect all external cables.

- As when lifting any heavy object, lift most of the weight with your legs rather than your back. Keep your knees bent and your back relatively straight and avoid twisting your body as you lift. Balance the load evenly and be sure that your footing is solid.

RELATED DOCUMENTATION

General Safety Guidelines and Warnings

Installation Instructions Warning

Chassis Lifting Guidelines for a QFX3600 or QFX3600-I Device

The weight of a fully loaded QFX3600 or QFX3600-I device chassis is approximately 20.5 lb (9.3 kg). Observe the following guidelines for lifting and moving a QFX3600 or QFX3600-I device:

- Before installing a QFX3600 or QFX3600-I device, read the guidelines in *Site Preparation Checklist for a QFX3600 or QFX3600-I Device* to verify that the intended site meets the specified power, environmental, and clearance requirements.

- Before lifting or moving the QFX3600 or QFX3600-I device, disconnect all external cables.

- As when lifting any heavy object, lift most of the weight with your legs rather than your back. Keep your knees bent and your back relatively straight and avoid twisting your body as you lift. Balance the load evenly and be sure that your footing is solid.

RELATED DOCUMENTATION

General Safety Guidelines and Warnings

Installation Instructions Warning

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

Chassis Lifting Guidelines for a QFX3500 Device

The weight of a fully loaded QFX3500 device chassis is approximately 30.8 lb (14 kg). Observe the following guidelines for lifting and moving a QFX3500 device:

> ⚠ **CAUTION**: If you are installing the QFX3500 device above 60 in. (152.4 cm) from the floor, you must remove the power supplies, fan trays, and management board before attempting to install the device, or ask someone to assist you during the installation.

- Before installing a QFX3500 device, read the guidelines in *Site Preparation Checklist for a QFX3500 Device* to verify that the intended site meets the specified power, environmental, and clearance requirements.

- Before lifting or moving the QFX3500 device, disconnect all external cables.

- As when lifting any heavy object, lift most of the weight with your legs rather than your back. Keep your knees bent and your back relatively straight and avoid twisting your body as you lift. Balance the load evenly and be sure that your footing is solid.

RELATED DOCUMENTATION

General Safety Guidelines and Warnings

Installation Instructions Warning

Mounting a QFX3500 Device in a Rack or Cabinet

Chassis Lifting Guidelines for EX4300 Switches

The weight of an EX4300 switch is approximately 13 lb (5.9 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 EX4300 Switches*.

- 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

Installation Instructions Warning

Mounting an EX4300 Switch

Restricted Access Warning

WARNING: This unit is intended for installation in restricted access areas. A restricted access area is an area to which access can be gained only by service personnel through

the use of a special tool, lock and key, or other means of security, and which is controlled by the authority responsible for the location.

Waarschuwing Dit toestel is bedoeld voor installatie op plaatsen met beperkte toegang. Een plaats met beperkte toegang is een plaats waar toegang slechts door servicepersoneel verkregen kan worden door middel van een speciaal instrument, een slot en sleutel, of een ander veiligheidsmiddel, en welke beheerd wordt door de overheidsinstantie die verantwoordelijk is voor de locatie.

Varoitus Tämä laite on tarkoitettu asennettavaksi paikkaan, johon pääsy on rajoitettua. Paikka, johon pääsy on rajoitettua, tarkoittaa paikkaa, johon vain huoltohenkilöstö pääsee jonkin erikoistyökalun, lukkoon sopivan avaimen tai jonkin muun turvalaitteen avulla ja joka on paikasta vastuussa olevien toimivaltaisten henkilöiden valvoma.

Avertissement Cet appareil est à installer dans des zones d'accès réservé. Ces dernières sont des zones auxquelles seul le personnel de service peut accéder en utilisant un outil spécial, un mécanisme de verrouillage et une clé, ou tout autre moyen de sécurité. L'accès aux zones de sécurité est sous le contrôle de l'autorité responsable de l'emplacement.

Warnung Diese Einheit ist zur Installation in Bereichen mit beschränktem Zutritt vorgesehen. Ein Bereich mit beschränktem Zutritt ist ein Bereich, zu dem nur Wartungspersonal mit einem Spezialwerkzeugs, Schloß und Schlüssel oder anderer Sicherheitsvorkehrungen Zugang hat, und der von dem für die Anlage zuständigen Gremium kontrolliert wird.

Avvertenza Questa unità deve essere installata in un'area ad accesso limitato. Un'area ad accesso limitato è un'area accessibile solo a personale di assistenza tramite un'attrezzo speciale, lucchetto, o altri dispositivi di sicurezza, ed è controllata dall'autorità responsabile della zona.

Advarsel Denne enheten er laget for installasjon i områder med begrenset adgang. Et område med begrenset adgang gir kun adgang til servicepersonale som bruker et spesielt verktøy, lås og nøkkel, eller en annen sikkerhetsanordning, og det kontrolleres av den autoriteten som er ansvarlig for området.

Aviso Esta unidade foi concebida para instalação em áreas de acesso restrito. Uma área de acesso restrito é uma área à qual apenas tem acesso o pessoal de serviço autorizado, que possua uma ferramenta, chave e fechadura especial, ou qualquer outra forma de segurança. Esta área é controlada pela autoridade responsável pelo local.

¡Atención! Esta unidad ha sido diseñada para instalarse en áreas de acceso restringido. Área de acceso restringido significa un área a la que solamente tiene acceso el personal de servicio mediante la utilización de una herramienta especial, cerradura con llave, o

algún otro medio de seguridad, y que está bajo el control de la autoridad responsable del local.

Varning! Denna enhet är avsedd för installation i områden med begränsat tillträde. Ett område med begränsat tillträde får endast tillträdas av servicepersonal med ett speciellt verktyg, lås och nyckel, eller annan säkerhetsanordning, och kontrolleras av den auktoritet som ansvarar för området.

Ramp Warning

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.

Avertissement 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.

Rack-Mounting and Cabinet-Mounting Warnings

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:

- Install the device in a rack that is secured to the building structure.

- Mount the device 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.

Avertissement 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 edifício.

- 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, oeriormente 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.

Grounded Equipment Warning

WARNING: This device must be properly grounded at all times. Follow the instructions in this guide to properly ground the device to earth.

Waarschuwing Dit apparaat moet altijd goed geaard zijn. Volg de instructies in deze gids om het apparaat goed te aarden.

Varoitus Laitteen on oltava pysyvästi maadoitettu. Maadoita laite asianmukaisesti noudattamalla tämän oppaan ohjeita.

Avertissement L'appareil doit être correctement mis à la terre à tout moment. Suivez les instructions de ce guide pour correctement mettre l'appareil à la terre.

Warnung Das Gerät muss immer ordnungsgemäß geerdet sein. Befolgen Sie die Anweisungen in dieser Anleitung, um das Gerät ordnungsgemäß zu erden.

Avvertenza Questo dispositivo deve sempre disporre di una connessione a massa. Seguire le istruzioni indicate in questa guida per connettere correttamente il dispositivo a massa.

Advarsel Denne enheten på jordes skikkelig hele tiden. Følg instruksjonene i denne veiledningen for å jorde enheten.

Aviso Este equipamento deverá estar ligado à terra. Siga las instrucciones en esta guía para conectar correctamente este dispositivo a tierra.

¡Atención! Este dispositivo debe estar correctamente conectado a tierra en todo momento. Siga las instrucciones en esta guía para conectar correctamente este dispositivo a tierra.

Varning! Den här enheten måste vara ordentligt jordad. Följ instruktionerna i den här guiden för att jorda enheten ordentligt.

Maintenance and Operational Safety Guidelines and Warnings

IN THIS SECTION

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.

Avertissement 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 baterían 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.

Avertissement 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.

Avertissement 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. 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.

Avertissement 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.

Avertissement 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.

Wall-Mounting Warning for EX4300 Switches

> ⚠ **WARNING**: When mounting EX4300 switches except EX4300-48MP and EX4300-48MP-S switches on a wall, orient the front panel of the chassis downward to ensure proper airflow and meet safety requirements in the event of a fire. When mounting EX4300-48MP and EX4300-48MP-S switches on a wall, orient the front panel of the chassis pointing to the right side or to the left side to ensure proper airflow and meet safety requirements in the event of a fire.

RELATED DOCUMENTATION

Mounting an EX4300 Switch on a Wall

CHAPTER 20

Power and Electrical Safety Information

IN THIS CHAPTER

General Electrical Safety Guidelines and Warnings

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 (Network Equipment-Building System) 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.

> **Avertissement** Certains ports de l'appareil sont destinés à un usage en intérieur uniquement (ports Type 2 ou Type 4 tels que décrits dans le document *GR-1089-CORE*) et doivent être isolés du câblage de l'installation extérieure exposée. Pour respecter les exigences NEBS et assurer une protection contre la foudre et les perturbations de tension secteur, les ports pour intérieur *ne doivent pas* être raccordés physiquement aux interfaces prévues pour la connexion à l'installation extérieure ou à son câblage. Les ports pour intérieur de l'appareil sont réservés au raccordement de câbles pour intérieur ou non exposés uniquement. L'ajout de protections ne constitue pas une précaution suffisante pour raccorder physiquement ces interfaces au câblage de l'installation extérieure.

> ⚠️ **CAUTION**: Before removing or installing components of a device, connect an electrostatic discharge (ESD) grounding strap to an ESD point and wrap and fasten the other end of the strap around your bare wrist. Failure to use an ESD grounding strap could result in damage to the device.
>
> **Attention** Avant de retirer ou d'installer des composants d'un appareil, raccordez un bracelet antistatique à un point de décharge électrostatique et fixez le bracelet à votre poignet nu. L'absence de port d'un bracelet antistatique pourrait provoquer des dégâts sur l'appareil.

- 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.

  - Suitable for installation in Information Technology Rooms in accordance with Article 645 of the National Electrical Code and NFPA 75.

    Peut être installé dans des salles de matériel de traitement de l'information conformément à l'article 645 du National Electrical Code et à la NFPA 75.

- 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 you clean grounding surface and give them a bright finish before making grounding connections.

- 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 equipment that appears to be damaged.

Prevention of Electrostatic Discharge Damage

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 wrist 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 63 on page 253) 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.
  > **Avertissement** Par mesure de sécurité, vérifiez régulièrement la résistance du bracelet antistatique. Cette valeur doit être comprise entre 1 et 10 mégohms (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 wrist 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 63 on page 253). If you are returning a component, place it in an antistatic bag before packing it.

Figure 63: Placing a Component into an Antistatic Bag
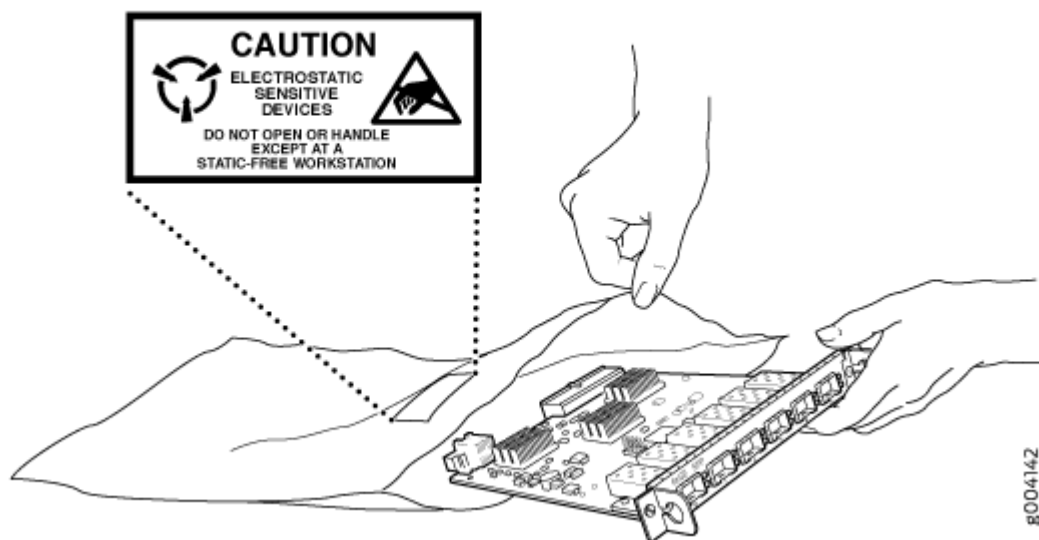
> ⚠️ **CAUTION**: ANSI/TIA/EIA-568 cables such as Category 5e and Category 6 can get electrostatically charged. To dissipate this charge, always ground the cables to a suitable and safe earth ground before connecting them to the system.
>
> **Attention** Les câbles ANSI/TIA/EIA-568, par exemple Cat 5e et Cat 6, peuvent emmagasiner des charges électrostatiques. Pour évacuer ces charges, reliez toujours les câbles à une prise de terre adaptée avant de les raccorder au système.

Action to Take After an Electrical Accident

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

1. Use caution. Be aware of potentially hazardous conditions that could cause further injury.

2. Disconnect power from the device.

3. If possible, send another person to get medical aid. Otherwise, assess the condition of the victim, and then call for help.

AC Power Electrical Safety Guidelines

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 (2-pole circuit breaker or 4-pole circuit breaker based on your device) 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。

AC Power Disconnection Warning

WARNING: Before working on the device or near power supplies, unplug all the power cords from an AC-powered device.

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.

Avertissement 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.

DC Power Electrical Safety Guidelines

- A DC-powered device is equipped with a DC terminal block that is rated for the power requirements of a maximally configured device.

- For permanently connected equipment, a readily accessible disconnect device shall be incorporated external to the equipment.

- For pluggable equipment, the socket-outlet shall be installed near the equipment and shall be easily accessible.

- Be sure to connect the ground wire or conduit to a solid central 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.

- 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.

DC Power Disconnection Warning

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.

Avertissement 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.

DC Power Grounding Requirements and Warning

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.

Avertissement 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.

DC Power Wiring Sequence Warning

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.

Avertissement 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 nan 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.

DC Power Wiring Terminations Warning

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.

Avertissement 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.

Multiple Power Supplies Disconnection Warning

WARNING: The network device has more than one power supply connection. All connections must be removed completely to remove power from the unit completely.

Waarschuwing Deze eenheid heeft meer dan één stroomtoevoerverbinding; alle verbindingen moeten volledig worden verwijderd om de stroom van deze eenheid volledig te verwijderen.

Varoitus Tässä laitteessa on useampia virtalähdekytkentöjä. Kaikki kytkennät on irrotettava kokonaan, jotta virta poistettaisiin täysin laitteesta.

Avertissement Cette unité est équipée de plusieurs raccordements d'alimentation. Pour supprimer tout courant électrique de l'unité, tous les cordons d'alimentation doivent être débranchés.

Warnung Diese Einheit verfügt über mehr als einen Stromanschluß; um Strom gänzlich von der Einheit fernzuhalten, müssen alle Stromzufuhren abgetrennt sein.

Avvertenza Questa unità ha più di una connessione per alimentatore elettrico; tutte le connessioni devono essere completamente rimosse per togliere l'elettricità dall'unità.

Advarsel Denne enheten har mer enn én strømtilkobling. Alle tilkoblinger må kobles helt fra for å eliminere strøm fra enheten.

Aviso Este dispositivo possui mais do que uma conexão de fonte de alimentação de energia; para poder remover a fonte de alimentação de energia, deverão ser desconectadas todas as conexões existentes.

¡Atención! Esta unidad tiene más de una conexión de suministros de alimentación; para eliminar la alimentación por completo, deben desconectarse completamente todas las conexiones.

Varning! Denna enhet har mer än en strömförsörjningsanslutning; alla anslutningar måste vara helt avlägsnade innan strömtillförseln till enheten är fullständigt bruten.

TN Power Warning

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.

Avertissement 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.

4
PART

Installation

CHAPTER 21

Before You Begin

Virtual Chassis Fabric Installation Overview

For best results, ensure you review and understand the Virtual Chassis Fabric (VCF) configuration options. These configuration options are explained in *Virtual Chassis Fabric Hardware Overview* and *Understanding Virtual Chassis Fabric Configuration*. Do not interconnect the switches with cables until directed in the procedure.

1. Install the individual switches in a rack or cabinet following the guidelines in *Plan a Virtual Chassis Fabric Deployment*.

   BEST PRACTICE: Install spine devices at the top of the rack or cabinet in order of primary routing engine (RE), backup RE, and then other leaf devices.

2. Make a list of all of the serial numbers of the devices.
3. Log into each device and configure into fabric mode and mixed mode, if needed. Mixed mode is only necessary for QFX5100 VCF when QFX5100-96S, QFX5100-48T, QFX3500, QFX3600, or EX4300 devices are present as leaf devices in the configuration. If a spine device is not properly configured in fabric and mixed mode for QFX5100 mixed VCF, the VCF devices reboot to commit the mixed mode or fabric settings. When fabric and mixed mode are not set, you might need to manually correct any issues that are related to the VCF not forming correctly because the device did not immediately join the VCF.

   WARNING: Only configure operational-level commands. If you commit any configuration-level commands (including assigning IP address), the Virtual Chassis Fabric cannot form and the switch must be zeroed.

4. Configure the VCF into mixed mode if it is a QFX5100 VCF and the switch models span different lines of switches.

5. Configure each device for one of the provisioning modes: autoprovision, preprovision, or nonprovision. See:

   - *Autoprovisioning a Virtual Chassis Fabric*

   - *Preprovisioning a Virtual Chassis Fabric*

   - *Configuring a Nonprovisioned Virtual Chassis Fabric*

6. Connect and configure one of the management ports (C0) or (C1) to a management switch as the Virtual Management Ethernet interface. Using this interface, you can configure and manage the devices in the VCF. See *Connect a Device to a Network for Out-of-Band Management*.

7. Commit your changes.

8. Cable the ports that you will use as VCPs. For cabling examples, see *Connecting QFX5110 in a QFX5110 Virtual Chassis Fabric*, *Connecting a QFX5100 Device in a Virtual Chassis Fabric*, "Connecting a QFX3500 or QFX3600 Switch in a QFX5100 Virtual Chassis Fabric" on page 410, and "Connecting EX Series Switches in a QFX5100 Virtual Chassis Fabric" on page 412.

   If you configured your devices as either autoprovisioned or preprovisioned, the Virtual Chassis ports (VCP) are automatically configured. If you configure the devices as nonprovisioned, you must manually configure the VCPs.

Installing a QFX5110 Switch

IN THIS CHAPTER

Standalone Installation Overview

You can mount a QFX5110:

- Flush with the front of a 19-in. four-post rack. Use the standard mounting brackets provided with the switch for this configuration.

- Recessed 2 in. (5 cm) from the front of a 19-in. four-post rack. Use the extension bracket provided in the standard mounting kit for this configuration.

To install and connect a QFX5110:

1. Follow the instructions in *Unpacking a QFX5110*.

2. Determine how the switch is to be mounted.

   Flush or recessed-mounted in a rack, see *Mounting a QFX5110 in a Rack* .

3. Follow the instructions in:

   a. *Connect the QFX5110 to Earth Ground*

   b. *Connecting the QFX5110 to Power*

   c. *Register Products—Mandatory to Validate SLAs*

4. Follow the instructions in *Configuring a QFX5110.*

Unpacking a QFX5110

The QFX5110 is a rigid sheet-metal structure that houses the hardware components. A QFX5110 is shipped in a cardboard carton, secured with foam packing material. The carton also contains an accessory box and a Documentation Roadmap card.

> ⚠️ **CAUTION**: The QFX5110 is maximally protected inside the shipping carton. Do not unpack the switch until you are ready to begin installation.

To unpack a QFX5110:

1. Move the shipping carton to a staging area as close to the installation site as possible, but where you have enough room to remove the system components.
2. Position the carton so that the arrows are pointing up.
3. Open the top flaps on the shipping carton.
4. Remove the accessory box and verify the contents against the inventory included in the box. lists the inventory of components supplied with a QFX5110.
5. Pull out the packing material holding the switch in place.
6. Verify the chassis components received:

   - Two power supplies

   - Five fan modules

   The QFX5110-32Q-CHAS is shipped without power supplies or fan modules.
7. Save the shipping carton and packing materials in case you need to move or ship the switch later.

Table 67: Inventory of Components Supplied with a QFX5110

Component	Quantity
Chassis	1
Fan modules	5

Table 67: Inventory of Components Supplied with a QFX5110 *(Continued)*

Component	Quantity
Power supplies (650 W) • JPSU-650W-AC-AFO • JPSU-650W-AC-AFI • JPSU-650W-DC-AFO • JPSU-650W-DC-AFI AC systems ship with 2 country-specific C13 power cables.	2
Four-post rack mount kit • Front mounting rail with attached front flange • Rear mounting blade with attached rear flange • Extension brackets • Flat head screws, 4-40	1 • 2 • 2 • 2 • 6
Spare - JNP-4PST-RMK-1U-E (Partial toolless RMK) Rack Mount Kit for QFX5100 Switches • A pair of front and rear mounting brackets • A pair of side mounting brackets • 16 flat head M4 x 6mm Phillips screws	
Rack mount assembly drawing	1
Documentation roadmap card	1
Warranty	1

> **NOTE**: We no longer include the RJ-45 console cable with the DB-9 adapter as part of the device package. If the console cable and adapter are not included in your device package, or if you need a different type of adapter, you can order the following separately:
>
> - RJ-45 to DB-9 adapter (JNP-CBL-RJ45-DB9)
>
> - RJ-45 to USB-A adapter (JNP-CBL-RJ45-USBA)
>
> - RJ-45 to USB-C adapter (JNP-CBL-RJ45-USBC)
>
> If you want to use RJ-45 to USB-A or RJ-45 to USB-C adapter you must have X64 (64-Bit) Virtual COM port (VCP) driver installed on your PC. See, https://ftdichip.com/drivers/vcp-drivers/ to download the driver.

Mounting a QFX5110 in a Rack

You can mount a QFX5110 on a four-post 19-in. rack using the mounting kit provided with the switch.

Space the front and rear rack rails between 23.5 in. (59.7 cm) to 30.6 in. (77.7 cm) front-to-back.

This topic describes:

Before You Begin Rack Installation

Before you begin mounting a QFX5110 switch in the rack:

1. Ensure that you understand how to prevent electrostatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.
2. Verify that the site meets the requirements described in *QFX5110 Site Preparation Checklist*.
3. Place the rack in its permanent location, allowing adequate clearance for airflow and maintenance, and secure it to the building structure.
4. Read *General Site Guidelines*, and the *QFX5110 Installation Safety Guidelines*.

5. Remove the switch from the shipping carton.

6. Ensure that you have the following parts and tools available to mount the switch in a rack:

- ESD grounding strap (not provided).

- Rack Mount Kit (provided).

- Appropriate screwdriver for the mounting screws (not provided).

- Two power cords with plugs appropriate to your geographical location (provided).

- RJ-45 cable and RJ-45 to DB-9 serial port adapter (not provided).

> **NOTE**: We no longer include the RJ-45 console cable with the DB-9 adapter as part of the device package. If the console cable and adapter are not included in your device package, or if you need a different type of adapter, you can order the following separately:
>
> - RJ-45 to DB-9 adapter (JNP-CBL-RJ45-DB9)
>
> - RJ-45 to USB-A adapter (JNP-CBL-RJ45-USBA)
>
> - RJ-45 to USB-C adapter (JNP-CBL-RJ45-USBC)
>
> If you want to use RJ-45 to USB-A or RJ-45 to USB-C adapter you must have X64 (64-Bit) Virtual COM port (VCP) driver installed on your PC. See, https://ftdichip.com/drivers/vcp-drivers/ to download the driver.

- Management host, such as a PC laptop, with a serial port (not provided).

Optional equipment: grounding cable kit with bracket, lug, and two screws and washers.

> ⚠ **CAUTION**: All QFX5110 switches require two people for installation, one person to lift the switch into place and another person to attach the switch to the rack. If you are installing the QFX5110 above 60 in. (152.4 cm) from the floor, you can remove the power supplies and fan modules to minimize the weight before attempting to install the switch.

> ⚠ **CAUTION**: If you are mounting multiple switches on a rack, mount the switch in the lowest position of the rack first. Proceed to mount the rest of the switches from the bottom to the top of the rack to minimize the risk of the rack toppling.

Mount a QFX5110 in a Rack or Cabinet by Using the JNP-4PST-RMK-1U-E Rack Mount Kit

IN THIS SECTION

You can mount the QFX5110 switches on a square hole or threaded hole four-post 19-in. racks using the partial tool less JNP-4PST-RMK-1U-E rack mount kit which is available as a spare.

JNP-4PST-RMK-1U-E rack mount kit consists of the following parts:

- A pair of front and rear mounting rails
- A pair of mounting brackets
- 16 flat head M4 x 6mm Phillips screws

A four-post installation evenly supports the device by all four corners.

Mount the Device by Using the JNP-4PST-RMK-1U-E Rack Mount Kit On a Square Hole Rack

Ensure that you have the following tools and parts available:

- An ESD grounding strap—not provided.
- Number 2 Phillips (+) screwdriver—not provided
- A pair of front and rear mounting rails that attach to the rack posts—provided with the rack mount kit
- A pair of mounting brackets and 16 flat head M4 x 6mm Phillips screws. These brackets attach to the device if not pre-installed—provided with the rack mount kit

To mount the device on four posts in a rack by using the JNP-4PST-RMK-1U-E rack mount kit:

1. Wrap and fasten the ESD grounding strap to your bare wrist and an connect the other end of the strap to the ESD point on the device.
2. Assemble the mounting rails.

   a. Slide the rear floating bracket into the front bracket. See Figure 64 on page 273.

Figure 64: Assemble the Mounting Rails

Front rail
Rear floating rail
g102032
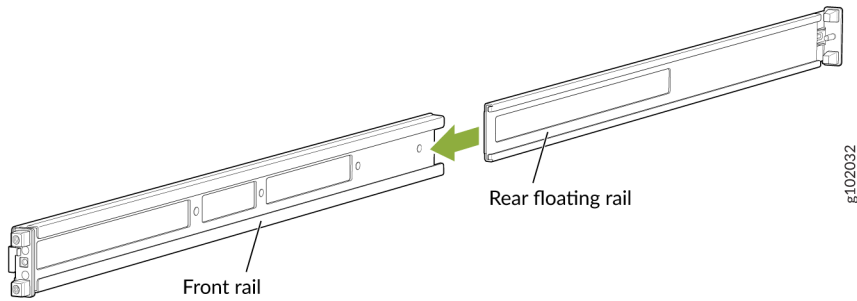
b. Mounting rails assembled. See Figure 65 on page 273.

Figure 65: Front and Rear Rails Assembled

g102033
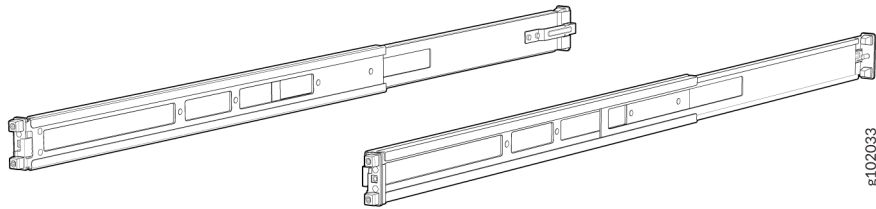
3. Attach the mounting rails to the rack.

a. Align the guide blocks of the rear mounting rails with the rear-post holes. Pull the rear mounting rails toward the front of the rack to lock the rails in place. You will hear a click sound when the latch locks into the corresponding rack holes. See Figure 66 on page 274.

Figure 66: Install the Rear Floating Rails

Rear rack post

Front rack post

g102034
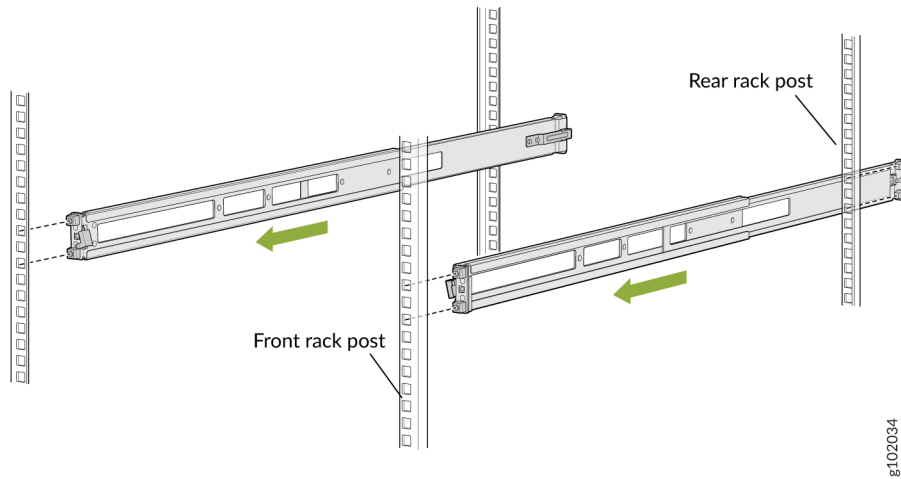
b. Move the latch lock on the front mounting rails to open position, slide the front mounting rails, and insert the guide blocks into the front rack posts. See Figure 67 on page 274.

Figure 67: Install the Front Mounting Rails

Rear rack post

Front rack post

g102038
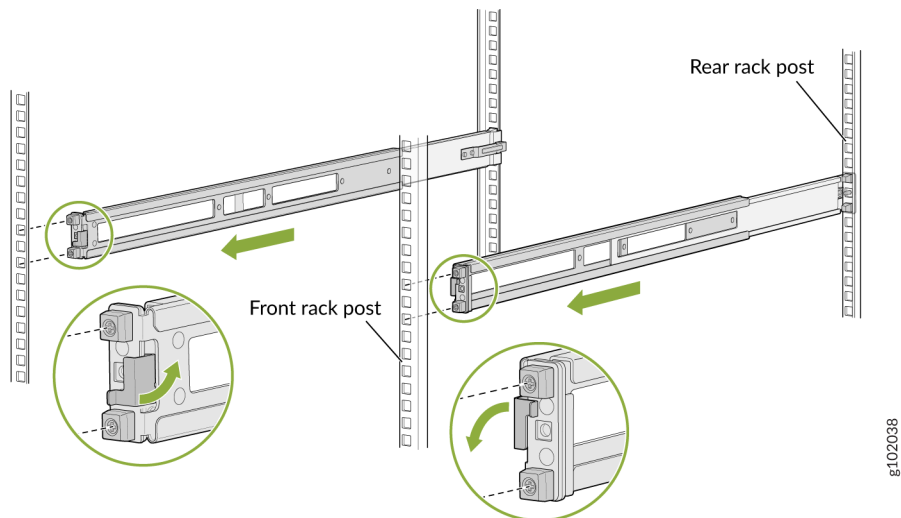
c. Push the lock latch to the locked position. See Figure 68 on page 275.

Figure 68: Front Mounting Rails Lock Latch
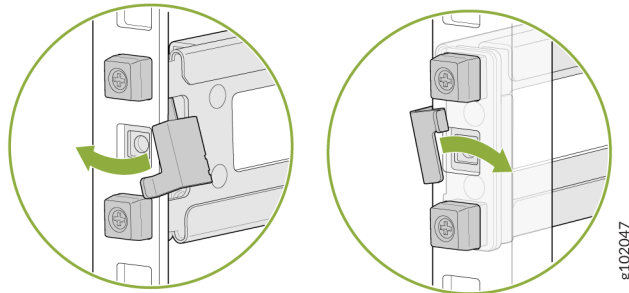
d. Visually ensure that the front and rear latches are locked into place on the mounting rails. See Figure 69 on page 275.

Figure 69: Mounting Rails Installed and Locked
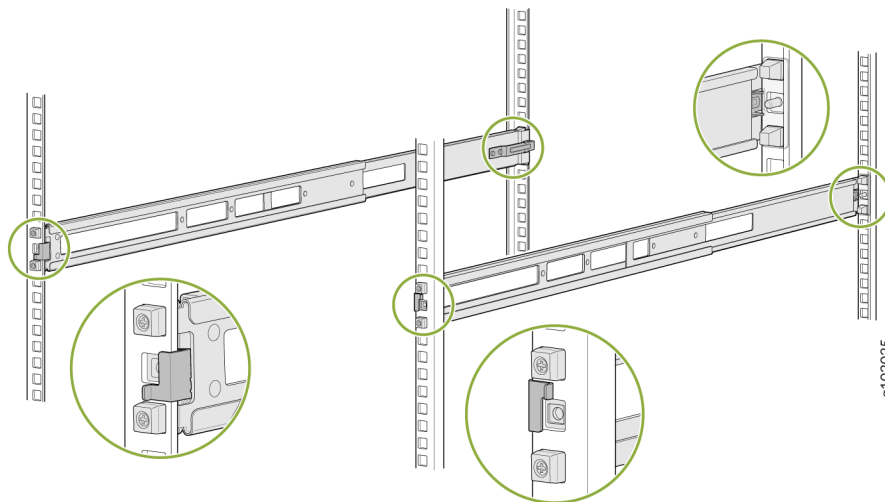
4. Attach mounting brackets to the device if not pre-installed. If your device already has the mounting brackets pre-installed than skip this step and move to the next step.

a. Align the holes on the mounting bracket with the screw holes on the side panel of the chassis.

b. Insert the flat head M4 x 6mm Phillips screws to attach the mounting bracket into the aligned holes on the chassis (see Figure 70 on page 276). Tighten the screws.

Figure 70: Attach the Mounting Brackets to the Device
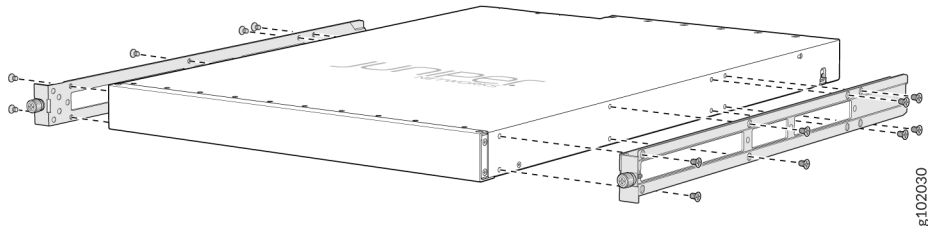
5. Position the device in such a manner that the **AIR OUT** labels on components are next to the hot aisle.

6. Grasp both sides of the device, lift it, and position the device such that the mounting rails slide into the channels of the mounting brackets. See Figure 71 on page 276.

Figure 71: Slide the Device into the Rack
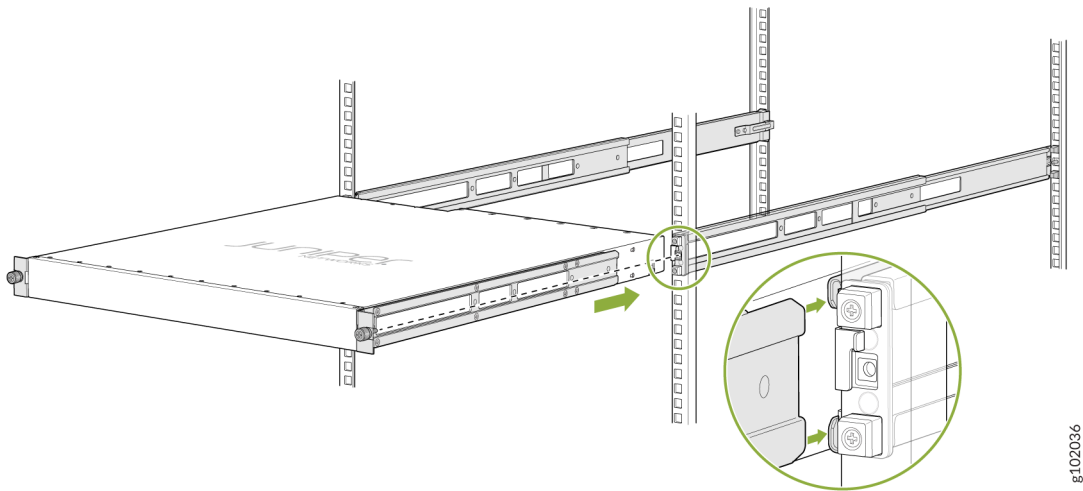
7. Tighten the two thumbscrews to secure the device. See Figure 72 on page 277.

Figure 72: Tighten the Thumb Screws
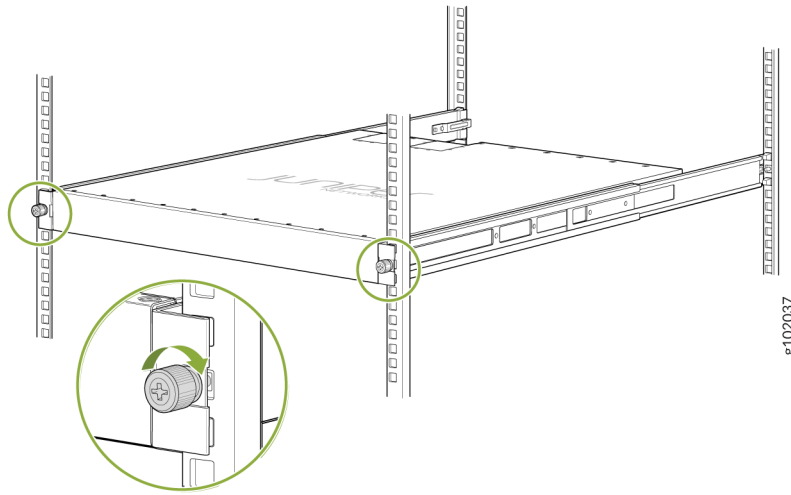
Mount the Device by Using the JNP-4PST-RMK-1U-E Rack Mount Kit On a Threaded Hole Rack

Ensure that you have the following tools and parts available:

- An ESD grounding strap—not provided

- Number 2 Phillips (+) screwdriver—not provided

- A pair of front and rear mounting rails that attach to the rack posts—provided with the rack mount kit

- A pair of side mounting brackets and 16 flat head M4 x 6mm Phillips screws. These brackets attach to the device if not pre-installed—provided with the rack mount kit

To mount the device on four posts in a threaded hole rack by using the JNP-4PST-RMK-1U-E rack mount kit:

1. Wrap and fasten the ESD grounding strap to your bare wrist and connect the other end of the strap to the ESD point on the device.

2. Assemble the mounting rails.

   a. Remove the guide blocks from the front mounting rails by loosening the screws and preserve them for later use. See .

Figure 73: Remove Guide Blocks from Front Mounting Rail

Front rail
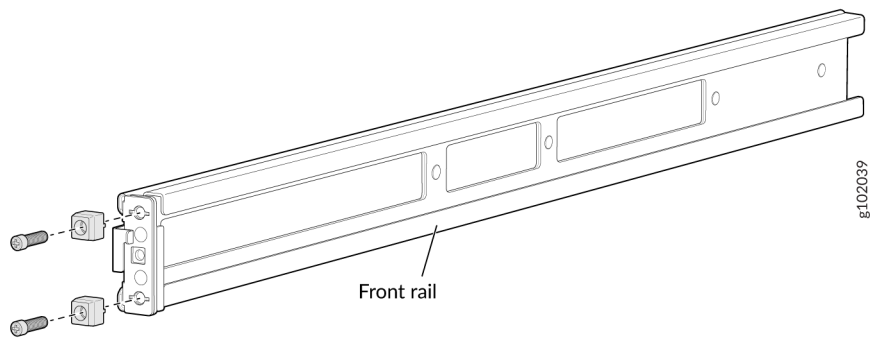
b. Remove the guide blocks from the rear floating rails by loosening the screws and washers. Preserve the guide blocks, screws, and washers for later use. See Figure 74 on page 278

Figure 74: Remove Guide Blocks from Rear Floating Rail
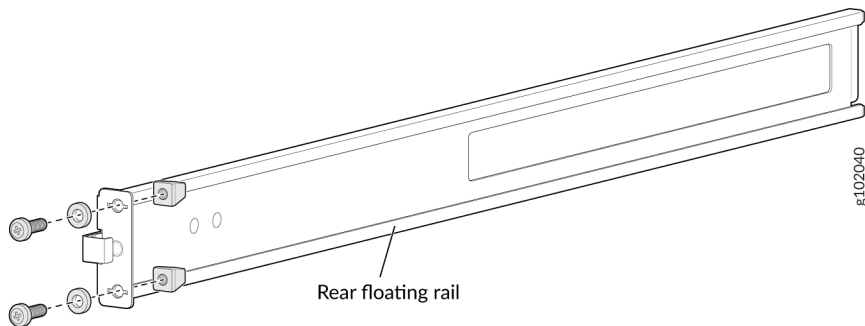
Rear floating rail

c. Slide the rear floating rails into the front mounting rails. See Figure 75 on page 278.

Figure 75: Slide Rear Floating Rail into Front Mounting Rail

Rear floating rail

Front rail
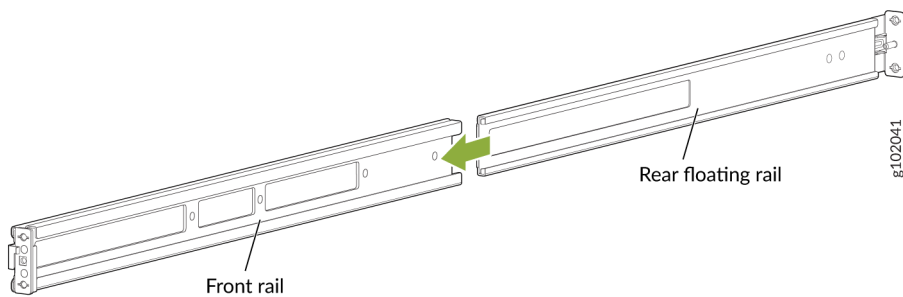
d. Mounting rails assembled. See Figure 76 on page 279.

Figure 76: Front and Rear Rails Assembled
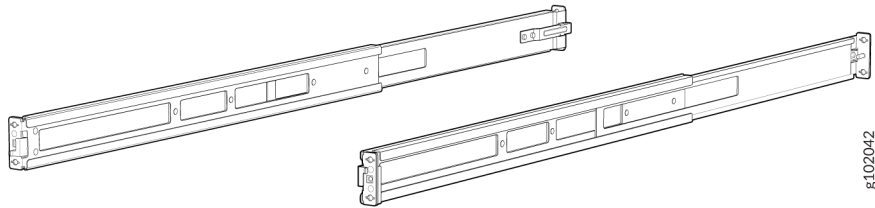
3. Attach the mounting rails to the threaded hole rack.

a. Align the guide blocks of the rear mounting rails with the rear-post holes. Pull the rear mounting rails toward the front of the rack to lock the rails in place. You will hear a click sound when the latch locks into the corresponding rack holes. See Figure 77 on page 279.

Figure 77: Install the Rear Floating Rails
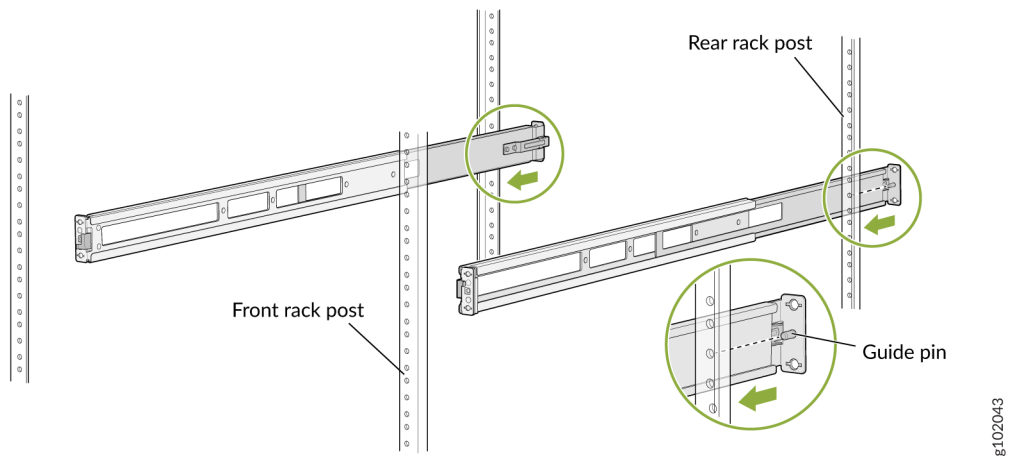
b. Move the latch locks on the front mounting rails to open position, slide the front mounting rails and align them to the front rack post. Push the lock latch to locked position and using the screws removed in step 2.a and the washers removed in step 2.b, secure the front mounting rails to the front rack post. See Figure 78 on page 280.

Figure 78: Install the Front Mounting Rails

g102048
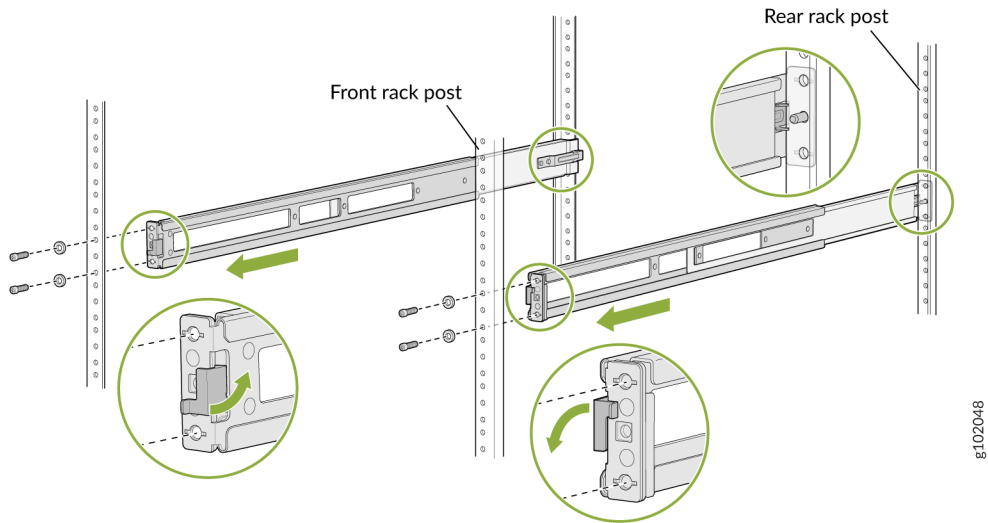
c. Secure the rear floating rails to the rear rack post by using screws (not provided) appropriate for your rack threaded size. See Figure 79 on page 280.

Figure 79: Secure the Rear Floating Rails
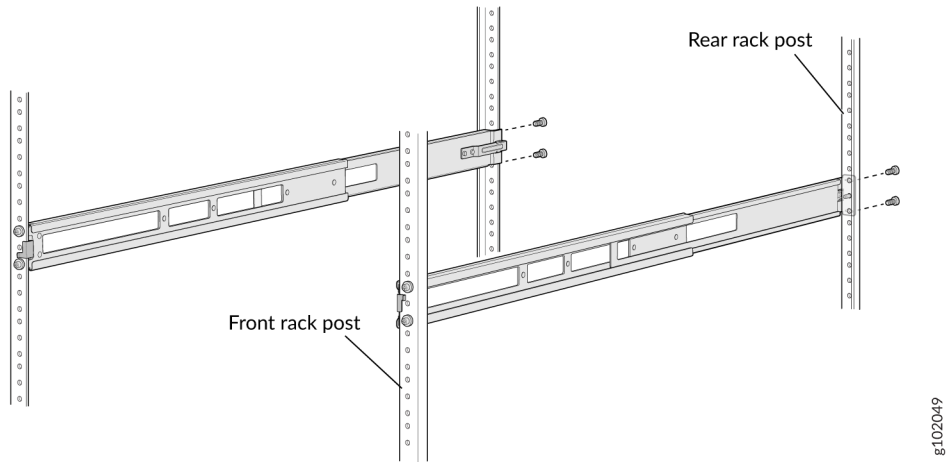
g102049

d. Visually ensure that the front and rear latches are locked into place on the mounting rails. See Figure 80 on page 281.

Figure 80: Mounting Rails Installed and Secured
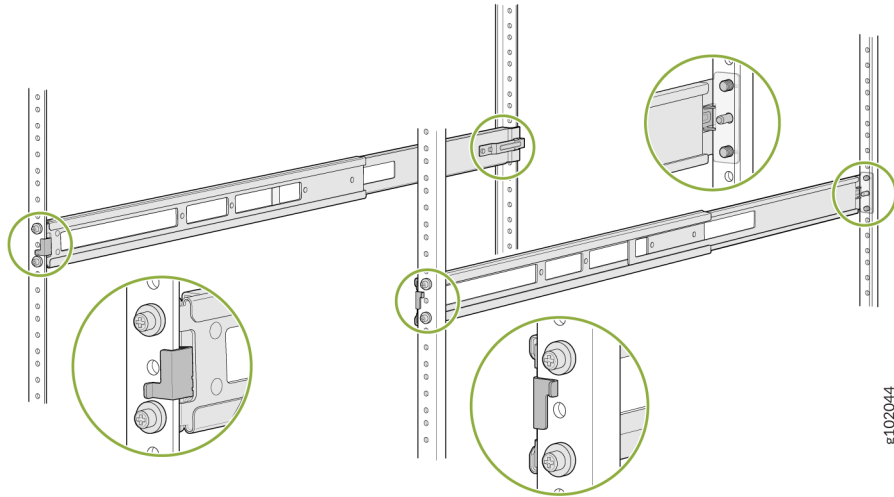
4. Attach mounting brackets to the device if not pre-installed. If your device already has the mounting brackets pre-installed than skip this step and move to the next step.

   a. Align the holes on the mounting bracket with the screw holes on the side panel of the chassis.

   b. Insert the flat head M4 x 6mm Phillips screws to attach the mounting bracket into the aligned holes on the chassis (see Figure 81 on page 281). Tighten the screws.

Figure 81: Attach the Mounting Brackets to the Device
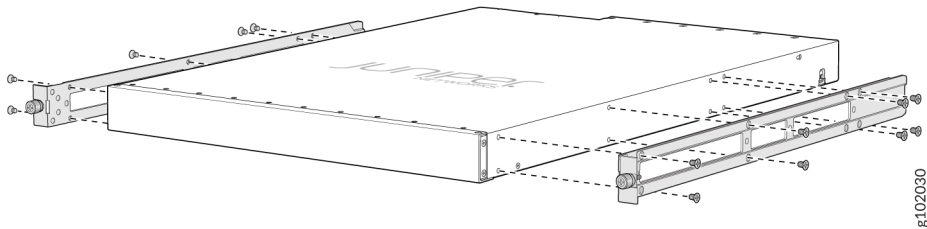
5. Position the device in such a manner that the **AIR OUT** labels on components are next to the hot aisle.

6. Grasp both sides of the device, lift it, and position the device such that the mounting rails slide into the channels of the mounting brackets. See Figure 82 on page 282.

Figure 82: Slide the Device into the Rack
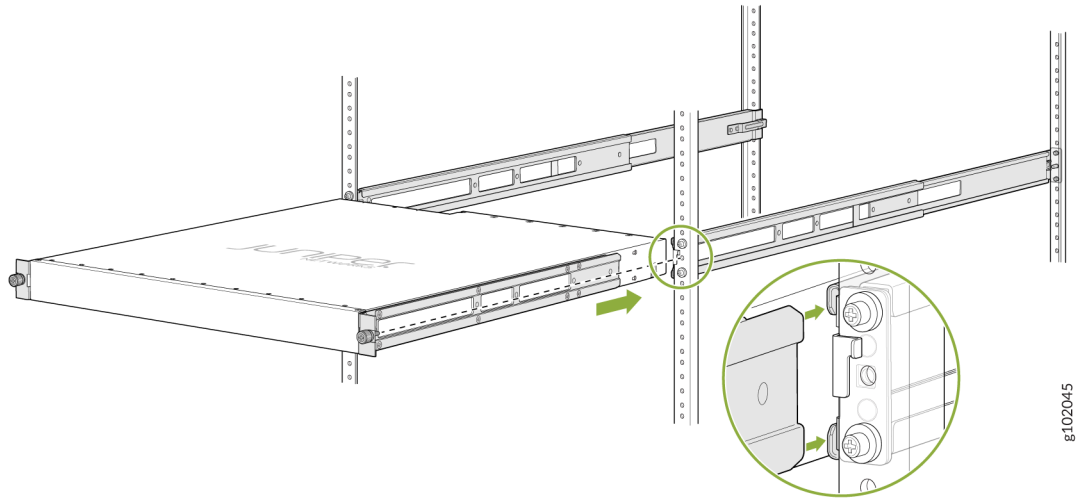
7. Tighten the two thumbscrews to secure the device. See Figure 83 on page 282.

Figure 83: Tighten Thumb Screws
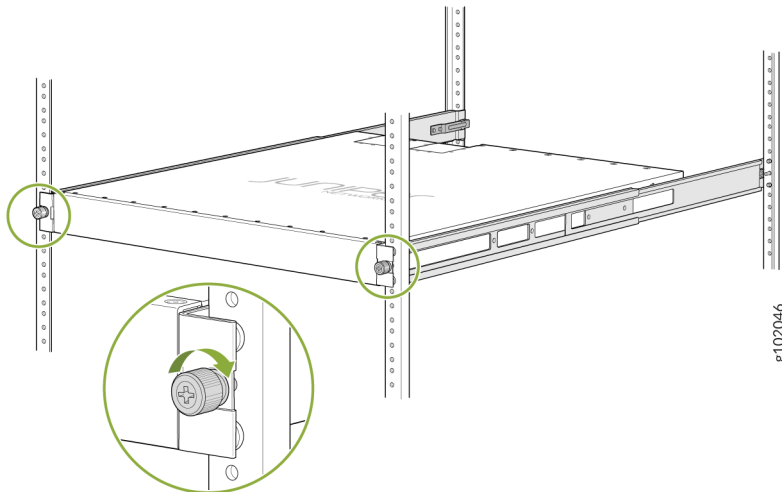
Connect the QFX5110 to Earth Ground

You must install the QFX5110 in a restricted-access location and ensure that the chassis is always properly grounded. The QFX5110 has a two-hole protective grounding terminal provided on the chassis. See Figure 84 on page 284. Under all circumstances, use this grounding connection to ground the

chassis. For AC-powered systems, you must also use the grounding wire in the AC power cord along with the two-hole grounding lug connection. This tested system meets or exceeds all applicable EMC regulatory requirements with the two-hole protective grounding terminal.

CAUTION: If an external ground connection is required, 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 (for example, by causing a short circuit).

NOTE: Mount your switch in the rack or cabinet before attaching the grounding lug to the switch. See *Unpacking and Mounting the QFX5110*.

Ensure that you have the following parts and tools available:

- Grounding cable for your QFX5110 device—The grounding cable must be 14 AWG (2 mm²), minimum 90° C wire, or as permitted by the local code (not provided).

- Grounding lug for your grounding cable—The grounding lug required is a Panduit LCD10-10A-L or equivalent (not provided).

- Two 10-32 x 0.25 screws with #10 split-lock washers—Two screws and washers are used to secure the grounding lug to the side of the chassis (not provided).

- Number 2 screwdriver.

An AC-powered QFX5110 switch chassis gains additional grounding when you plug the power supply in the switch into a grounded AC power outlet by using an AC power cord appropriate for your geographical location. See *QFX5110 AC Power Cord Specifications*.

To connect earth ground to a QFX5110:

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 that is attached to the grounding cable over the protective earthing terminal.
3. Secure the grounding lug to the protective earthing terminal with two screws and washers. See Figure 84 on page 284

Figure 84: Connecting a Grounding Cable to a QFX5110
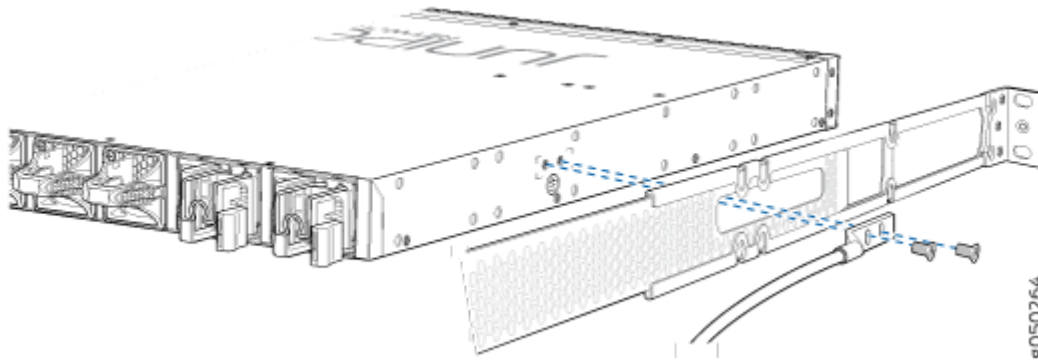
g050264

4. Dress the grounding cable and ensure that it does not touch or block access to other device components and that it does not drape where people could trip over it.

Connecting AC Power to a QFX5110

Ensure that you have a power cord appropriate for your geographical location available to connect AC power to the switch.

Before you begin connecting AC power to the switch:

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

- Ensure that you have connected the switch chassis to earth ground.

> ⚠ **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).
>
> To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the chassis 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 earth ground, see *Connect the QFX5110 to Earth Ground*.
>
> On AC systems, the switch gains 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 *QFX5110 AC Power Supply Description*).

> ⚠ **CAUTION**:

- Install the power supply in the chassis. For instructions on installing a power supply in a QFX5110, see *Installing a Power Supply in a QFX5110*.

The QFX5110 is shipped with two 650 W power supplies pre-installed. Each power supply is a hot-removable and hot-insertable field-replaceable unit (FRU) when the second power supply is installed and running. You can install replacement power supplies in the two slots next to the fan modules without powering off the switch or disrupting switch functions.

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

To connect AC power to a QFX5110:

1. Attach the grounding strap to your bare wrist and to a site ESD point.
2. Ensure that the power supplies are fully inserted in the chassis and the latches are secure. If only one power supply is installed, ensure that a blank cover panel is installed over the second power supply slot.
3. Locate the power cord or cords shipped with the switch; the cords have plugs appropriate for your geographical location. See *QFX5110 AC Power Specifications*.

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

4. Connect each power supply to the power sources. Insert the coupler end of the power cord into the AC power cord inlet on the AC power supply faceplate.
5. Push the power cord retainer onto the power cord (see).

Figure 85: Connecting an AC Power Cord to an AC Power Supply in a QFX5110
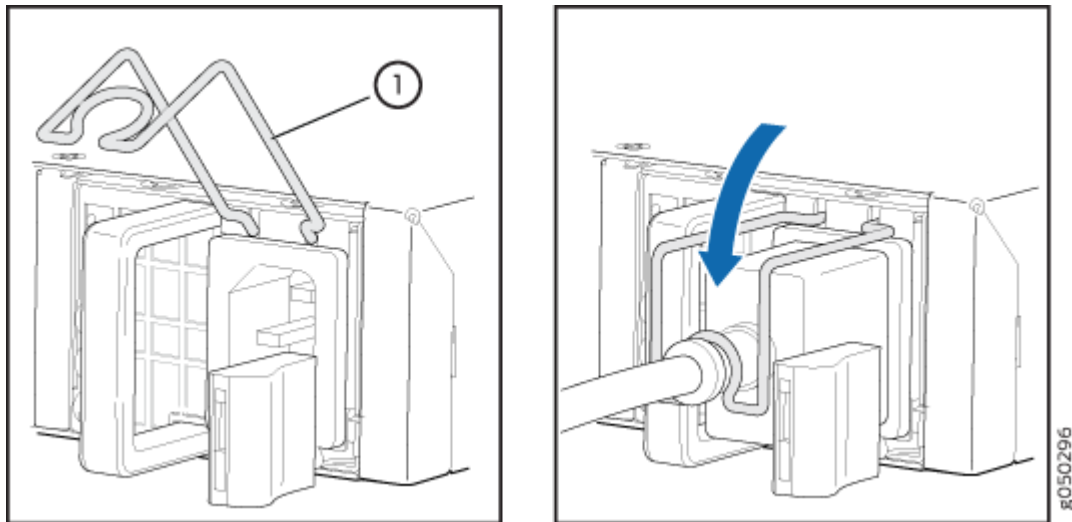
  1– Power cord retainer

6. If the AC power source outlet has a power switch, set it to the off (O) position.

> **NOTE**: The switch powers on as soon as power is provided to the power supply. There is no power switch on the device.

7. Insert the power cord plug into an AC power source outlet.

8. If the AC power source outlet has a power switch, set it to the on (|) position.

9. Verify that the AC and DC LEDs on each power supply are lit green.

   If the amber fault LED is lit, remove power from the power supply, and replace the power supply (see *Removing a Fan Module from a QFX5110*). Do not remove the power supply until you have a replacement power supply ready: the power supplies or a blank cover panel must be installed in the switch to ensure proper airflow.

> ⚠ **CAUTION**: Replace a failed power supply with a blank panel or new power supply within one minute of removal to prevent chassis overheating.

Connecting DC Power to a QFX5110

Before you begin connecting DC power to the switch:

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

- Ensure that you have connected the switch chassis to earth ground.

> ⚠️ **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).
>
> To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the chassis 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 earth ground, see *Connect the QFX5110 to Earth Ground*.
>
> On DC systems, you can also ground the chassis using the DC protective earthing terminal on the DC power supply as an alternate method. This method is useful if you are unable to access the chassis ground point by using the two-holed grounding lug, see *Alternate Method to Ground QFX5110-48S-DC and QFX5110-32Q-DC Systems*.

- Install the power supply in the chassis. For instructions on installing a power supply in a QFX5110, see *Installing a Power Supply in a QFX5110*.

Ensure that you have the following parts and tools available:

- DC power source cables (14–16 AWG) with ring lug (Molex 190700069 or equivalent) (not provided)

- Phillips (+) screwdriver, number 2 (not provided)

- Multimeter (not provided)

The QFX5110 is shipped from the factory with two 650 W power supplies. Each power supply is a hot-removable and hot-insertable field-replaceable unit (FRU) when the second power supply is installed and running. You can install replacement power supplies in the two slots next to the fan modules without powering off the switch or disrupting the switching function.

> ⚡ **WARNING**: A DC-powered QFX5110 is intended for installation only in a restricted access location.

> **NOTE**: The battery returns of the DC power supply must be connected as an isolated DC return (DC-I).

To connect DC power to a QFX5110:

1. Attach the grounding strap to your bare wrist and to a site ESD point.

2. 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 low resistance (indicating a closed circuit) to chassis ground is positive (+) and will be installed on the V+ (return) DC power input terminal.

   - The cable with very high resistance (indicating an open circuit) to chassis ground is negative (–) and will be installed on the V– (input) 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.

3. Install heat-shrink tubing insulation around the power cables.

   To install heat-shrink tubing:

   a. Slide the tubing over the portion of the cable where it is attached to the lug barrel. Ensure that tubing covers the end of the wire and the barrel of the lug attached to it.

   b. Shrink the tubing with a heat gun. Ensure that you heat all sides of the tubing evenly so that it shrinks around the cable tightly.

   shows the steps to install heat-shrink tubing.

   > **NOTE**: Do not overheat the tubing.

Figure 86: How to Install Heat-Shrink Tubing
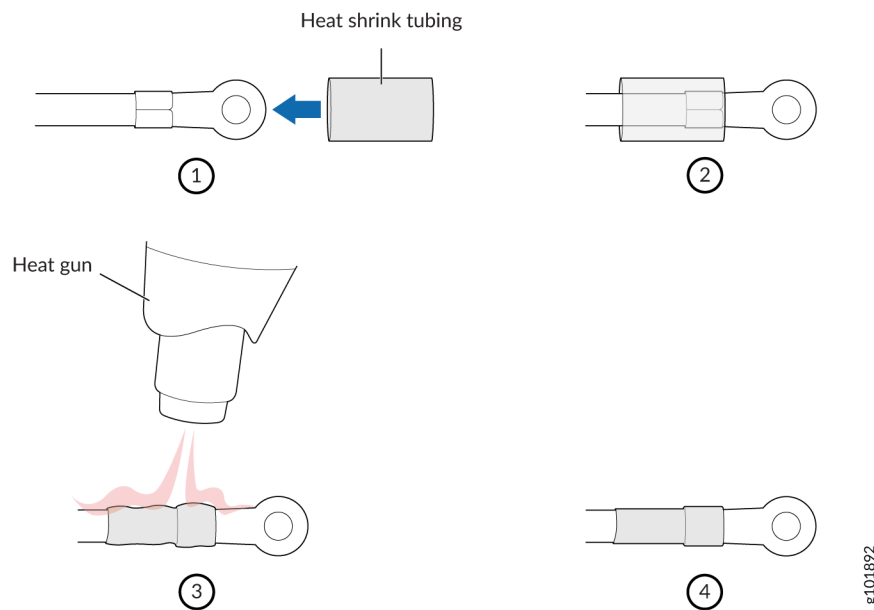
4. Ensure that the input circuit breaker is open so that the voltage across the DC power source cable leads is 0 V and that the cable leads do not become active while you are connecting DC power.

> **NOTE**: The V+ terminals are referred to as +RTN, and V– terminals are referred to as –48 V in *DC Power Wiring Sequence Warning* and *DC Power Electrical Safety Guidelines*.

5. Ensure that the power supplies are fully inserted in the chassis.

6. Remove the terminal block cover. The terminal block cover is a piece of clear plastic that snaps into place over the terminal block (see Figure 87 on page 291).

7. Remove the screws on the terminals using the screwdriver. Save the screws.

> ⚠ **WARNING**: Ensure that the power cables do not block access to device components or drape where people can trip on them.

8. Connect each power supply to the power sources. Secure power source cables to the power supplies by screwing the ring lugs attached to the cables to the appropriate terminals by using the screw from the terminals (see Figure 87 on page 291 and Figure 88 on page 292).

The QFX5110 is designed to operate with a DC power supply that has a single, non-redundant, feed input. For source redundancy, two DC power supplies must be installed in the QFX5110;

connect source (A) to one power supply and connect source (B) to the second power supply. This configuration provides the commonly deployed A/B feed redundancy for the system.

The terminal block of the power supply has four terminals labeled V+, V+, V−, and V− for connecting DC power source cables labeled positive (+) and negative (−). The V+ terminals are shunted internally together, as are the V- terminals.

> ⚠️ **CAUTION**: The connection between each power source and power supply must include a circuit breaker.
>
> Do not connect two sources to a single power supply because doing so can potentially cause circulating current in feed wires whenever there is any difference in the voltage of the two sources.

a. Secure the ring lug of the positive (+) DC power source cable to the V+ terminal on the DC power supply.

b. Secure the ring lug of the negative (−) DC power source cable to the V− terminal on the DC power supply.

c. Tighten the screws on the power supply terminals until snug using the screwdriver. Do not overtighten; apply between 5 in-lb (0.56 Nm) and 6 in-lb (0.68 Nm) of torque to the screws.

Figure 87: DC Power Supply Faceplate for a QFX5110
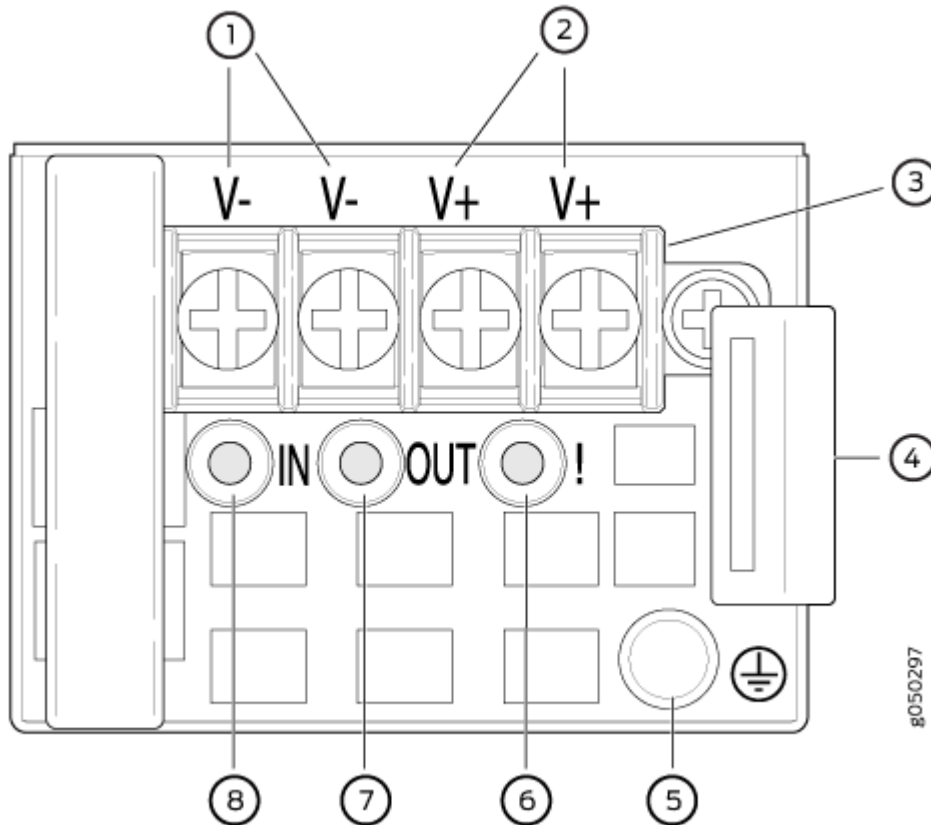
1– Shunt negative input terminals (+RTN)	5– Protective earthing terminal
2– Shunt positive input terminals (-48V)	6– Fault LED
3– Terminal block	7– Output LED
4– Ejector lever	8– Input LED

⚠ **CAUTION**: The V+ terminals are shunted internally together, as are the V- terminals. The same polarity terminal can be wired together from the same source to provide an additional current path in a higher power chassis. Do not connect the terminals to different sources.

Figure 88: Securing Ring Lugs to the Terminals on the QFX5110 DC Power Supply
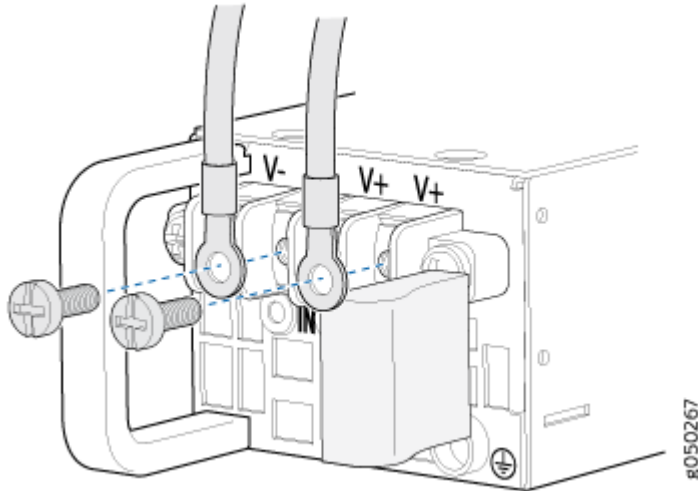
9. Replace the terminal block cover.

10. Close the input circuit breaker.

> **NOTE**: The switch powers on as soon as power is provided to the power supply. There is no power switch on the device.

11. Verify that the **IN** and **OUT** LEDs on the power supply are lit green and are on steadily.

CHAPTER 23

Installing a QFX5100 Switch

IN THIS CHAPTER

QFX5100 Standalone Installation Overview

You can mount a QFX5100 device:

- Flush with the front of a 19-in. four-post rack. Use the standard mounting brackets provided with the switch for this configuration.

- Recessed 2 in. (5 cm) from the front of a 19-in. four-post rack. Use the extension bracket provided in the standard mounting kit for this configuration. Recessed mounting is primarily used in enclosed cabinets.

To install and connect a QFX5100 device:

1. Follow the instructions in Unpack a QFX5100 Device.
2. Determine how the device is to be mounted.

   Flush or recessed mounted in a rack or cabinet, see Mount a QFX5100 Device in a Rack or Cabinet.
3. Follow the instructions in:

   a. Connecting Earth Ground to a QFX5100 Device

b. Connecting AC Power to a QFX5100 Device or Connecting DC Power to a QFX5100 Device

c. *Register Products—Mandatory to Validate SLAs*

4. Depending on how you plan to use the QFX5100 device, do one of the following:

- If you are using the QFX5100 device as a standalone switch, follow the instructions in Configure a QFX5100 Device.

- If you are using the QFX5100 device as a Node device in a QFX3000-G QFabric system, see *QFX3000-G QFabric System Installation Overview* for information about the steps to install and configure your QFX3000-G QFabric system.

- If you are using the QFX5100 device as a Node device in a QFX3000-M QFabric system, see *QFX3000-M QFabric System Installation Overview* for information about the steps to install and configure your QFX3000-M QFabric system.

- If you are using a QFX5100-24Q as an Interconnect device in a QFX3000-M QFabric system, see *Connecting a QFX5100 Node Device to a QFX5100-24Q Interconnect Device*.

- If you are using the QFX5100 device in a Virtual Chassis Fabric, see Connecting a QFX5100 Device in a Virtual Chassis Fabric.

Unpack a QFX5100 Device

The QFX5100 switch chassis is a rigid sheet-metal structure that houses the hardware components. A QFX5100 device is shipped in a cardboard carton, secured with foam packing material. The carton also contains an accessory box and quick start instructions.

> ⚠ **CAUTION**: QFX5100 devices are maximally protected inside the shipping carton. Do not unpack the switch until you are ready to begin installation.

To unpack a QFX5100 device:

1. Move the shipping carton to a staging area as close to the installation site as possible, but where you have enough room to remove the system components.

2. Position the carton so that the arrows are pointing up.

3. Open the top flaps on the shipping carton.

4. Remove the accessory box and verify the contents against the inventory included in the box. Table 68 on page 295 lists the inventory of components supplied with a QFX5100 device.

5. Pull out the packing material holding the switch in place.

6. Verify the chassis components received:

- Two power supplies

- Fan modules

  - Five fan modules for 1 U devices

  - Three fan modules for 2 U devices

> **NOTE**: Product SKU QFX5100-24Q: If you ordered the optional high-speed uplink modules, they are packaged as components and must be installed in the switch

7. Save the shipping carton and packing materials in case you need to move or ship the switch later.

Table 68: Inventory of Components Supplied with a QFX5100 Device

Component	Quantity
Chassis with five fan modules and two power supplies. The QFX5100-96S has three fan modules.	1
Rear mounting blades	2
Front mounting brackets	2
Extension brackets	2
RJ-45 cable and RJ-45 to DB-9 adapter	1
Power cords (AC systems only)	2

RELATED DOCUMENTATION

Mount a QFX5100 Device in a Rack or Cabinet

QFX5100 Standalone Installation Overview

Mount a QFX5100 Device in a Rack or Cabinet

IN THIS SECTION

-
-

You can mount all QFX5100 switches on a four post 19-in. rack or cabinet using the mounting kit provided with the device.

For four post rack or cabinet installations, the mounting kit contains two front mounting rails with two matching rear mounting blades. This configuration allows either end of the switch to be mounted flush with the rack and still be adjustable for racks with different depths.

(The remainder of this topic uses "rack" to mean "rack or cabinet.") The front and rear rack rails must be spaced between 28.5 in. (72.4 cm) to 31.5 in. (80 cm) front to back.

Before You Begin Rack Installation

Before you begin mounting a QFX5100 switch in the rack or cabinet:

1. Ensure that you understand how to prevent electrostatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.
2. Verify that the site meets the requirements described in Site Preparation Checklist for a QFX5100 Device.
3. Place the rack in its permanent location, allowing adequate clearance for airflow and maintenance, and secure it to the building structure.
4. Read *General Site Guidelines*, with particular attention to QFX5100 Installation Safety Guidelines.
5. Remove the switch from the shipping carton (see Unpack a QFX5100 Device).
6. Ensure that you have the following parts and tools available to mount the switch in a rack:

   - ESD grounding strap (not provided).

   - Blades, rails, or brackets (provided).

     - For four-post installations:

       - One pair of rear mounting blades. These mounting blades support the rear of the chassis and must be installed (provided).

- One pair of front mounting rails. The mounting blades slide into the mounting rails to support the switch (provided).

- Screws to secure the mounting rails to the chassis (provided).

  - Twelve screws for 1 U chassis

  - Twenty-four screws for QFX5100-96S

- Eight screws to secure the chassis and rear installation blades to the rack (not provided).

- Appropriate screwdriver for the mounting screws (not provided).

- Two power cords with plugs appropriate to your geographical location (provided).

- RJ-45 cable and RJ-45 to DB-9 serial port adapter (provided).

- Management host, such as a PC laptop, with a serial port (not provided).

Optional equipment: Grounding cable kit with bracket, lug, and three nuts with integrated washers.

> **WARNING**: The 1 U versions of QFX5100 switches must be supported at all four corners. Mounting the chassis using only the front brackets will damage the chassis and can result in serious bodily injury.

> **CAUTION**: All QFX5100 switches require two people for installation, one person to lift the switch into place and another person to attach the switch to the rack. If you are installing the QFX5100 switch above 60 in. (152.4 cm) from the floor, you can remove the power supplies and fan modules to minimize the weight before attempting to install the switch.

> **CAUTION**: If you are mounting multiple switches on a rack, mount the switch in the lowest position of the rack first. Proceed to mount the rest of the switches from the bottom to the top of the rack to minimize the risk of the rack toppling.

Four-Post Procedure

To mount the switch on four posts in a rack using the provided mounting kit:

1. Attach the ESD grounding strap to your bare wrist and to a site ESD point.
2. Decide whether the Field Replaceable Unit (FRU) end of the switch or the port end is to be placed at the front of the rack. Position the switch in such a manner that the **AIR IN** labels on components are next to the cold aisle and **AIR OUT** labels on components are next to the hot aisle.

3. Align the holes in the mounting rail with the holes on the side of the chassis. See Figure 89 on page 298 through Figure 91 on page 298 for examples the proper alignment of 1 U and 2 U chassis systems.

Figure 89: Attaching Mounting Rails to the QFX5100-24Q
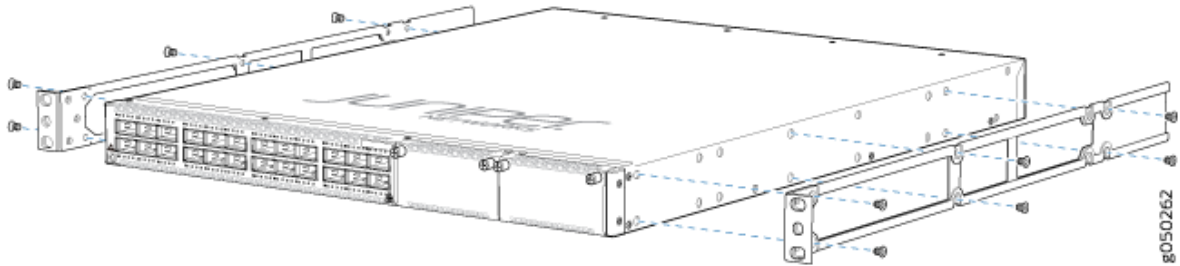
Figure 90: Attaching Mounting Rails to the QFX5100-48S
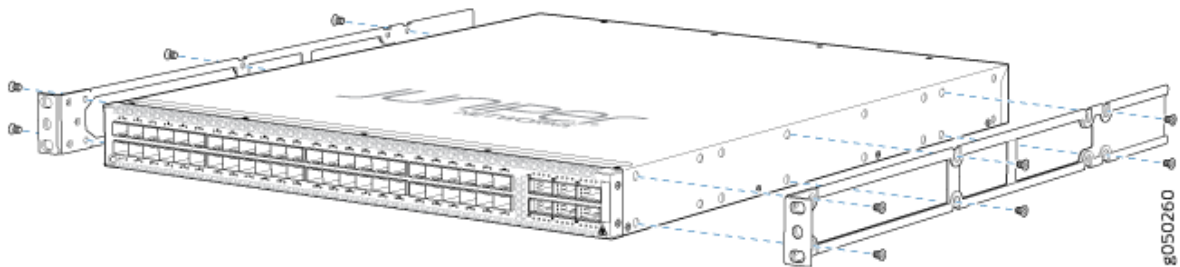
Figure 91: Attaching Mounting Rails to the QFX5100-96S
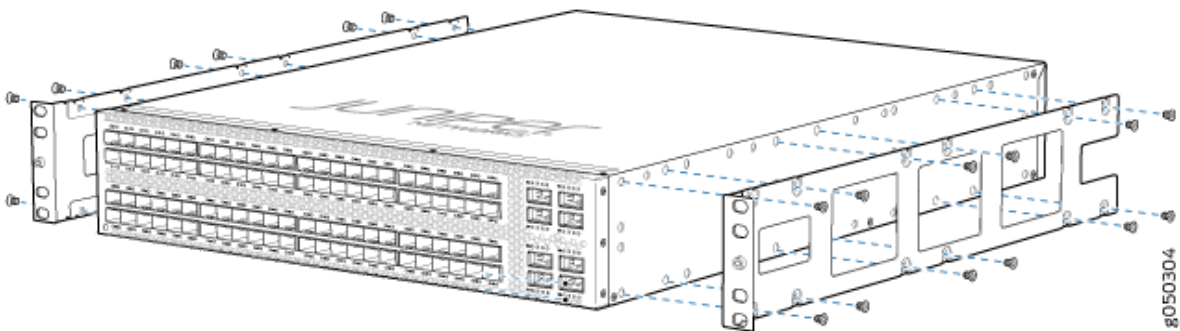
4. Attach the mounting rail to the switch using the mounting screws (and cage nuts and washers if your rack requires them). Tighten the screws.

5. Repeats steps 4 and 5 on the opposite side of the switch.

6. Have one person grasp both sides of the switch, lift it, and position it in the rack so that the front bracket is aligned with the rack holes.

7. Have a second person secure the front of the switch to the rack using four mounting screws (and cage nuts and washers if your rack requires them.) Tighten the screws. See Figure 92 on page 299 and Figure 93 on page 299 for examples of connecting the mounting rails and blades.

Figure 92: Attach 1 U Switch to Rack
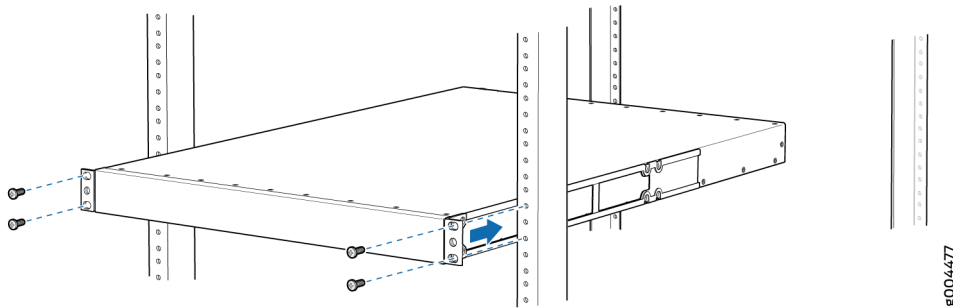
Figure 93: Slide Mounting Rail onto the QFX5100-96S Rear Mounting Blade
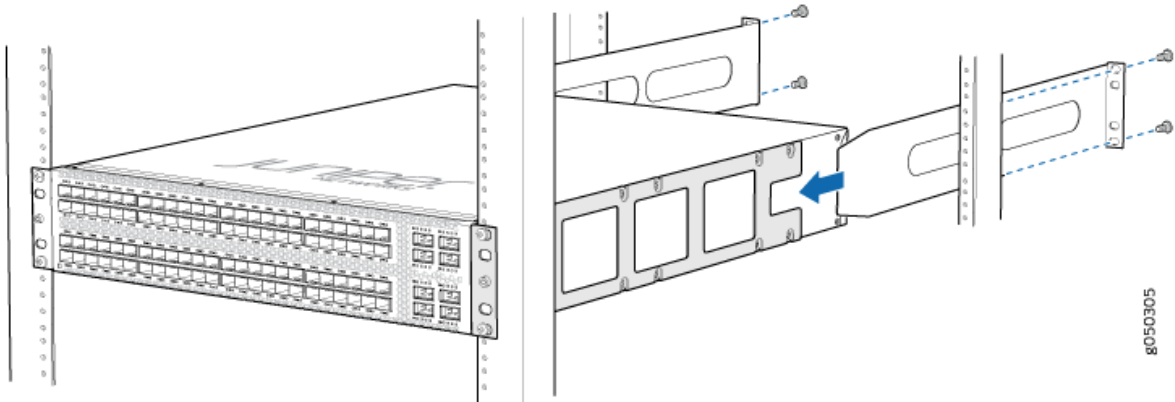
8. Continue to support the switch while sliding the rear mounting-blades into the channel of the side mounting-rails and securing the blades to the rack. Use the four mounting screws (and cage nuts and washers if your rack requires them) to attach each blade to the rack. (Use eight front-mounting screws for the QFX5100-96S.) Tighten the screws. See Figure 94 on page 300.

Figure 94: Slide Mounting Blade into 1 U Mounting Rail
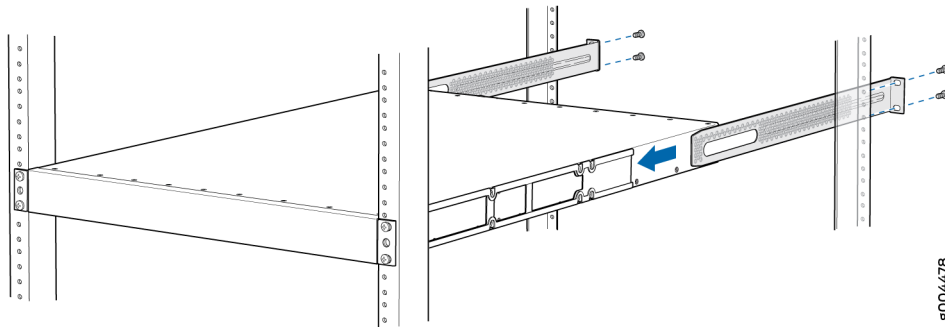
9. Ensure that the switch chassis is level by verifying that all the screws on the front of the rack are aligned with the screws at the back of the rack.

Connecting Earth Ground to a QFX5100 Device

To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the QFX5100 device to earth ground before you connect it to power.

You must install the QFX5100 in a restricted-access location and ensure that the chassis is always properly grounded. The QFX5100 has a two-hole protective grounding terminal provided on the chassis. See Figure 95 on page 301. We recommend that you use this protective grounding terminal as the preferred method for grounding the chassis regardless of the power supply configuration. However, if additional grounding methods are available, you can also use those methods. For example, you can use the grounding wire in the AC power cord or use the grounding terminal or lug on a DC power supply. This tested system meets or exceeds all applicable EMC regulatory requirements with the two-hole protective grounding terminal.

Before you connect earth ground to the protective earthing terminal of a QFX5100 device, ensure that a licensed electrician has attached an appropriate grounding lug to the grounding cable.

> ⚠️ **CAUTION**: Using a grounding cable with an incorrectly attached lug can damage the switch.

> **NOTE**: Mount your switch in the rack or cabinet before attaching the grounding lug to the switch. See Mount a QFX5100 Device in a Rack or Cabinet.

Ensure that you have the following parts and tools available:

- Protective earthing terminal bracket—This bracket attaches to the QFX5100 switch chassis through the left front mounting bracket, providing a protective earthing terminal for the switch.

- Grounding cable for your QFX5100 device—The grounding cable must be 14 AWG (2 mm²), minimum 90° C wire, or as permitted by the local code.

- Grounding lug for your grounding cable—The grounding lug required is a Panduit LCD10-10A-L or equivalent.

- Two SAE 10-32 washers and screws—To attach the grounding lug to the protective earthing terminal.

- Screwdriver to attach the screws.

An AC-powered QFX5100 switch chassis gains additional grounding when you plug the power supply in the switch into a grounded AC power outlet by using an AC power cord appropriate for your geographical location. See *AC Power Cord Specifications for a QFX Series Device*.

To connect earth ground to a QFX5100 device:

1. Attach one end of the grounding cable to an appropriate earth ground site, such as the mounting rack.

2. Position the grounding lug over the protective earthing terminal on the side of the chassis, which is visible through the mounting bracket.

3. Secure the grounding lug to the protective earthing terminal with the washers and screws. See and .

Figure 95: Connecting a Grounding Cable to a 1 U QFX5100 Device
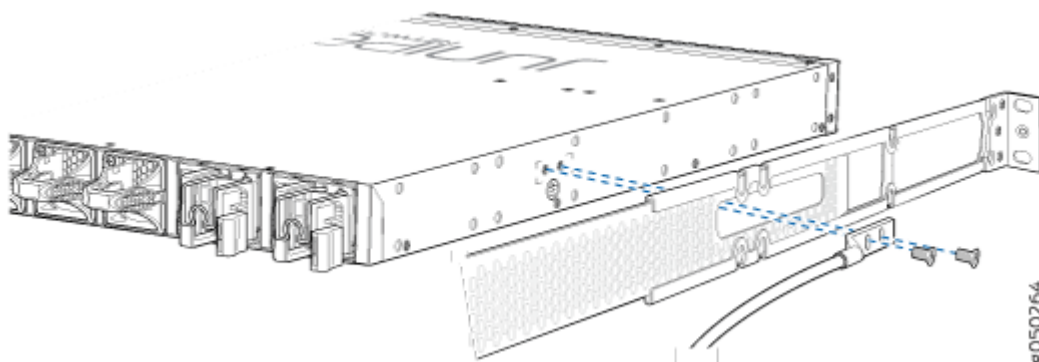
Figure 96: Connecting a Grounding Cable to the 2 U QFX5100-96S Device

4. Dress the grounding cable and ensure that it does not touch or block access to other device components and that it does not drape where people could trip over it.

General Safety Guidelines and Warnings

Grounded Equipment Warning

Connecting AC Power to a QFX5100 Device

Ensure that you have a power cord appropriate for your geographical location available to connect AC power to the switch.

Before you begin connecting AC power to the switch:

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

- Ensure that you have connected the switch chassis to earth ground.

⚠️ **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).

> To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the chassis 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 earth ground, see Connecting Earth Ground to a QFX5100 Device. The switch gains 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 Supply for a QFX5100 Device).

- Install the power supply in the chassis. For instructions on installing a power supply in a QFX5100 device, see Installing a Power Supply in a QFX5100 Device.

The QFX5100 is shipped from the factory with two power supplies. Each power supply is a hot-removable and hot-insertable field-replaceable unit (FRU) when the second power supply is installed and running. You can install replacement power supplies in the two slots next to the fan modules without powering off the switch or disrupting the switching function.

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

To connect AC power to a QFX5100 device:

1. Attach the grounding strap to your bare wrist and to a site ESD point.

2. Ensure that the power supplies are fully inserted in the chassis and the latches are secure. If only one power supply is installed, ensure a that blank cover panel is installed over the second power supply slot.

3. Locate the power cord or cords shipped with the switch; the cords have plugs appropriate for your geographical location. See *AC Power Cord Specifications for a QFX Series Device*.

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

4. Connect each power supply to the power sources. Insert the coupler end of the power cord into the AC power cord inlet on the AC power supply faceplate.

5. Push the power cord retainer onto the power cord (see Figure 97 on page 304 and Figure 98 on page 304).

Figure 97: Connecting an AC Power Cord to an AC Power Supply in a 1 U QFX5100 Device
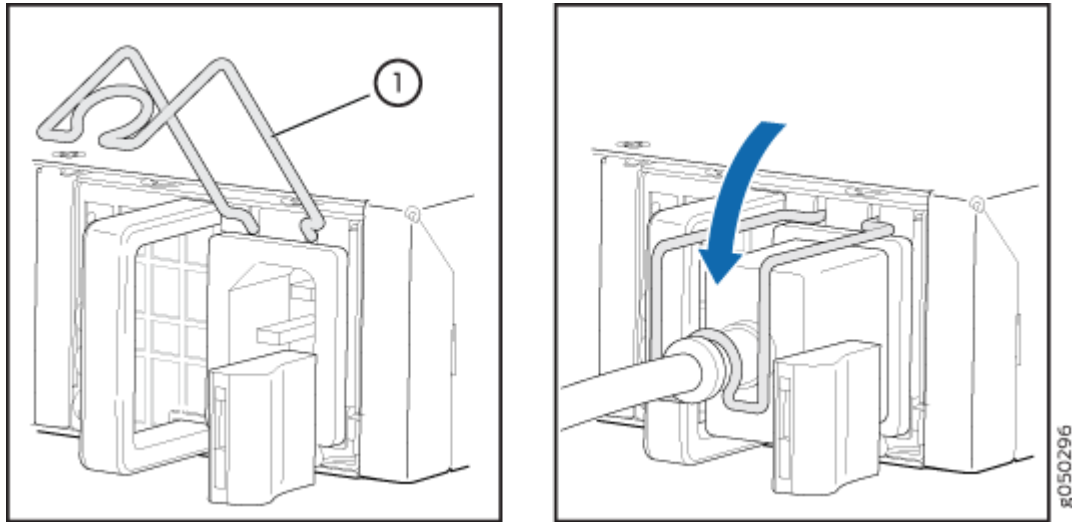
1— Power cord retainer

Figure 98: Connecting an AC Power Cord to an AC Power Supply in a 2 U QFX5100 Device
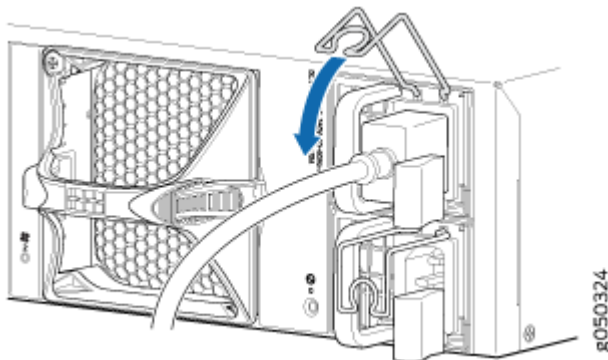
6. If the AC power source outlet has a power switch, set it to the OFF (O) position.

> **NOTE**: The switch powers on as soon as power is provided to the power supply. There is no power switch on the device.

7. Insert the power cord plug into an AC power source outlet.

8. If the AC power source outlet has a power switch, set it to the ON (|) position.

9. Verify that the AC and DC LEDs on each power supply are lit green.

   If the amber fault LED is lit, remove power from the power supply, and replace the power supply (see Removing a Power Supply from a QFX5100 Device). Do not remove the power supply until you have

a replacement power supply ready: the power supplies or a blank cover panel must be installed in the switch to ensure proper airflow.

> ⚠ **CAUTION**: Replace a failed power supply with a blank panel or new power supply within 1 minute of removal to prevent chassis overheating.

> ⚠ **CAUTION**: A system reboot with Routing Engine FPGA version 7.1 might not successfully boot the Junos OS software. In case of a system reboot failure, you need to power cycle the switch. To check the current FPGA version, issue the `show chassis firmware` command.

Connecting DC Power to a QFX5100 Device

Before you begin connecting DC power to the switch:

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

- Ensure that you have connected the switch chassis to earth ground.

> ⚠ **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).
>
> To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the chassis 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 earth ground, see Connecting Earth Ground to a QFX5100 Device.

- Install the power supply in the chassis. For instructions on installing a power supply in a QFX5100 device, see Installing a Power Supply in a QFX5100 Device.

Ensure that you have the following parts and tools available:

- DC power source cables (14–16 AWG) with ring lug (Molex 190700069 or equivalent) (not provided)

- Phillips (+) screwdriver, number 2 (not provided)

- Multimeter (not provided)

The QFX5100 is shipped from the factory with two power supplies. Each power supply is a hot-removable and hot-insertable field-replaceable unit (FRU) when the second power supply is installed and running. You can install replacement power supplies in the two slots next to the fan modules without powering off the switch or disrupting the switching function.

> ⚡ **WARNING**: DC-powered QFX5100 devices are intended for installation only in a restricted access location.

> **NOTE**: The battery returns of the DC power supply must be connected as an isolated DC return (DC-I).

To connect DC power to a QFX5100 device:

1. Attach the grounding strap to your bare wrist and to a site ESD point.
2. 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 low resistance (indicating a closed circuit) to chassis ground is positive (+) and will be installed on the V+ (return) DC power input terminal.

   - The cable with very high resistance (indicating an open circuit) to chassis ground is negative (–) and will be installed on the V– (input) 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.

3. Install heat-shrink tubing insulation around the power cables.

   To install heat-shrink tubing:

a. Slide the tubing over the portion of the cable where it is attached to the lug barrel. Ensure that tubing covers the end of the wire and the barrel of the lug attached to it.

b. Shrink the tubing with a heat gun. Ensure that you heat all sides of the tubing evenly so that it shrinks around the cable tightly.

Figure 99 on page 307 shows the steps to install heat-shrink tubing.

NOTE: Do not overheat the tubing.

Figure 99: How to Install Heat-Shrink Tubing
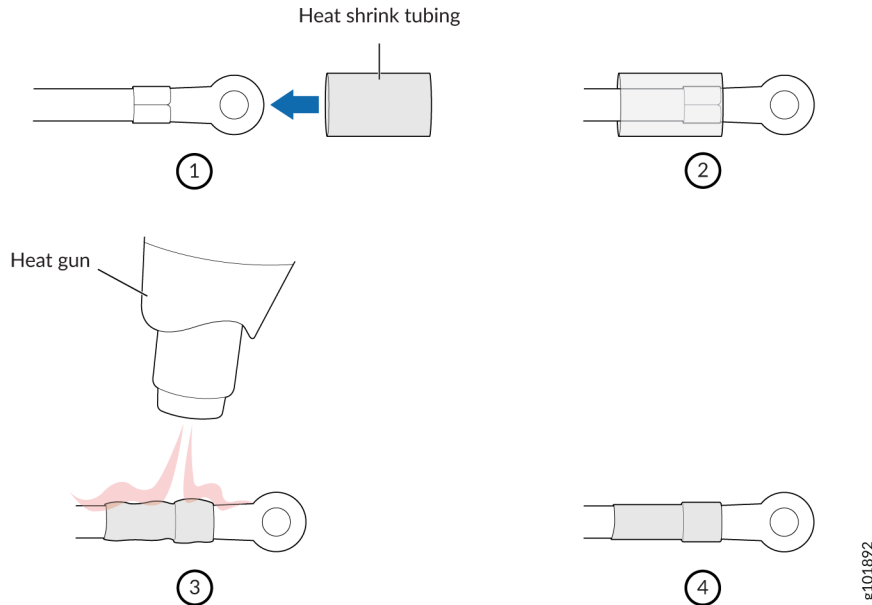
4. Ensure that the input circuit breaker is open so that the voltage across the DC power source cable leads is 0 V and that the cable leads do not become active while you are connecting DC power.

NOTE: The V+ terminals are referred to as +RTN, and V– terminals are referred to as –48 V in *DC Power Wiring Sequence Warning* and *DC Power Electrical Safety Guidelines*.

5. Ensure that the power supplies are fully inserted in the chassis.

6. Remove the terminal block cover. The terminal block cover is a piece of clear plastic that snaps into place over the terminal block (see Figure 100 on page 309).

7. Remove the screws on the terminals using the screwdriver. Save the screws.

⚠ **WARNING**: Ensure that the power cables do not block access to device components or drape where people can trip on them.

8. Connect each power supply to the power sources. Secure power source cables to the power supplies by screwing the ring lugs attached to the cables to the appropriate terminals by using the screw from the terminals (see Figure 100 on page 309 and Figure 101 on page 310).

   The QFX5100 is designed to operate with a DC power supply that has a single, non-redundant, feed input. For source redundancy, two DC power supplies must be installed in QFX5100; connect source (A) to one power supply and connect source (B) to the second power supply. This configuration provides the commonly deployed A/B feed redundancy for the system.

   The terminal block of the power supply has four terminals labeled V+, V+, V−, and V− for connecting DC power source cables labeled positive (+) and negative (−). The V+ terminals are shunted internally together, as are the V- terminals.

   ⚠ **CAUTION**: The connection between each power source and power supply must include a circuit breaker.
   Do not connect two sources to a single power supply because doing so can potentially cause circulating current in feed wires whenever there is any difference in the voltage of the two sources.

   ◢ **NOTE**: For QFX5100-96S installations using battery backup, a single 15 A circuit breaker is recommended.

   a. Secure the ring lug of the positive (+) DC power source cable to the V+ terminal on the DC power supply.

   b. Secure the ring lug of the negative (−) DC power source cable to the V− terminal on the DC power supply.

   c. Tighten the screws on the power supply terminals until snug using the screwdriver. Do not overtighten—apply between 5 in-lb (0.56 Nm) and 6 in-lb (0.68 Nm) of torque to the screws.

Figure 100: DC Power Supply Faceplate for a QFX5100 Device
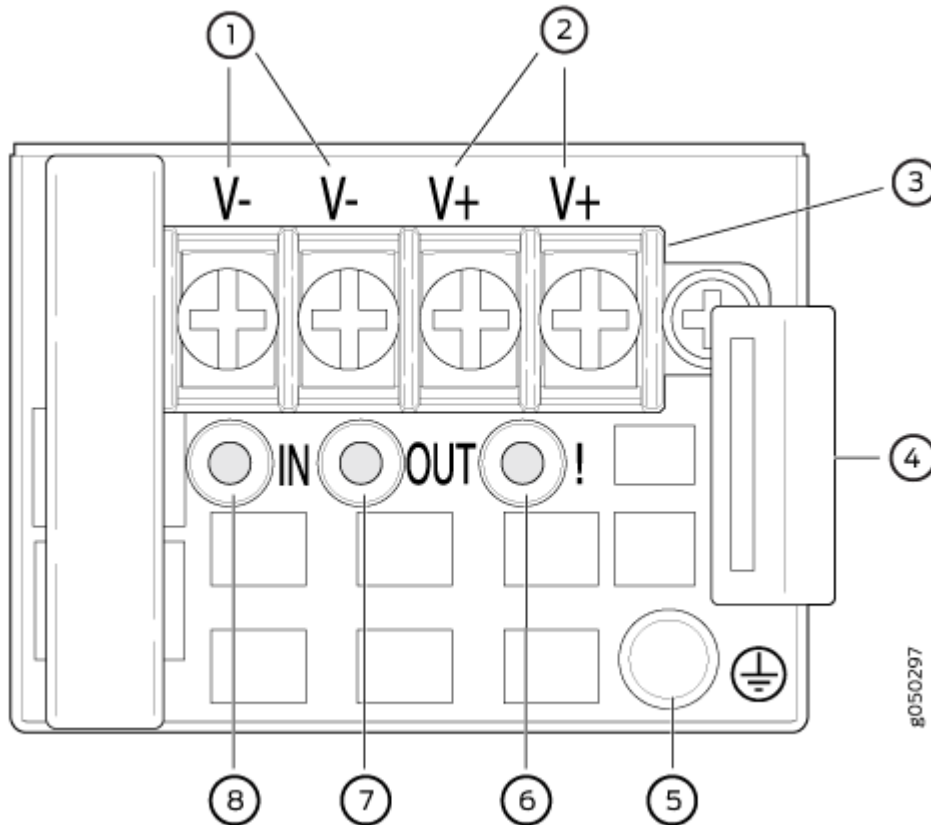
1–	Shunt negative input terminals (-48V)	5–	ESD grounding point
2–	Shunt positive input terminals (+RTN)	6–	Fault LED
3–	Terminal block	7–	Output LED
4–	Ejector lever	8–	Input LED

⚠ **CAUTION**: The V+ terminals are shunted internally together, as are the V-terminals. The same polarity terminal can be wired together from the same source to provide an additional current path in a higher power chassis. Do not connect the terminals to different sources.

Figure 101: Securing Ring Lugs to the Terminals on the QFX5100 DC Power Supply
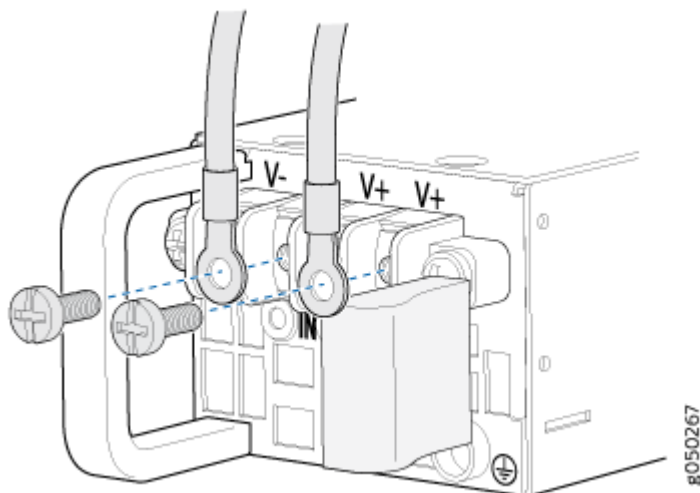
9. Replace the terminal block cover.

10. Close the input circuit breaker.

> **NOTE**: The switch powers on as soon as power is provided to the power supply. There is no power switch on the device.

11. Verify that the **IN** and **OUT** LEDs on the power supply are lit green and are on steadily.

> ⚠ **CAUTION**: A system reboot with Routing Engine FPGA version 7.1 might not successfully boot the Junos OS software. In case of a system reboot failure, you need to power cycle the switch. To check the current FPGA version, issue the `show chassis firmware` command.

Connecting a QFX Series Device to a Management Console

Ensure that you have an RJ-45 to DB-9 rollover cable available.

> **NOTE**: We no longer include the RJ-45 console cable with the DB-9 adapter as part of the device package. If the console cable and adapter are not included in your device package, or if you need a different type of adapter, you can order the following separately:

- RJ-45 to DB-9 adapter (JNP-CBL-RJ45-DB9)

- RJ-45 to USB-A adapter (JNP-CBL-RJ45-USBA)

- RJ-45 to USB-C adapter (JNP-CBL-RJ45-USBC)

If you want to use RJ-45 to USB-A or RJ-45 to USB-C adapter you must have X64 (64-Bit) Virtual COM port (VCP) driver installed on your PC. See, https://ftdichip.com/drivers/vcp-drivers/ to download the driver.

The QFX Series has a console port with an RJ-45 connector. Use the console port to connect the device to a management console or to a console server.

To connect the QFX Series to a management console (see Figure 102 on page 311 and Figure 103 on page 311):

1. Connect one end of the Ethernet cable to the console port (labeled **CON**).
2. Connect the other end of the Ethernet cable into the console server (see Figure 102 on page 311) or management console (see Figure 103 on page 311).

Figure 102: Connecting the QFX Series to a Management Console Through a Console Server

Figure 103: Connecting the QFX Series Directly to a Management Console

Connecting a QFX5100 Device in a Virtual Chassis Fabric

The role of a QFX5100 device in a VCF is dependant on the other switch models used in the VCF configuration. To understand the different hardware configurations supported, see *Virtual Chassis Fabric Hardware Overview*.

You can install a VCF in a single rack, multiple racks, or in wire closets. You construct a QFX5100 VCF by cabling and then configuring SFP+ or QSFP+ interfaces into Virtual Chassis ports (VCPs). All non-channelized QSFP+ uplink interfaces on QFX5100 switches can be configured into VCPs. All fixed SFP+ interfaces on QFX5100-96S switches can also be configured into VCPs.

> **BEST PRACTICE**: Use 40-Gigabit QSFP+ ports as VCPs.

Figure 104 on page 313 shows QFX5100 devices in the leaf role in a QFX5110 VCF, while Figure 105 on page 314 shows QFX5100-24Q in the spine role in a QFX5100 VCF. The cabling in these examples all used QSFP+ ports as VCPs.

Figure 104: QFX5100-24Q as a Leaf Device in a QFX5110 VCF
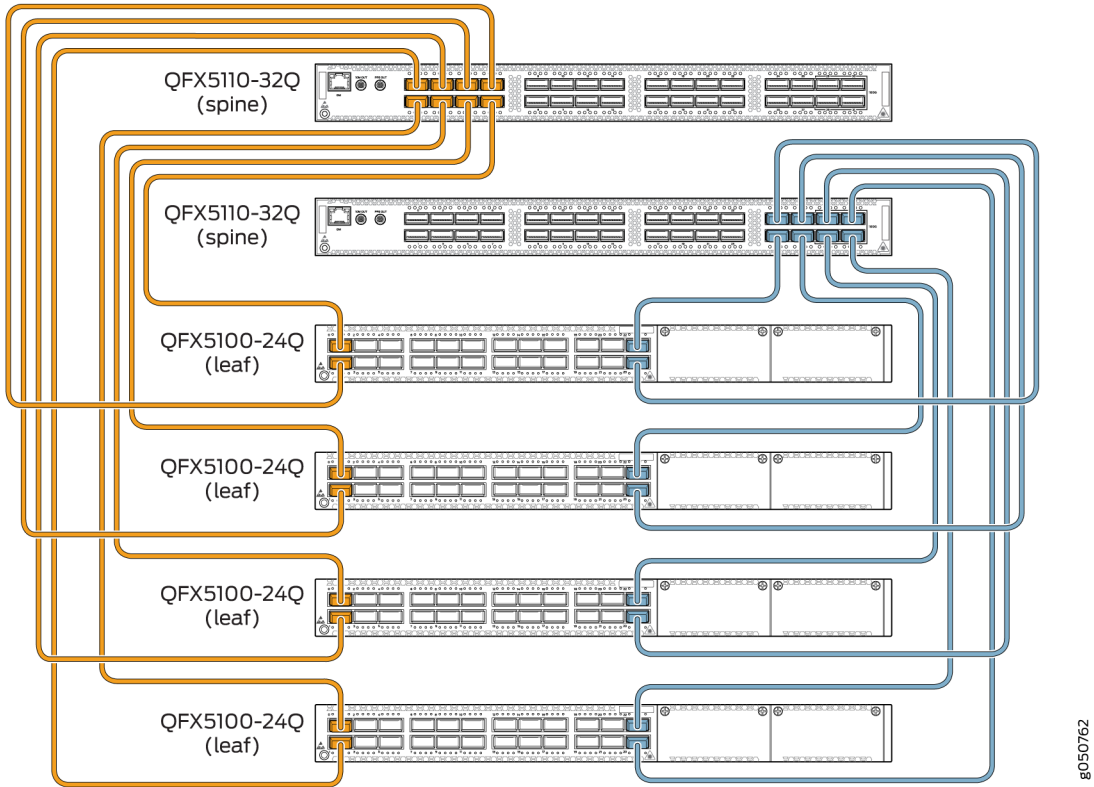
Figure 105: QFX5100-24Q as Spine and QFX5100-48S as Leaf Devices in a QFX5100 VCF
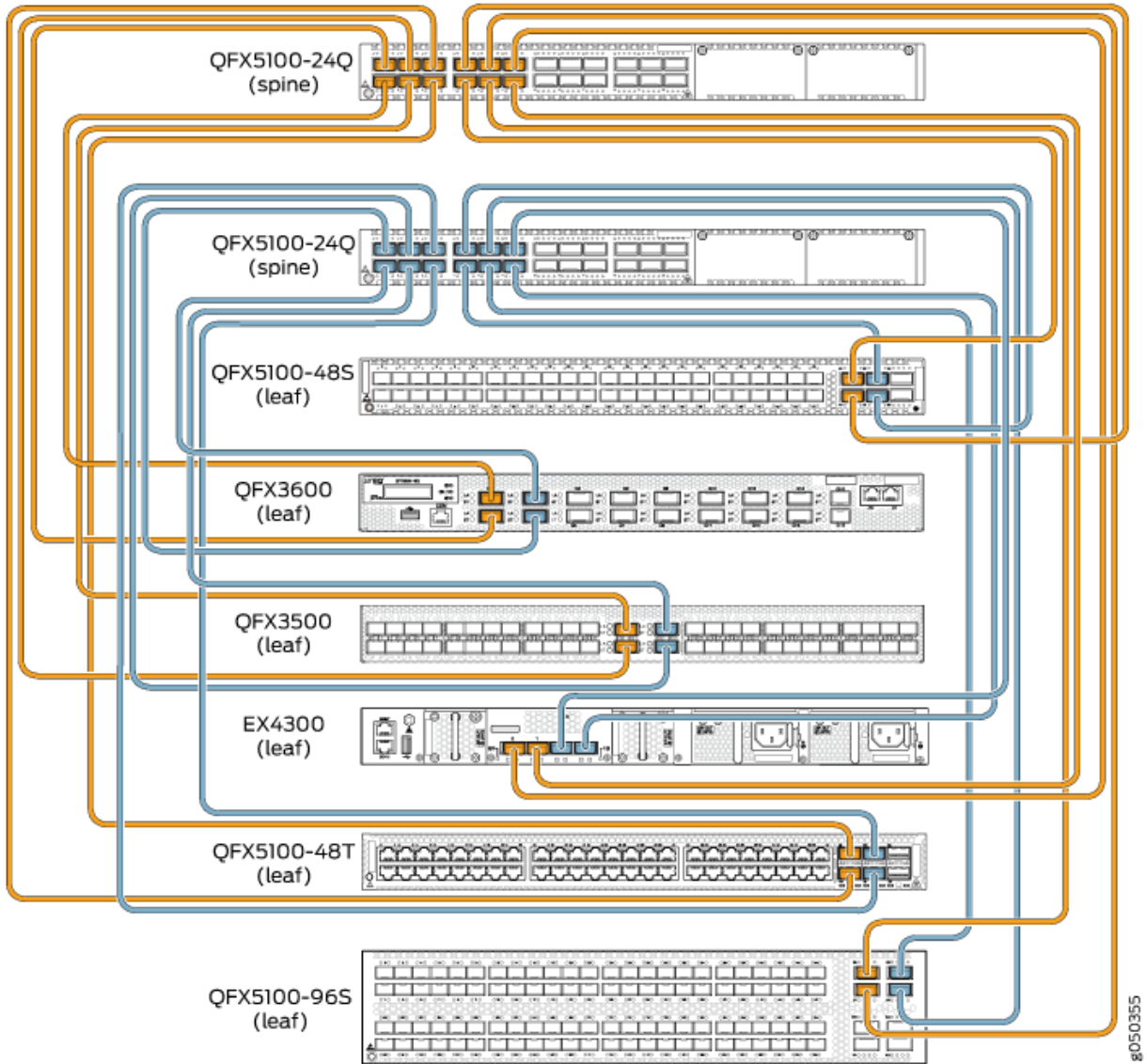
RELATED DOCUMENTATION

Virtual Chassis Fabric Hardware Overview

Plan a Virtual Chassis Fabric Deployment

Connecting QFX5110 in a QFX5110 Virtual Chassis Fabric

Connecting a QFX5100 Device to a Network for Out-of-Band Management

Ensure that you have an appropriate cable available. See "Cable Specifications for Console and Management Connections for the QFX Series" on page 157 and The Hardware Compatibility Tool.

You can monitor and manage the QFX5100 device using a dedicated management channel. QFX5100 devices have a minimum of two management ports: a 10/100/1000BASE-T RJ-45 port and a 1-Gbps small form-factor pluggable (SFP) ports. Some product SKUs have an additional 1-Gbps SFP port that can be used either for fiber or copper connections. Use the management ports to connect the QFX5100 device to a network for out-of-band management.

CAUTION: Configuring the two management interfaces within the same subnet is not supported.

NOTE: You cannot use the management ports to perform the initial configuration of the QFX5100 device. You must configure the management ports before you can successfully connect to the QFX5100 switch using these ports. See *Configure a QFX5100 Device*.

To connect a QFX5100 switch to a network for out-of-band management (see Figure 106 on page 315):

1. Connect one end of the cable to one of the management ports (labeled **C0** and

   C1) on the QFX5100 switch.

2. Connect the other end of the cable to the management switch (see Figure 106 on page 315).

Figure 106: Connecting a QFX5100 Switch to a Network for Out-of-Band Management

RELATED DOCUMENTATION

Management Panel of a QFX5100 Device

CHAPTER 24

Installing a QFX3600 Switch

Installing and Connecting a QFX3600 or QFX3600-I Device

To install and connect a QFX3600 or QFX3600-I device:

1. Follow the instructions in *Unpacking a QFX3600 or QFX3600-I Device*.

2. Mount the device by following the instructions appropriate for your site:

    -   *Mounting a QFX3600 or QFX3600-I Device on Two Posts in a Rack or Cabinet*

    -   *Mounting a QFX3600 or QFX3600-I Device on Four Posts in a Rack or Cabinet*

3. Follow the instructions in *Connecting Earth Ground to QFX3600 or QFX3600-I Devices*.

4. Follow the instructions for connecting power as appropriate for your site:

    -   *Connecting AC Power to a QFX3500, QFX3600, or QFX3600-I Device*

    -   *Connecting DC Power to a QFX3500, QFX3600, or QFX3600-I Device*

5. Depending on how you will be using the QFX3600 or QFX3600-I device, take one of the following actions:

- If you are using the QFX3600 device as a standalone switch, follow the instructions in Configuring a QFX3600 Device as a Standalone Switch.

- If you are using the QFX3600 device as a Node device in a QFX3000-G QFabric system, see *QFX3000-G QFabric System Installation Overview* for information about the steps to install and configure your QFX3000-G QFabric system.

- If you are using the QFX3600 device as a Node device in a QFX3000-M QFabric system, see *QFX3000-M QFabric System Installation Overview* for information about the steps to install and configure your QFX3000-M QFabric system.

- If you are using the QFX3600-I device as an Interconnect device in a QFX3000-M QFabric system, see *QFX3000-M QFabric System Installation Overview* for information about the steps to install and configure your QFX3000-M QFabric system.

RELATED DOCUMENTATION

Rack Requirements for a QFX3600 or QFX3600-I Device

Cabinet Requirements for a QFX3600 or QFX3600-I Device

Clearance Requirements for Airflow and Hardware Maintenance for a QFX3600 or QFX3600-I Device

Unpacking a QFX3600 or QFX3600-I Device

The QFX3600 or QFX3600-I device chassis is a rigid sheet-metal structure that houses the hardware components. QFX3600 and QFX3600-I devices are shipped in a cardboard carton, secured with foam packing material. The carton also contains an accessory box and quick start instructions.

> ⚠️ **CAUTION**: QFX3600 and QFX3600-I devices are maximally protected inside the shipping carton. Do not unpack the device until you are ready to begin installation.

To unpack a QFX3600 or QFX3600-I device:

1. Move the shipping carton to a staging area as close to the installation site as possible, but where you have enough room to remove the system components.

2. Position the carton so that the arrows are pointing up.

3. Open the top flaps on the shipping carton.

4. Remove the accessory box and verify the contents against the inventory included in the box. Table 69 on page 319 lists the inventory of components supplied with a QFX3600 or QFX3600-I device.

5. Pull out the packing material holding the device in place.

6. Verify the chassis components received:

   - Three fan trays

   - Two power supplies

7. Save the shipping carton and packing materials in case you need to move or ship the device later.

Table 69: Accessory Kit Part Contents

Parts	Quantity
Chassis grounding lug	1
M5 screws to attach the chassis grounding lug to the protective earth terminal on the chassis	2
Electrostatic discharge (ESD) grounding strap **NOTE**: Use only clip-style ESD grounding straps with the chassis grounding lug.	1
SFP/SFP+ port dust covers	2
QSFP+ port dust covers	16
RJ-45 cable and RJ-45 to DB-9 adapter for console port connection	1
Mounting brackets for front-mounting in a four-post rack or cabinet	2
M4 flat-head screws to attach the brackets for front-mounting in a rack or cabinet	6
Rear installation blades for front-mounting in a four-post rack or cabinet	2
Mounting brackets for front-mounting in a two-post rack or cabinet	2
Mounting brackets for mid-mounting in a two-post rack or cabinet	2
M4 pan-head screws to attach the brackets for front-mounting or mid-mounting in a rack or cabinet	6

Installing and Connecting a QFX3600 or QFX3600-I Device

Mounting a QFX3600 or QFX3600-I Device on Two Posts in a Rack or Cabinet

Before mounting a QFX3600 or QFX3600-I device on two posts in a rack:

- Ensure you understand how to prevent electrostatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.

- Verify that the site meets the requirements described in Site Preparation Checklist for a QFX3600 or QFX3600-I Device.

- 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*, with particular attention to Chassis Lifting Guidelines for a QFX3600 or QFX3600-I Device.

- Remove the device from the shipping carton (see *Unpacking a QFX3600 or QFX3600-I Device*).

Ensure that you have the following parts and tools available:

- ESD grounding strap (provided)

- One pair of mounting brackets depending on how you want to mount the device (provided)

  - Use the front/rear mounting brackets (part number 540-038579) to front-mount or rear-mount the device.

  - Use the mid-mounting brackets (part number 540-038665) to mid-mount the device.

- 6 Phillips 4x6-mm pan-head mounting screws (provided)

- Four screws to secure the chassis to the rack (not provided)

- Appropriate screwdriver for the mounting screws (not provided)

You can mid-mount a QFX3600 or QFX3600-I device on two posts of a 19-in. rack or cabinet by using the mounting brackets provided with the device. (The remainder of this topic uses "rack" to mean "rack or cabinet.")

You can also mount the device on four posts of a four-post rack by using the mounting brackets provided with the device. See *Mounting a QFX3600 or QFX3600-I Device on Four Posts in a Rack or Cabinet*.

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

> **NOTE**: One person must be available to lift the device while another secures the device to the rack.

> **CAUTION**: If you are mounting multiple device on a rack, mount a device in the bottom of the rack first and proceed to mount the rest of the devices from bottom to top.

To mount the device on two posts in a rack:

1. Attach the ESD grounding strap to your bare wrist and to a site ESD point.

2. Place the device on a flat, stable surface.

3. Align the mid-mounting brackets (part number 540-038665) with the holes on the side panels of the device chassis, such that the mounting ears are in the center of the side panels. See Figure 107 on page 322.

4. Insert mounting screws into the aligned holes. Tighten the screws.

5. Have one person grasp both sides of the device, lift the device, and position it in the rack, aligning the mounting ear holes with the threaded holes in the rack or cabinet rail. Align the bottom mounting ear hole in both the mounting brackets with a hole in each rack rail, making sure the chassis is level. See Figure 107 on page 322.

6. Have a second person secure the device to the rack by using the appropriate screws. Tighten the screws.

7. Ensure that the device chassis is level by verifying that all screws on one side of the rack are aligned with the screws on the other side.

Figure 107: Mounting the Device on Two Posts in a Rack
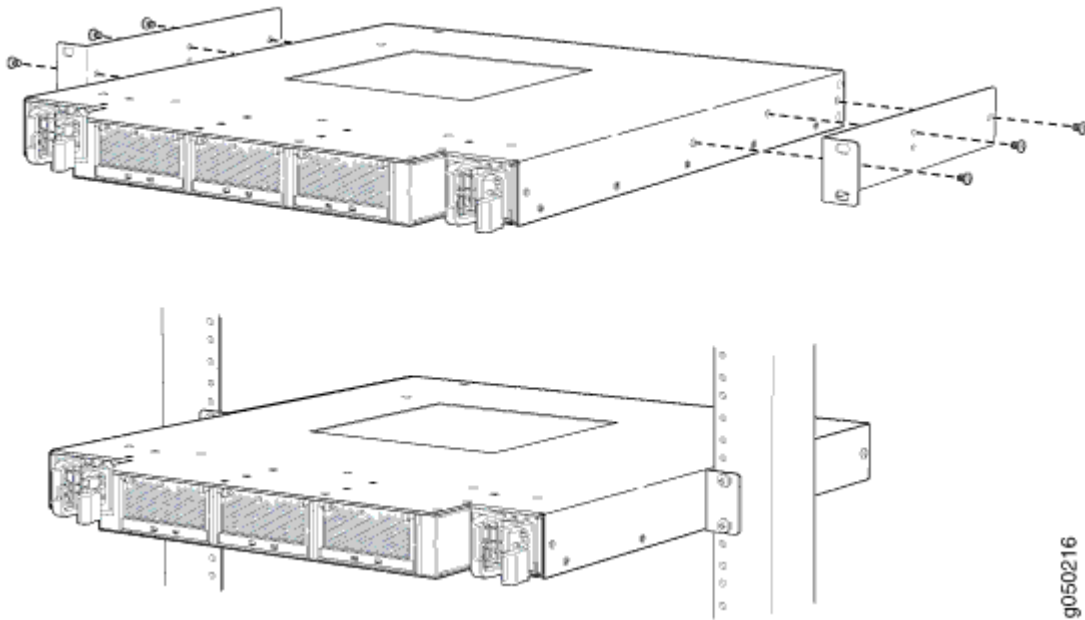
RELATED DOCUMENTATION

Rack-Mounting and Cabinet-Mounting Warnings

Connecting Earth Ground to QFX3600 or QFX3600-I Devices

Connecting AC Power to a QFX3500, QFX3600, or QFX3600-I Device

Connecting DC Power to a QFX3500, QFX3600, or QFX3600-I Device

Mounting a QFX3600 or QFX3600-I Device on Four Posts in a Rack or Cabinet

Before you begin mounting a QFX3600 or QFX3600-I device on the rack or cabinet:

- Ensure you understand how to prevent electrostatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.

- Verify that the site meets the requirements described in Site Preparation Checklist for a QFX3600 or QFX3600-I Device.

- Place the rack in its permanent location, allowing adequate clearance for airflow and maintenance, and secure it to the building structure.

- Read *General Site Guidelines*, with particular attention to Chassis Lifting Guidelines for a QFX3600 or QFX3600-I Device.

- Remove the device from the shipping carton (see *Unpacking a QFX3600 or QFX3600-I Device*).

Ensure that you have the following parts and tools available to mount the device on four posts in a rack:

- ESD grounding strap (provided).

- One pair of mounting brackets (part number 540-038596) (provided).

- One pair of rear installation blades (part number 540-038598). These installation blades support the rear of the chassis, and must be installed (provided).

- 6 Phillips 4x5-mm flat-head mounting screws (provided).

- Eight screws to secure the chassis and rear installation blades to the rack (not provided).

- Appropriate screwdriver for the mounting screws (not provided).

You can front-mount or rear-mount a QFX3600 or QFX3600-I device on four posts in a 19-in. rack or cabinet by using the mounting brackets and installation blades provided with the device. (The remainder of this topic uses "rack" to mean "rack or cabinet.") The front and rear rack rails must be spaced between 19.3 in. (49 cm) and 36 in. (91.4 cm) front to back.

You can also mount the device on two posts of a 19-in. rack or cabinet by using the mounting brackets provided with the device. See *Mounting a QFX3600 or QFX3600-I Device on Two Posts in a Rack or Cabinet*.

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

> ⚡ **WARNING**: QFX3600 and QFX3600-I devices must be supported at all four corners. Mounting the chassis using only the front brackets damages the chassis and can result in serious bodily injury.

> ⚠ **CAUTION**: If you are installing the QFX3600 or QFX3600-I device above 60 in. (152.4 cm) from the floor, you must remove the power supplies and fan trays before attempting to install the device, or ask someone to assist you during the installation.

> ⚠ **CAUTION**: If you are mounting multiple devices on a rack, mount the device in the lowest position of the rack first, and proceed to mount the rest of the devices from bottom to top.

To mount the device on four posts in a rack:

1. Attach the ESD grounding strap to your bare wrist and to a site ESD point.

2. Decide where to position the device in the rack.

3. Install the rear installation blades. See .

   a. With two mounting screws—and cage nuts and washers if your rack requires them—attach one of the rear installation blades to the left rear of the rack at the point where you want to mount the device. Tighten the screws.

   b. Position the second rear installation blade at the desired position in the right rear of the rack, so that it is on the same rack level as the left rear installation blade. If the right and left rear installation blades are not on the same level, the chassis will rest at an angle in the rack instead of resting flat and level.

   c. With two mounting screws—and cage nuts and washers if your rack requires them—attach the second rear installation blade to the right rear of the rack at the point where you want to mount the device. Tighten the screws.

Figure 108: Attaching the Installation Blades to the Rear of the Rack
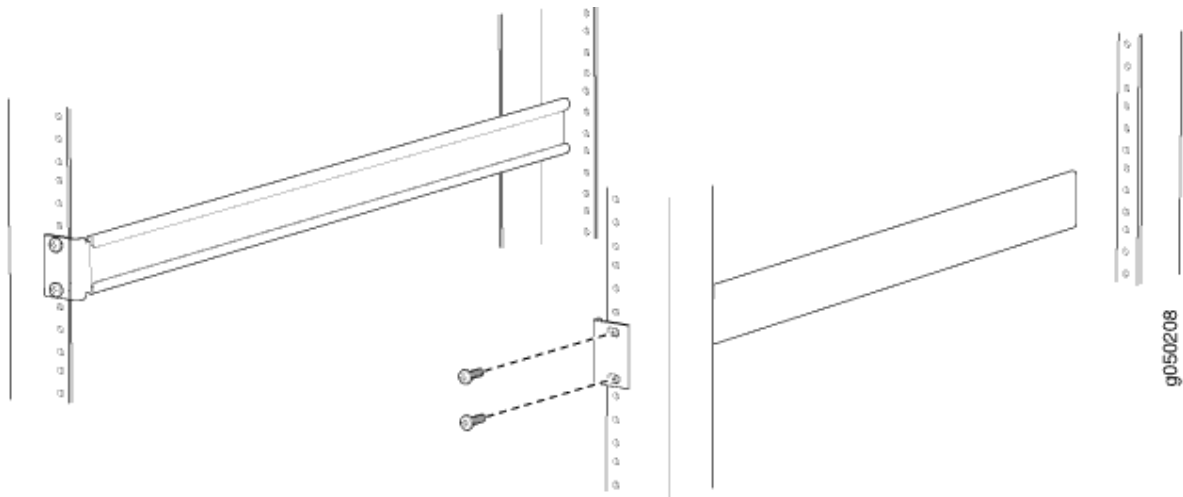
4. Prepare the device for mounting.

   a. Place the device on a flat, stable surface.

   b. Align the mounting brackets along the front or rear of the side panels of the device chassis depending on how you want to mount the device. For example, if you want to front-mount the device, align the brackets along the front of the side panel such that the mounting ears are in the front of the device chassis. See .

   c. Align the holes in the mounting brackets with holes on the side panels of the device chassis.

    d. Insert mounting screws into the aligned holes. Tighten the screws.

5. Mount the device.

    a. Grasp both sides of the device, lift it, and position it in the rack so that the rear of the chassis slides onto the installation blade. See .

> **TIP**: If someone is assisting you, have one person stand at the rear of the rack where the installation blade is installed, to help guide the device onto the installation blade.

    b. Align the holes in the front brackets on the chassis with the holes in the rack. Ensure that the chassis is level.

    c. With four mounting screws—and cage nuts and washers if your rack requires them—secure the front of the device to the rack. Tighten the screws.

    d. Ensure that the device chassis is level by verifying that all screws on one side of the rack are aligned with the screws on the other side.

Figure 109: Mounting the Device on Four Posts
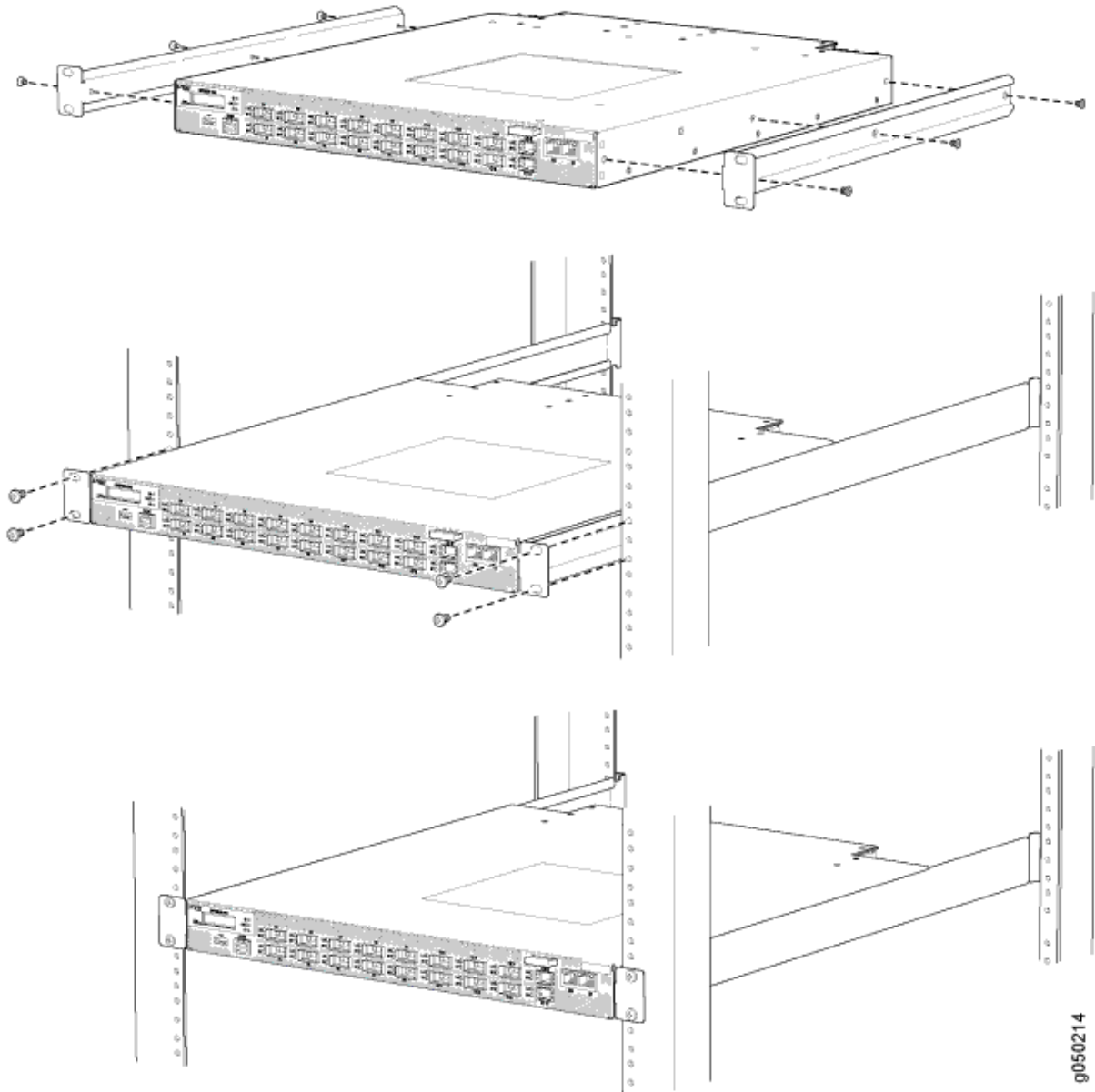
RELATED DOCUMENTATION

Rack-Mounting and Cabinet-Mounting Warnings

Connecting Earth Ground to QFX3600 or QFX3600-I Devices

Connecting AC Power to a QFX3500, QFX3600, or QFX3600-I Device

Connecting DC Power to a QFX3500, QFX3600, or QFX3600-I Device

Connecting Earth Ground to QFX3600 or QFX3600-I Devices

To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the QFX3600 and QFX3600-I devices 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 left rear of the chassis to connect to the earth ground (see).

Before you connect earth ground to the protective earthing terminal of a QFX3600 or QFX3600-I device, ensure that a licensed electrician has attached an appropriate grounding lug to the grounding cable.

> ⚠️ **CAUTION**: Using a grounding cable with an incorrectly attached lug can damage the switch.

> **NOTE**: Mount your device in the rack or cabinet before attaching the grounding lug to the switch. See *Mounting a QFX3600 or QFX3600-I Device on Two Posts in a Rack or Cabinet* and *Mounting a QFX3600 or QFX3600-I Device on Four Posts in a Rack or Cabinet*.

Ensure that you have the following parts and tools available:

- Grounding cable for your QFX3600 or QFX3600-I device—The grounding cable must be 14 AWG (2 mm²), minimum 90° C wire, or as permitted by the local code.

- Grounding lug for your grounding cable—The grounding lug required is a Panduit LCD10-10A-L or equivalent. This grounding lug is provided in the accessory kit.

- Two M5 screws with integrated washers—The screws are used to secure the grounding lug to the protective earthing terminal. The screws are provided in the accessory kit.

- Phillips (+) screwdriver, number 2.

An AC-powered QFX3600 or QFX3600-I device chassis gains additional grounding when you plug the power supply in the switch into a grounded AC power outlet by using an AC power cord appropriate for your geographical location. See *AC Power Cord Specifications for a QFX Series Device*.

To connect earth ground to a QFX3600 or QFX3600-I device:

1. Connect one end of the grounding cable to a proper earth ground, such as the rack in which the device is mounted.

2. Place the grounding lug attached to the grounding cable over the protective earthing terminal.

3. Secure the grounding lug to the protective earthing terminal with screws.

4. Dress the grounding cable and ensure that it does not touch or block access to other switch components and that it does not drape where people could trip over it.

Figure 110: Connecting a Grounding Cable to a QFX3600 or QFX3600-I Device

RELATED DOCUMENTATION

General Safety Guidelines and Warnings

Grounded Equipment Warning

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 QFX3500, QFX3600, or QFX3600-I Device

Ensure that you have a power cord appropriate for your geographical location available to connect AC power to the device.

Before you begin connecting AC power to the device:

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

- Ensure that you have connected the device chassis to earth ground.

> ⚠️ **CAUTION**: Before you connect power to the device, 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 device (for example, by causing a short circuit).
>
> To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the chassis 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 device chassis to connect to the earth ground. For instructions on connecting earth ground, see *Connecting Earth Ground to a QFX3500 Device* or *Connecting Earth Ground to QFX3600 or QFX3600-I Devices*. The device gains additional grounding when you plug the power supply in the device into a grounded AC power outlet by using the AC power cord appropriate for your geographical location (see *AC Power Cord Specifications for a QFX Series Device*).

- Install the power supply in the chassis. For instructions on installing a power supply in a QFX3500 device, see Installing a Power Supply in a QFX3500 Device. For instructions on installing a power supply in a QFX3600 or QFX3600-I device, see Installing a Power Supply in a QFX3600 or QFX3600-I Device.

The QFX3500, QFX3600, and QFX3600-I devices are shipped from the factory with two 650 W power supplies pre-installed. Each power supply is a hot-removable and hot-insertable field-replaceable unit (FRU) when the second power supply is installed and running. You can install replacement power supplies without powering off the device or disrupting the switching function.

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

To connect AC power to a QFX3500, QFX3600, or QFX3600-I device:

1. Attach the grounding strap to your bare wrist and to a site ESD point.
2. Ensure that the power supplies are fully inserted in the chassis and the latches are secure. If only one power supply is installed, ensure a that blank cover panel is installed over the second power supply slot.
3. Locate the power cord or cords shipped with the device; the cords have plugs appropriate for your geographical location. See *AC Power Cord Specifications for a QFX Series Device*.

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

4. Connect each power supply to the power sources. Insert the coupler end of the power cord into the AC power cord inlet on the AC power supply faceplate.

5. Push the power cord retainer onto the power cord (see or).

Figure 111: Connecting an AC Power Cord to an AC Power Supply in a QFX3500 Device
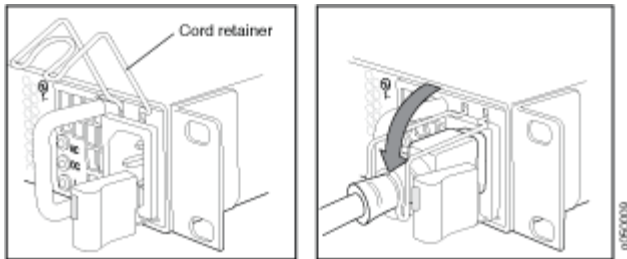
Figure 112: Connecting an AC Power Cord to an AC Power Supply in a QFX3600 or QFX3600-I Device

6. If the AC power source outlet has a power switch, set it to the OFF (O) position.

> **NOTE**: The device powers on as soon as power is provided to the power supply. There is no power switch on the device.

7. Insert the power cord plug into an AC power source outlet.

8. If the AC power source outlet has a power switch, set it to the ON (|) position.

9. Verify that the AC and DC LEDs on each power supply are lit green.

   If the amber fault LED is lit, remove power from the power supply, and replace the power supply (see Removing a Power Supply from a QFX3500 Device or Removing a Power Supply from a QFX3600 or QFX3600-I Device). Do not remove the power supply until you have a replacement power supply

ready: the power supplies or a blank cover panel must be installed in the device to ensure proper airflow.

> ⚠️ **CAUTION**: Replace a failed power supply with a blank panel or new power supply within 1 minute of removal to prevent chassis overheating.

RELATED DOCUMENTATION

AC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

AC Power Supply LEDs on a QFX3500, QFX3600, or QFX3600-I Device

Connecting DC Power to a QFX3500, QFX3600, or QFX3600-I Device

Before you begin connecting DC power to the device:

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

- Ensure that you have connected the device chassis to earth ground.

> ⚠️ **CAUTION**: Before you connect power to the device, 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 device (for example, by causing a short circuit).
>
> To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the chassis 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 device chassis to connect to the earth ground. For instructions on connecting earth ground, see *Connecting Earth Ground to a QFX3500 Device* or *Connecting Earth Ground to QFX3600 or QFX3600-I Devices*.

- Install the power supply in the chassis. For instructions on installing a power supply in a QFX3500 device, see Installing a Power Supply in a QFX3500 Device. For instructions on installing a power supply in a QFX3600 or QFX3600-I device, see Installing a Power Supply in a QFX3600 or QFX3600-I Device

Ensure that you have the following parts and tools available:

- DC power source cables (14–16 AWG) with ring lug (Molex 190700069 or equivalent) (not provided)

- Phillips (+) screwdriver, number 2 (not provided)

- Multimeter (not provided)

The QFX3500, QFX3600, and QFX3600-I devices are shipped from the factory with two 650 W power supplies pre-installed. Each power supply is a hot-removable and hot-insertable field-replaceable unit (FRU) when the second power supply is installed and running. You can install replacement power supplies without powering off the device or disrupting the switching function.

> ⚡ **WARNING**: DC-powered QFX3500, QFX3600 and QFX3600-I devices are intended for installation only in a restricted access location.

> **NOTE**: The battery returns of the DC power supply should be connected as an isolated DC return (DC-I).

To connect DC power to a QFX3500, QFX3600 or QFX3600-I device:

1. Attach the grounding strap to your bare wrist and to a site ESD point.
2. 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 low resistance (indicating a closed circuit) to chassis ground is positive (+) and will be installed on the V+ (return) DC power input terminal.

   - The cable with very high resistance (indicating an open circuit) to chassis ground is negative (–) and will be installed on the V– (input) 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.

3. Ensure that the input 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.

> **NOTE**: The V+ terminals are referred to as +RTN, and V– terminals are referred to as –48 V in *DC Power Wiring Sequence Warning* and *DC Power Electrical Safety Guidelines*.

4. Ensure that the power supplies are fully inserted in the chassis.
5. Remove the terminal block cover. The terminal block cover is a piece of clear plastic that snaps into place over the terminal block (see Figure 113 on page 334).
6. Remove the screws on the terminals using the screwdriver. Save the screws.

> ⚠ **WARNING**: Ensure that the power cables do not block access to device components or drape where people can trip on them.

7. Connect each power supply to the power sources. Secure power source cables to the power supplies by screwing the ring lugs attached to the cables to the appropriate terminals by using the screw from the terminals (see Figure 114 on page 335 and Figure 113 on page 334).

> ⚠ **CAUTION**: The DC power supply has four terminals labeled V+, V+, V–, and V– for connecting DC power source cables labeled positive (+) and negative (–). The V+ terminals are shunted internally together, as are the V- terminals. The same polarity terminal can be wired together from the same source to provide an additional current path in a higher power chassis. Do not connect the terminals to different sources. For example, connect –48 V from DC source feed A to the input terminals of one power supply and connect –48 V from feed B to the input terminals of the second power supply on the other side of the chassis. This configuration provides the commonly deployed A/B feed redundancy for the system.

a. Secure the ring lug of the positive (+) DC power source cable to the V+ terminal on the DC power supply.

b. Secure the ring lug of the negative (–) DC power source cable to the V– terminal on the DC power supply.

c. Tighten the screws on the power supply terminals until snug using the screwdriver. Do not overtighten—apply between 5 in-lb (0.56 Nm) and 6 in-lb (0.68 Nm) of torque to the screws.

Figure 113: DC Power Supply Faceplate for a QFX3500, QFX3600 or QFX3600-I Device
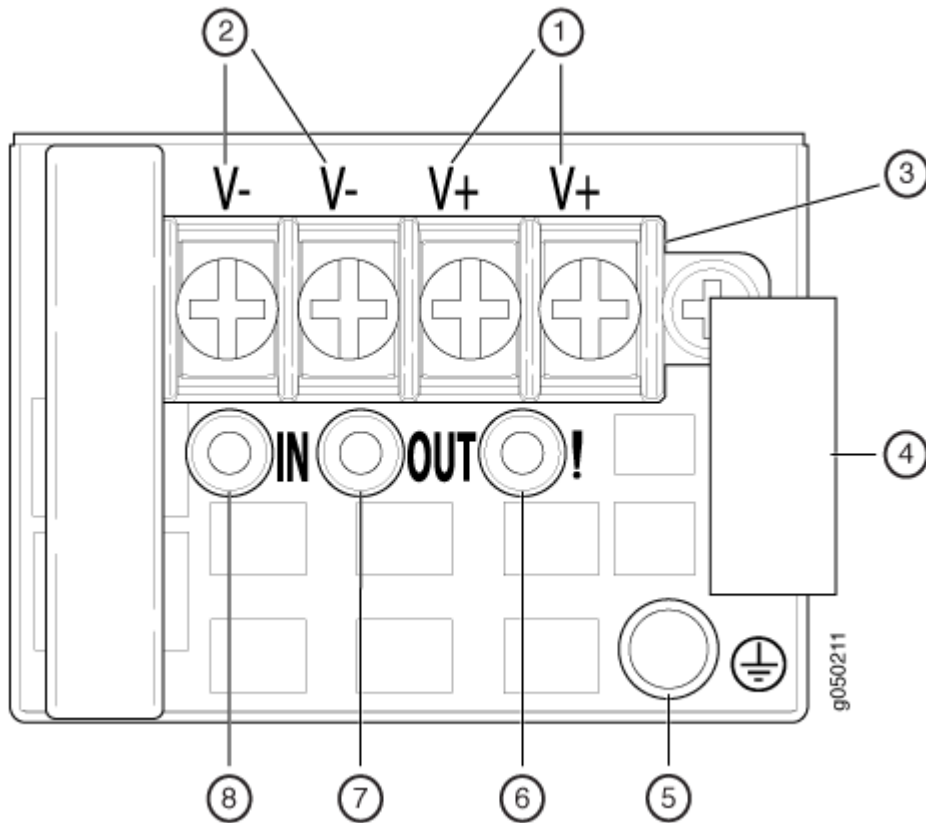
1–	Shunt positive input terminals	5–	ESD grounding point
2–	Shunt negative input terminals	6–	Fault LED
3–	Terminal block	7–	Output LED
4–	Ejector lever	8–	Input LED

⚠ **CAUTION**: The V+ terminals are shunted internally together, as are the V- terminals. The same polarity terminal can be wired together from the same source to provide an additional current path in a higher power chassis. Do not connect the terminals to different sources.

Figure 114: Securing Ring Lugs to the Terminals on the QFX3500, QFX3600 or QFX3600-I DC Power Supply

8. Replace the terminal block cover.

9. Close the input circuit breaker.

> **NOTE**: The device powers on as soon as power is provided to the power supply. There is no power switch on the device.

10. Verify that the **IN** and **OUT** LEDs on the power supply are lit green and are on steadily.

RELATED DOCUMENTATION

DC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

DC Power Supply LEDs on a QFX3500, QFX3600, or QFX3600-I Device

Connecting a QFX Series Device to a Management Console

Ensure that you have an RJ-45 to DB-9 rollover cable available.

> **NOTE**: We no longer include the RJ-45 console cable with the DB-9 adapter as part of the device package. If the console cable and adapter are not included in your device package, or if you need a different type of adapter, you can order the following separately:

- RJ-45 to DB-9 adapter (JNP-CBL-RJ45-DB9)

- RJ-45 to USB-A adapter (JNP-CBL-RJ45-USBA)

- RJ-45 to USB-C adapter (JNP-CBL-RJ45-USBC)

If you want to use RJ-45 to USB-A or RJ-45 to USB-C adapter you must have X64 (64-Bit) Virtual COM port (VCP) driver installed on your PC. See, https://ftdichip.com/drivers/vcp-drivers/ to download the driver.

The QFX Series has a console port with an RJ-45 connector. Use the console port to connect the device to a management console or to a console server.

To connect the QFX Series to a management console (see Figure 115 on page 336 and Figure 116 on page 336):

1. Connect one end of the Ethernet cable to the console port (labeled **CON**).

2. Connect the other end of the Ethernet cable into the console server (see Figure 115 on page 336) or management console (see Figure 116 on page 336).

Figure 115: Connecting the QFX Series to a Management Console Through a Console Server

Figure 116: Connecting the QFX Series Directly to a Management Console

Connecting QFX Series and EX Series Switches in a QFX Virtual Chassis

IN THIS SECTION

In a QFX Virtual Chassis, you can connect up to 10 standalone QFX5100, QFX3600, QFX3500, and EX4300 switches except EX4300-48MP and EX4300-48MP-S switches into a QFX Series Virtual Chassis and manage the interconnected switches as a single chassis. Unlike a Virtual Chassis Fabric (VCF), which is cabled in a spine and leaf topology, the QFX Virtual Chassis is cabled in a ring topology. For Virtual Chassis Fabric cabling examples, see Connecting a QFX5100 Device in a Virtual Chassis Fabric.

As of Junos Release 17.3R1, you can also connect select models of the QFX5100 in the line card role in a QFX5110 Virtual Chassis. See Connecting QFX5110 and QFX5100 Members in a QFX5110 Virtual Chassis.

This topic describes how to cable QFX Series switches and EX4300 switches into a QFX Virtual Chassis.

Before You Start

You configure a QFX Series Virtual Chassis by configuring the switch interfaces into Virtual Chassis ports (VCPs). VCPs connect switches together to form a Virtual Chassis, and are responsible for passing all data and control traffic between member switches in the Virtual Chassis. All non-channelized QSFP+ uplink interfaces on standalone QFX5100 switches can be configured into VCPs. All fixed SFP+ interfaces on QFX5100-96S switches can also be configured into VCPs.

Use the following interfaces to create VCPs:

- On QFX5100, non-channelized QSFP+ uplink interfaces. All fixed SFP+ interfaces on the QFX5100-96S switches are also available.

- On EX4300 switches, the built-in QSFP+ ports are dedicated VCPs by default. In 48-port EX4300 switches except EX4300-48MP and EX4300-48MP-S switches, you can use the QSFP+ ports as network ports or as VCPs. You can also use the SFP+ uplink module ports as VCPs by configuring these ports as VCPs.

  In EX4300-48MP and EX4300-48MP-S switches, you can use only the built-in QSFP+ ports as VCPs. You cannot configure the ports on the uplink module in EX4300-48MP and EX4300-48MP-S switches to Virtual Chassis ports (VCPs).

- On QFX3500 and QFX3600, all non-channelized QSFP+ and fixed SFP+ interfaces.

> **BEST PRACTICE**: Use the 40-Gigabit QSFP+ interfaces for the VCPs.

The advantages of connecting multiple switches into a Virtual Chassis include better-managed bandwidth at a network layer, simplified configuration and maintenance because multiple devices can be managed as a single device, increased fault tolerance and high availability (HA) because a Virtual Chassis can remain active and network traffic can be redirected to other member switches when a single member switch fails, and a flatter, simplified Layer 2 network topology that minimizes or eliminates the need for loop prevention protocols such as Spanning Tree Protocol (STP).

You can increase VCP bandwidth between member switches by configuring multiple interfaces between the same two switches into VCPs. When multiple VCPs are interconnecting the same two member switches, a Link Aggregation Group (LAG) bundle is automatically formed when the VCPs are on interfaces supporting identical speeds. For instance, if you have two 40-Gigabit QSFP+ interfaces configured as VCPs between member switches, a LAG with two member links with 80 Gbps of total bandwidth is formed. 10-Gigabit SFP+ and 40-Gigabit QSFP+ interfaces configured as VCPs cannot be members of the same LAG, however. The Virtual Chassis feature is not applicable to QFX devices in a QFabric.

Virtual Chassis can be installed in a single rack, multiple racks, or in wire closets.

Valid Configurations

Valid configurations are:

- All QFX5100 members–in a ring topology this is Virtual Chassis; in a spine and leaf topology this is a Virtual Chassis Fabric (VCF). For a cabling example of spine and leaf, see Connecting a QFX5100 Device in a Virtual Chassis Fabric.

- All QFX3600 members

- All QFX3500 members

- A mixture of QFX3600 and QFX3500 members

- A mixture of QFX5100, QFX3600, and QFX3500 members–use the QFX5100 switches as primary and backup whenever possible.

- A mixture of QFX5100, QFX3600, QFX3500, and EX4300 members except EX4300-48MP and EX4300-48MP-S switches. EX4300 switches as the primary or backup is not supported; use QFX5100 switches in these roles whenever possible.

An all EX4300 member is simply considered an EX4300 Virtual Chassis (see Understanding EX Series Virtual Chassis).

If the QSFP+ interfaces are not available for VCP, 10-Gigbit interfaces can be used.

All members of the Virtual Chassis are required to run the same Junos OS Release. You can check the version and release by issuing the `show chassis version` CLI command.

Cabling QFX3500 Switches in a QFX5100 Virtual Chassis

Figure 117 on page 340 is the preferred cabling method using the 40-Gigabit QSFP ports. See Figure 118 on page 341 for an alternative method using the 10-Gigabit SFP+ ports.

Figure 117: QFX3500 Using the 40G Ports as the VCPs

Figure 118: QFX3500 Using the 10G Ports as the VCPs

Cabling QFX3600 Switches in a QFX Virtual Chassis

See for a diagram of configuring an exclusive QFX3600 Virtual Chassis.

Figure 119: QFX3600 Using the 40G Ports as the VCPs
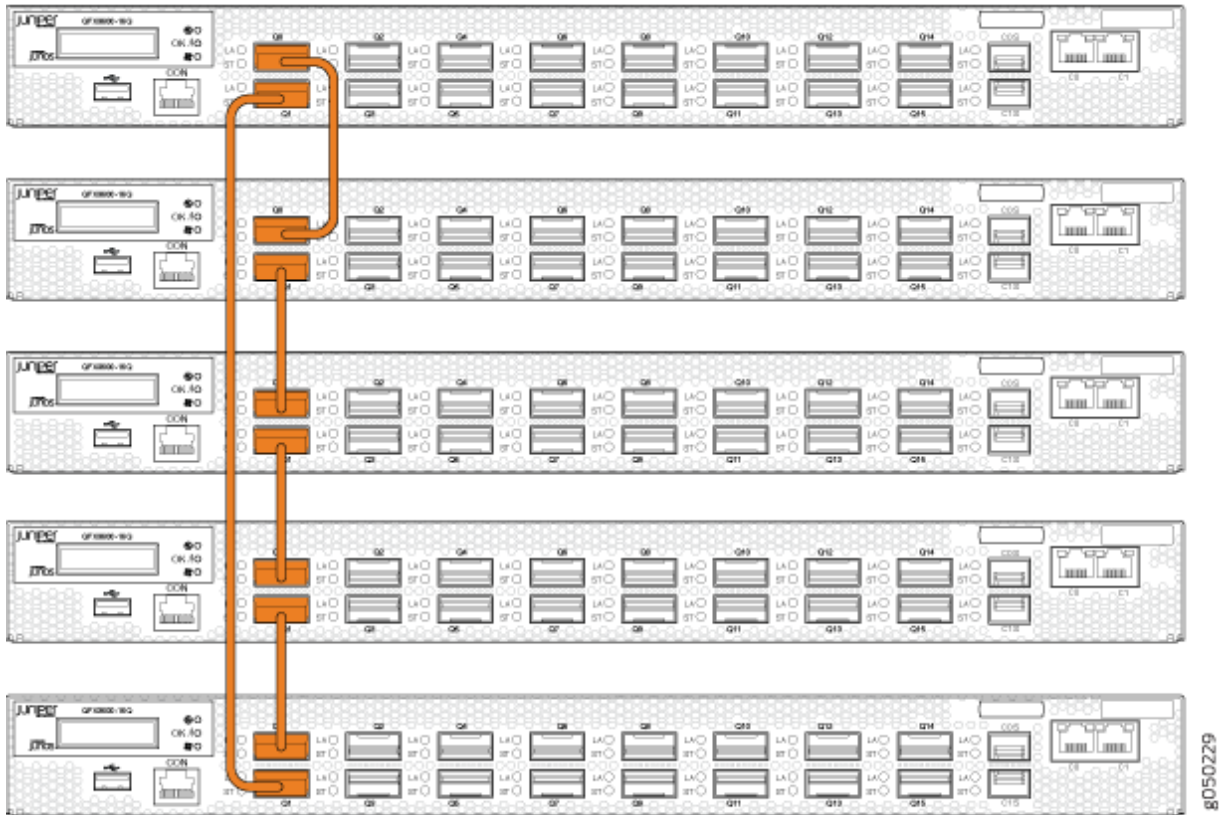
Cabling a Mixed QFX Virtual Chassis

A mixed QFX Virtual Chassis is a mixture of QFX5100 , QFX3500, QFX3600, or EX4300 switches except EX4300-48MP and EX4300-48MP-S switches in a ring topology. Always configure a QFX5100 as the primary and backup devices when they are available. See Figure 120 on page 343 for an example using the 40-Gigabit QSFP+ ports and Figure 121 on page 343 for an example using both 40-Gigabit and 10-Gigabit SFP+ ports. Figure 122 on page 344 shows QFX5100-24Q switches as the primary and backup cabled in a ring to QFX3500 and QFX3600 switches.

Figure 120: QFX3500 and QFX3600 Mixed Using the 40G Ports as the VCPs
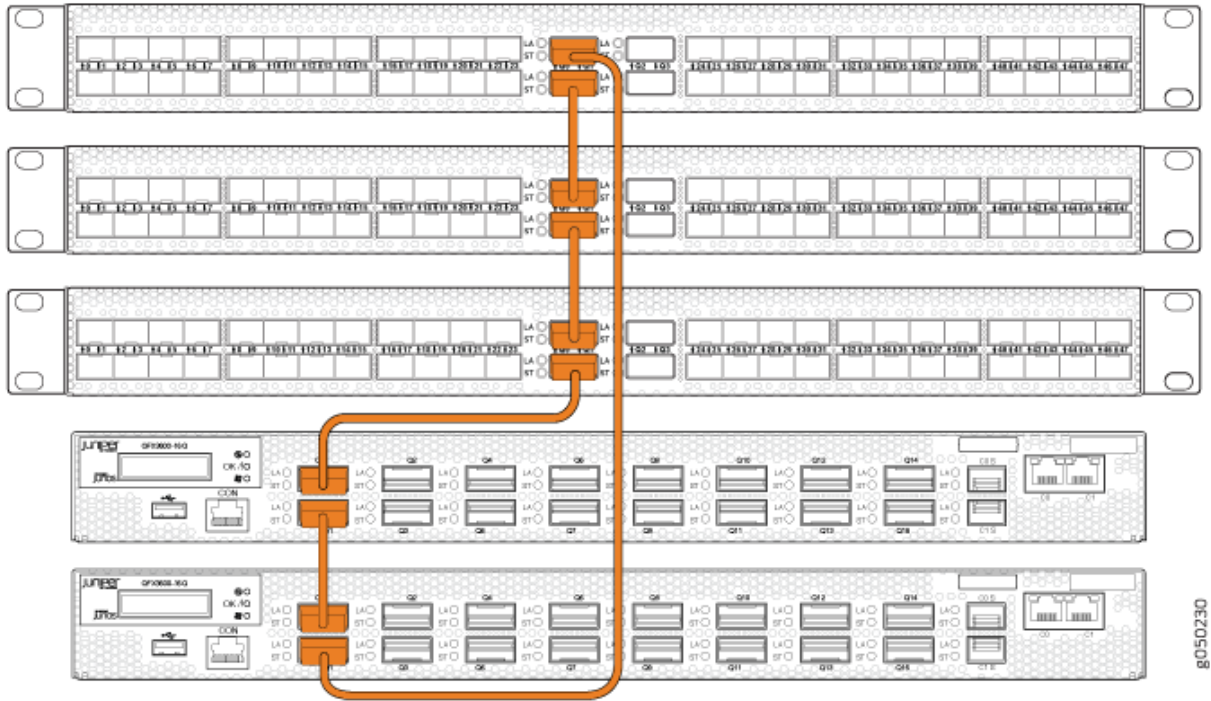
Figure 121: QFX3500 and QFX3600 Mixed Using Both 40G Ports and 10G Ports as the VCPs
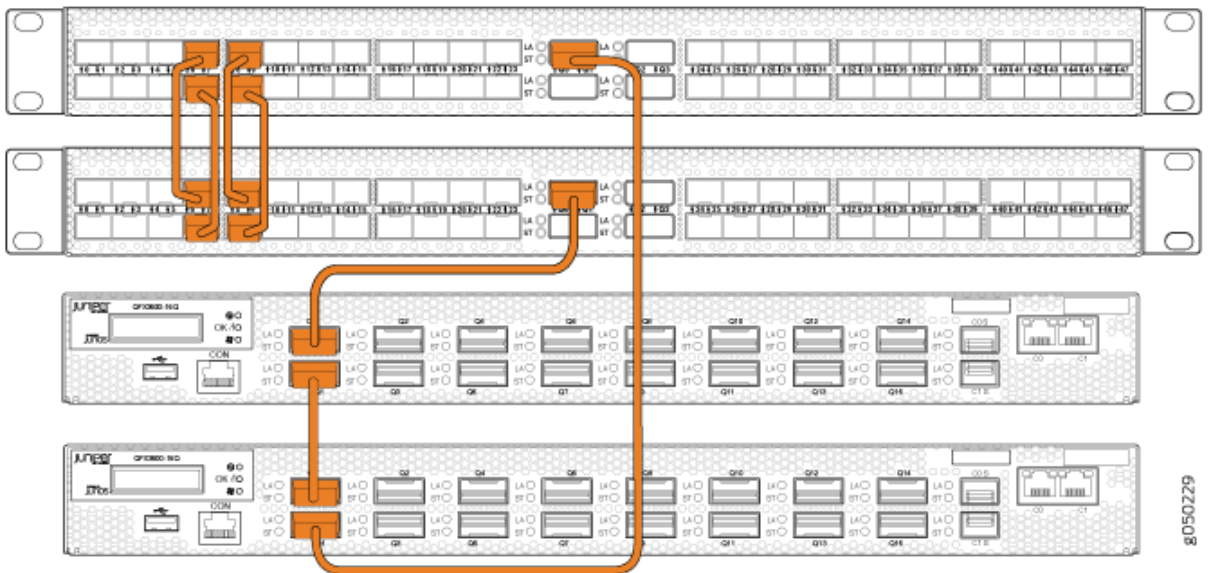
Figure 122: QFX5100 Primary Connecting QFX3600 and QFX3500 Using 40G Ports as VCPs
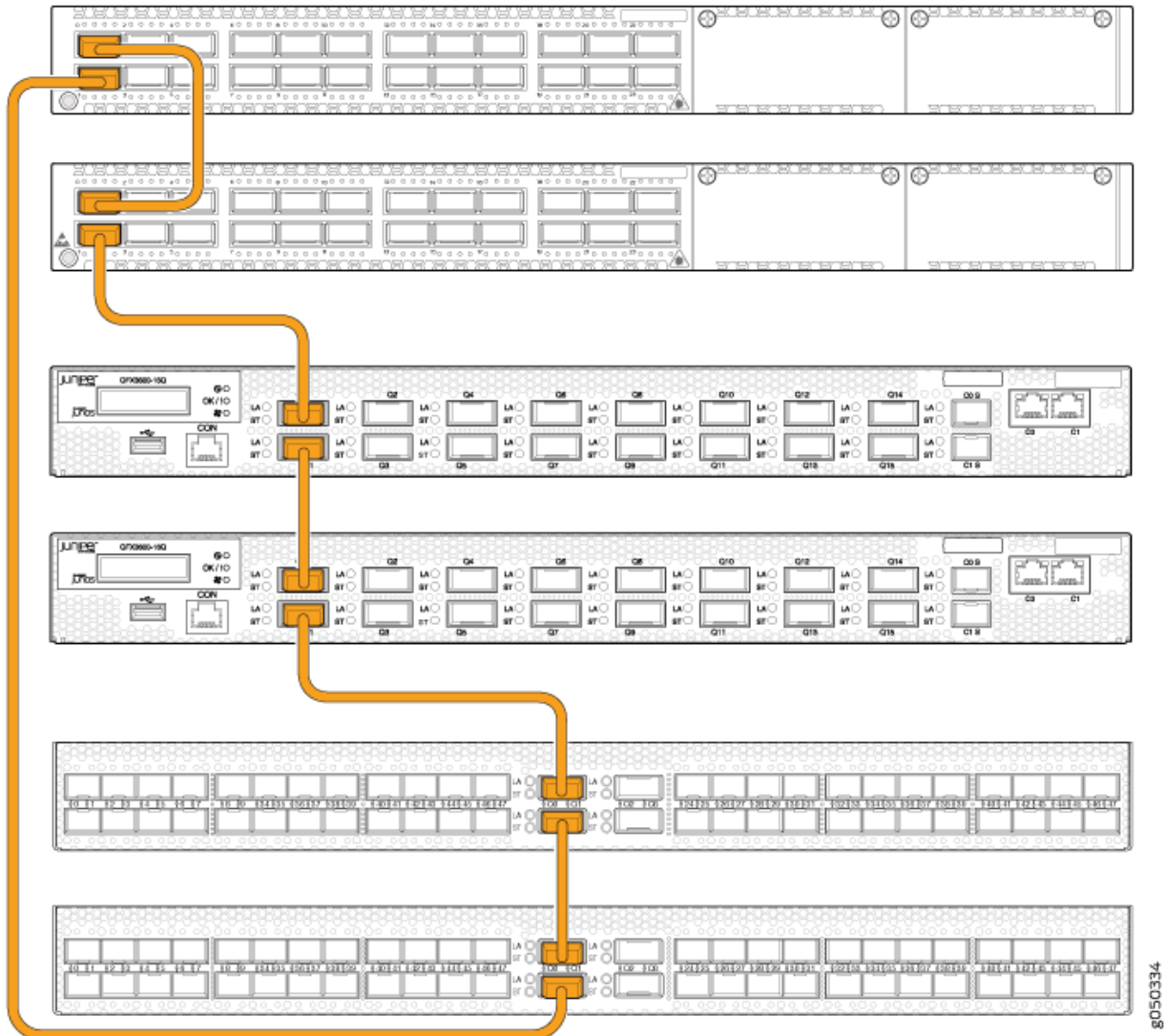
RELATED DOCUMENTATION

Understanding QFX Series Virtual Chassis

Connecting QFX5110 and QFX5100 Members in a QFX5110 Virtual Chassis

Adding a New Switch to an Existing EX4650 or QFX Series Virtual Chassis

Connecting a QFX5100 Device in a Virtual Chassis Fabric

Connect a Device to a Network for Out-of-Band Management

Ensure that you have an Ethernet cable that has an RJ-45 connector at either end. Figure 123 on page 345 shows the RJ-45 connector of the Ethernet cable.

Figure 123: RJ-45 Connector on an Ethernet Cable
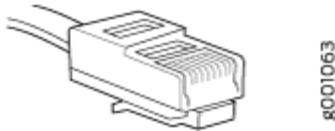
You can monitor and manage these devices by using a dedicated management channel. Each device has a management port to which you can connect an Ethernet cable with an RJ-45 connector. Use the management port to connect the device to the management device.

To connect a device to a network for out-of-band management (see Figure 124 on page 345):

1. Connect one end of the Ethernet cable to the management port on the device.
2. Connect the other end of the Ethernet cable to the management device.

Figure 124: Connect a Device to a Network for Out-of-Band Management
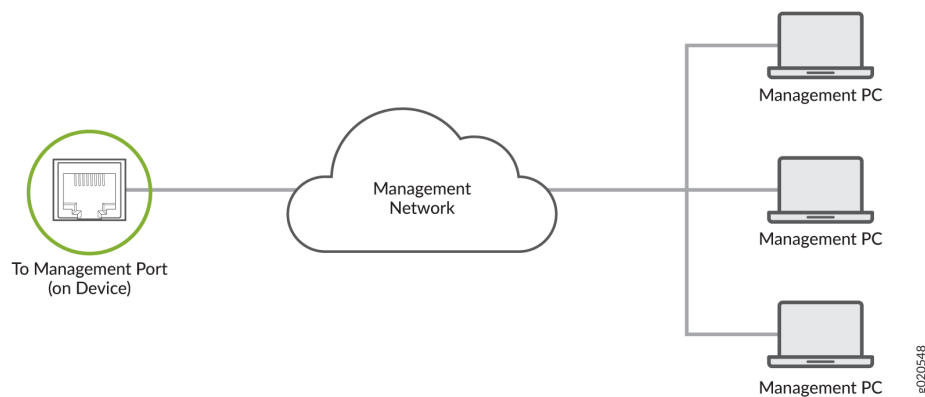
CHAPTER 25

Installing a QFX3500 Switch

Installing and Connecting a QFX3500 Device

To install and connect a QFX3500 device:

1. Follow the instructions in *Unpacking a QFX3500 Device*.
2. Mount the device by following the instructions in *Mounting a QFX3500 Device in a Rack or Cabinet*.
3. Follow the instructions in *Connecting Earth Ground to a QFX3500 Device*.
4. Follow the instructions in *Connecting AC Power to a QFX3500, QFX3600, or QFX3600-I Device*.
5. Depending on how you will be using the QFX3500 device, do one of the following:

   - If you are using the QFX3500 device as a standalone switch, follow the instructions in Configuring a QFX3500 Device as a Standalone Switch.

   - If you are using the QFX3500 device as a Node device in a QFX3000-G QFabric system, see *QFX3000-G QFabric System Installation Overview* for information about the steps to install and configure your QFX3000-G QFabric system.

- If you are using the QFX3500 device as a Node device in a QFX3000-M QFabric system, see *QFX3000-M QFabric System Installation Overview* for information about the steps to install and configure your QFX3000-M QFabric system.

RELATED DOCUMENTATION

Rack Requirements for a QFX3500 Device

Cabinet Requirements for a QFX3500 Device

Clearance Requirements for Airflow and Hardware Maintenance for a QFX3500 Device

Unpacking a QFX3500 Device

The QFX3500 device chassis is a rigid sheet-metal structure that houses the hardware components. A QFX3500 device is shipped in a cardboard carton, secured with foam packing material. The carton also contains an accessory box and quick start instructions.

> **CAUTION**: QFX3500 devices are maximally protected inside the shipping carton. Do not unpack the device until you are ready to begin installation.

To unpack a QFX3500 device:

1. Move the shipping carton to a staging area as close to the installation site as possible, but where you have enough room to remove the system components.
2. Position the carton so that the arrows are pointing up.
3. Open the top flaps on the shipping carton.
4. Remove the accessory box and verify the contents against the inventory included in the box. Table 70 on page 348 lists the inventory of components supplied with a QFX3500 device.
5. Pull out the packing material holding the device in place.
6. Verify the chassis components received:

   - Management board

   - Two fan trays

   - One or two power supplies, depending on your order. If only one power supply is installed, a blank panel should be installed on the second power supply slot.
7. Save the shipping carton and packing materials in case you need to move or ship the device later.

Table 70: Inventory of Components Supplied with a QFX3500 Device

Component	Quantity
Chassis with management board, two fan trays, and one or two power supplies	1
Rear installation blades	2
RJ-45 cable and RJ-45 to DB-9 adapter	1
SFP/SFP+ port dust covers	48
QSFP+ port dust covers	4
Electrostatic discharge (ESD) grounding strap	1

RELATED DOCUMENTATION

Mounting a QFX3500 Device in a Rack or Cabinet

Installing and Connecting a QFX3500 Device

Mounting a QFX3500 Device in a Rack or Cabinet

IN THIS SECTION

You can mount a QFX3500 device on four posts in a 19-in. rack or cabinet by using the mounting kits provided with the device. Choose one of the following two mounting kits provided for the different QFX3500 chassis configurations.

- If your installation kit has two rails and your QFX3500 has mounting holes integrated as part of the chassis, use "Two Mounting Rails Procedure" on page 350. This configuration aligns the management end of the device flush with the rack. The adjustable rails allow for installation into racks having different depths.

- If your installation kit has four rails and the QFX3500 does not have mounting holes as part of the chassis faceplate, use "Four Mounting Rails Procedure" on page 351. This configuration allows either end of the device to be mounted flush with the rack and still be adjustable for racks with different depths.

(The remainder of this topic uses "rack" to mean "rack or cabinet.") The front and rear rack rails must be spaced between 28 in. (71.1 cm) and 36 in. (91.4 cm) front to back.

Before You Begin Rack Installation

Before you begin mounting a QFX3500 device in the rack or cabinet:

- If replacing an existing QFX3500, remove previous rack-mount hardware. The mounting bracket and mounting blade in this procedure is not compatible with other Juniper mounting kits.

- Ensure that you understand how to prevent electrostatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.

- Verify that the site meets the requirements described in Site Preparation Checklist for a QFX3500 Device.

- Place the rack in its permanent location, allowing adequate clearance for airflow and maintenance, and secure it to the building structure.

- Read *General Site Guidelines*, with particular attention to Chassis Lifting Guidelines for a QFX3500 Device.

- Remove the device from the shipping carton (see *Unpacking a QFX3500 Device*).

Ensure that you have the following parts and tools available to mount the device on four posts in a rack:

- ESD grounding strap (provided).

- One pair of rear installation blades. These installation blades support the rear of the chassis and must be installed (provided).

- Eight screws to secure the chassis and rear installation blades to the rack (not provided).

- Appropriate screwdriver for the mounting screws (not provided).

> **WARNING**: The QFX3500 device must be supported at all four corners. Mounting the chassis using only the front brackets will damage the chassis and can result in serious bodily injury.

> **CAUTION**: If you are installing the QFX3500 device above 60 in. (152.4 cm) from the floor, you must remove the power supplies, fan trays, and management board before attempting to install the device, or ask someone to assist you during the installation.

> **CAUTION**: If you are mounting multiple devices on a rack, mount the device in the lowest position of the rack first and proceed to mount the rest of the devices from bottom to top.

Two Mounting Rails Procedure

To mount the device on four posts in a rack using a two-rail kit:

1. Attach the ESD grounding strap to your bare wrist and to a site ESD point.
2. With two mounting screws—and cage nuts and washers if your rack requires them—attach one of the rear installation blades to the rear of the rack at the point where you want to mount the device. Tighten the screws. The blade helps support the rear of the chassis. You install the second rear installation blade after securing both front mounting brackets. See .

Figure 125: Installing an Installation Blade in a Rack
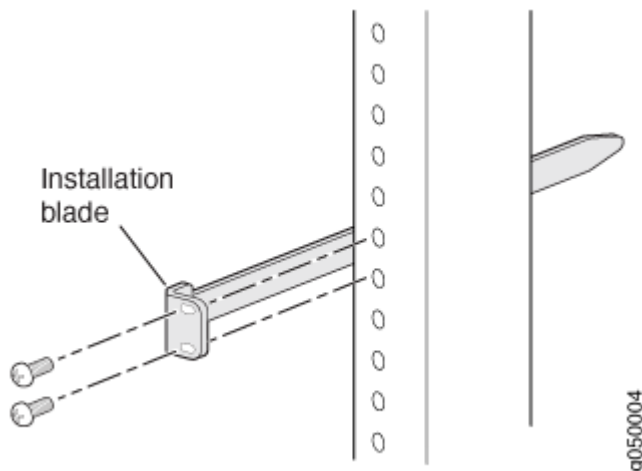
3. Grasp both sides of the device, lift it, and position it in the rack so that the blade receptacle at the rear of the chassis catches and slides onto the installation blade. See Figure 126 on page 351.

> **TIP**: If someone is assisting you, have one person stand at the rear of the rack where the installation blade is installed, to help guide the device onto the installation blade.

Figure 126: Mounting the QFX3500 Device on Four Posts in a Rack Using a Two-Rail Kit
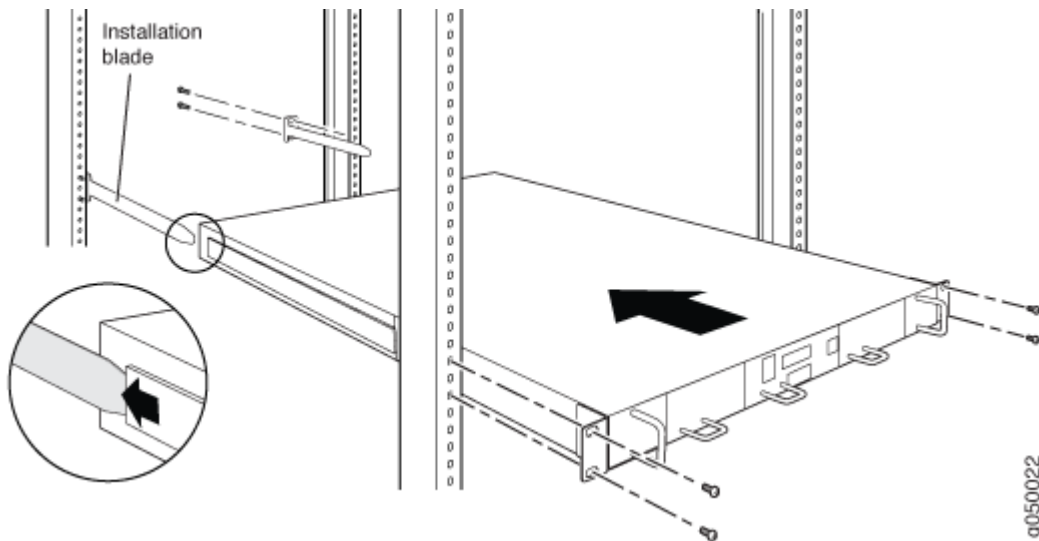
4. Align the holes in the front brackets on the chassis with the holes in the rack. Ensure that the chassis is level.

5. With four mounting screws—and cage nuts and washers if your rack requires them—secure the front of the device to the rack. Insert the first screw on the opposite corner from the rear installation blade you installed. Tighten the screws.

6. Ensure that the device 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.

7. With two mounting screws—and cage nuts and washers if your rack requires them—slide the second rear mounting blade into the blade receptacle on the chassis, and secure it to the rear of the rack by tightening the screws. You might need to loosen and adjust the first mounting blade to install the second blade.

Four Mounting Rails Procedure

To mount the device on four posts in a rack using a four -rail kit:

1. Attach the ESD grounding strap to your bare wrist and to a site ESD point.

2. Decide whether the management end of the device or the ports are to be placed at the front of the rack.

3. Align the holes in the mounting rail with the button fasteners on the side of the device and slide the holes over the fasteners to click into place. See to see the proper alignment.

Figure 127: Attaching a Mounting Rail to the QFX3500
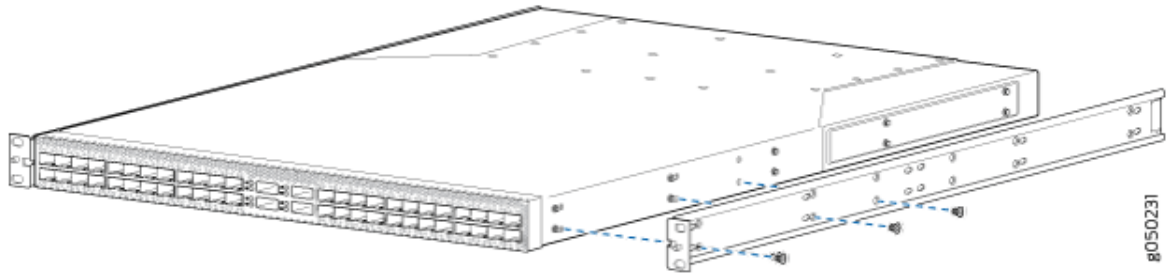
4. With three mounting screws—and cage nuts and washers if your rack requires them—attach the mounting rail to the device. Tighten the screws.

5. Repeats steps 3 and 4 on the opposite side of the device. One end of the device now has front facing mounting holes, the other end none.

6. With two mounting screws—and cage nuts and washers if your rack requires them—attach one of the rear installation blades to the rear of the rack at the point where you want to mount the device. Tighten the screws. The blade helps support the rear of the chassis. You install the second rear installation blade after securing both front mounting brackets. See for detail on installing the rear blade.

7. Grasp both sides of the device, lift it, and position it in the rack so that the blade receptacle at the rear of the chassis catches and slides onto the installation blade. See .

Figure 128: Slide Mounting Rail onto the Rear Mounting Blade
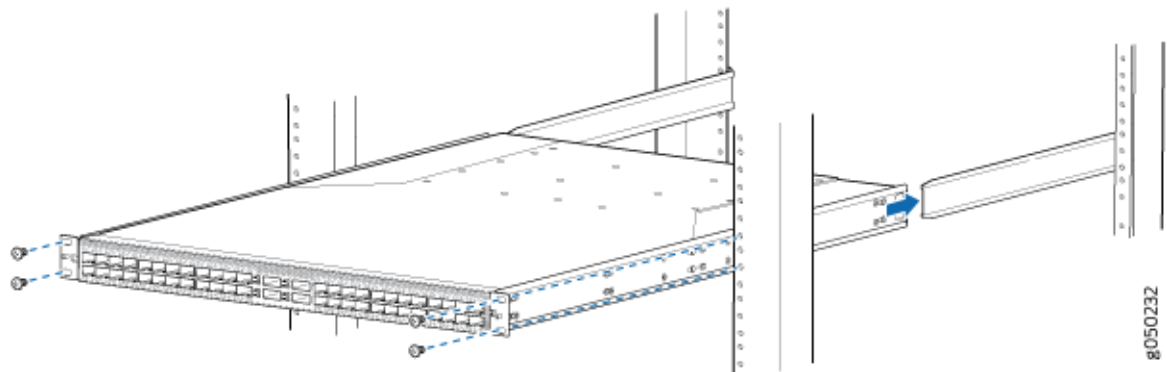
8. Align the holes in the mounting brackets with the holes in the rack. Ensure that the chassis is level.

9. With four front mounting screws–and cage nuts and washers if your rack requires them–attach the mounting bracket to the rack. Insert the first screw on the opposite corner from the mounting blade. Tighten the screws.

10. Ensure that the switch chassis is level by verifying that the screws on the front of the rack are aligned with the screws at the back of the rack.

11. With two mounting screws—and cage nuts and washers if your rack requires them—slide the second rear mounting blade into the blade receptacle on the mounting blade, and secure it to the rear of the rack by tightening the screws. You might need to loosen and adjust the other mounting blade to install the second blade.

RELATED DOCUMENTATION

Rack-Mounting and Cabinet-Mounting Warnings

Connecting AC Power to a QFX3500, QFX3600, or QFX3600-I Device

Configuring a QFX3500 Device as a Standalone Switch

Connecting Earth Ground to a QFX3500 Device

To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the QFX3500 device to earth ground before you connect it to power.

For installations that require a separate grounding conductor to the chassis, you must attach a protective earthing terminal bracket on the QFX3500 device left front mounting bracket to connect to the earth ground (see Figure 129 on page 354).

Before you connect earth ground to the protective earthing terminal of a QFX3500 device, ensure that a licensed electrician has attached an appropriate grounding lug to the grounding cable.

> ⚠️ **CAUTION**: Using a grounding cable with an incorrectly attached lug can damage the device.

> **NOTE**: Mount your device in the rack or cabinet before attaching the grounding lug to the device. See *Mounting a QFX3500 Device in a Rack or Cabinet*.

Ensure that you have the following parts and tools available:

- Protective earthing terminal bracket—This L-shaped bracket attaches to a post on the QFX3500 device left front mounting bracket, providing a protective earthing terminal for the device. This bracket is provided in the accessory kit.

- Grounding cable for your QFX3500 device—The grounding cable must be 14 AWG (2 mm²), minimum 90° C wire, or as permitted by the local code.

- Grounding lug for your grounding cable—The grounding lug required is a Panduit LCD10-10A-L or equivalent. This grounding lug is provided in the accessory kit.

- Three M4 hex nuts with integrated washers—One nut and washer are required to secure the grounding lug bracket to the left front mounting bracket, and two nuts and washers are used to secure the grounding lug to the grounding lug bracket protective earthing terminal. Four nuts are provided in the accessory kit.

- 7-mm wrench or socket with driver to attach all three nuts.

An AC-powered QFX3500 device chassis gains additional grounding when you plug the power supply in the device into a grounded AC power outlet by using an AC power cord appropriate for your geographical location. See *AC Power Cord Specifications for a QFX Series Device*.

To connect earth ground to a QFX3500 device:

1. Secure the provided protective earthing terminal bracket to the threaded post on the QFX3500 device left front mounting bracket with the nut provided. The posts on the protective earthing terminal bracket should point to the left. See Figure 129 on page 354.

Figure 129: Connecting a Grounding Cable to a QFX3500 Device
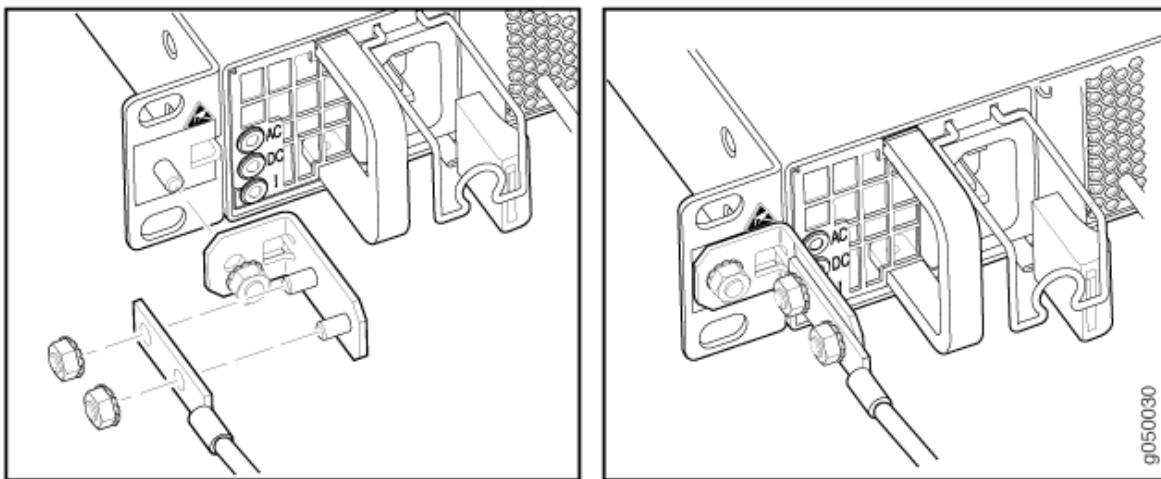
2. Connect one end of the grounding cable to a proper earth ground, such as the rack in which the device is mounted.

3. Place the grounding lug attached to the grounding cable over the protective earthing terminal on the protective earthing terminal bracket.

4. Secure the grounding lug to the protective earthing terminal with two nuts.

5. Dress the grounding cable and ensure that it does not touch or block access to other device components and that it does not drape where people could trip over it.

RELATED DOCUMENTATION

General Safety Guidelines and Warnings

Grounded Equipment Warning

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 QFX3500, QFX3600, or QFX3600-I Device

Ensure that you have a power cord appropriate for your geographical location available to connect AC power to the device.

Before you begin connecting AC power to the device:

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

- Ensure that you have connected the device chassis to earth ground.

> ⚠️ **CAUTION**: Before you connect power to the device, 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 device (for example, by causing a short circuit).
>
> To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the chassis 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 device chassis to connect to the earth ground. For instructions on connecting earth ground, see *Connecting Earth Ground to a QFX3500 Device* or *Connecting Earth Ground to QFX3600 or QFX3600-I Devices*. The device gains additional grounding when you plug the power supply in the device into a grounded AC power outlet by using the AC power cord appropriate for your geographical location (see *AC Power Cord Specifications for a QFX Series Device*).

- Install the power supply in the chassis. For instructions on installing a power supply in a QFX3500 device, see Installing a Power Supply in a QFX3500 Device. For instructions on installing a power supply in a QFX3600 or QFX3600-I device, see Installing a Power Supply in a QFX3600 or QFX3600-I Device.

The QFX3500, QFX3600, and QFX3600-I devices are shipped from the factory with two 650 W power supplies pre-installed. Each power supply is a hot-removable and hot-insertable field-replaceable unit (FRU) when the second power supply is installed and running. You can install replacement power supplies without powering off the device or disrupting the switching function.

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

To connect AC power to a QFX3500, QFX3600, or QFX3600-I device:

1. Attach the grounding strap to your bare wrist and to a site ESD point.
2. Ensure that the power supplies are fully inserted in the chassis and the latches are secure. If only one power supply is installed, ensure a that blank cover panel is installed over the second power supply slot.
3. Locate the power cord or cords shipped with the device; the cords have plugs appropriate for your geographical location. See *AC Power Cord Specifications for a QFX Series Device*.

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

4. Connect each power supply to the power sources. Insert the coupler end of the power cord into the AC power cord inlet on the AC power supply faceplate.
5. Push the power cord retainer onto the power cord (see Figure 130 on page 356 or Figure 131 on page 357).

Figure 130: Connecting an AC Power Cord to an AC Power Supply in a QFX3500 Device
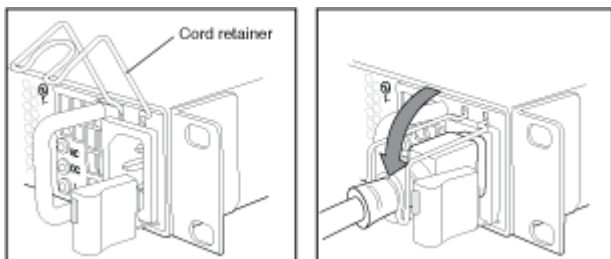
Figure 131: Connecting an AC Power Cord to an AC Power Supply in a QFX3600 or QFX3600-I Device

6. If the AC power source outlet has a power switch, set it to the OFF (O) position.

> **NOTE**: The device powers on as soon as power is provided to the power supply. There is no power switch on the device.

7. Insert the power cord plug into an AC power source outlet.

8. If the AC power source outlet has a power switch, set it to the ON (|) position.

9. Verify that the AC and DC LEDs on each power supply are lit green.

   If the amber fault LED is lit, remove power from the power supply, and replace the power supply (see Removing a Power Supply from a QFX3500 Device or Removing a Power Supply from a QFX3600 or QFX3600-I Device). Do not remove the power supply until you have a replacement power supply ready: the power supplies or a blank cover panel must be installed in the device to ensure proper airflow.

> ⚠ **CAUTION**: Replace a failed power supply with a blank panel or new power supply within 1 minute of removal to prevent chassis overheating.

RELATED DOCUMENTATION

AC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

AC Power Supply LEDs on a QFX3500, QFX3600, or QFX3600-I Device

Connecting DC Power to a QFX3500, QFX3600, or QFX3600-I Device

Before you begin connecting DC power to the device:

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

- Ensure that you have connected the device chassis to earth ground.

> ⚠️ **CAUTION**: Before you connect power to the device, 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 device (for example, by causing a short circuit).
>
> To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the chassis 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 device chassis to connect to the earth ground. For instructions on connecting earth ground, see *Connecting Earth Ground to a QFX3500 Device* or *Connecting Earth Ground to QFX3600 or QFX3600-I Devices*.

- Install the power supply in the chassis. For instructions on installing a power supply in a QFX3500 device, see Installing a Power Supply in a QFX3500 Device. For instructions on installing a power supply in a QFX3600 or QFX3600-I device, see Installing a Power Supply in a QFX3600 or QFX3600-I Device

Ensure that you have the following parts and tools available:

- DC power source cables (14–16 AWG) with ring lug (Molex 190700069 or equivalent) (not provided)

- Phillips (+) screwdriver, number 2 (not provided)

- Multimeter (not provided)

The QFX3500, QFX3600, and QFX3600-I devices are shipped from the factory with two 650 W power supplies pre-installed. Each power supply is a hot-removable and hot-insertable field-replaceable unit (FRU) when the second power supply is installed and running. You can install replacement power supplies without powering off the device or disrupting the switching function.

> ⚠️ **WARNING**: DC-powered QFX3500, QFX3600 and QFX3600-I devices are intended for installation only in a restricted access location.

> **NOTE**: The battery returns of the DC power supply should be connected as an isolated DC return (DC-I).

To connect DC power to a QFX3500, QFX3600 or QFX3600-I device:

1. Attach the grounding strap to your bare wrist and to a site ESD point.

2. 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 low resistance (indicating a closed circuit) to chassis ground is positive (+) and will be installed on the V+ (return) DC power input terminal.

   - The cable with very high resistance (indicating an open circuit) to chassis ground is negative (–) and will be installed on the V– (input) 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.

3. Ensure that the input 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.

   > **NOTE**: The V+ terminals are referred to as +RTN, and V– terminals are referred to as –48 V in *DC Power Wiring Sequence Warning* and *DC Power Electrical Safety Guidelines*.

4. Ensure that the power supplies are fully inserted in the chassis.

5. Remove the terminal block cover. The terminal block cover is a piece of clear plastic that snaps into place over the terminal block (see).

6. Remove the screws on the terminals using the screwdriver. Save the screws.

   > ⚠ **WARNING**: Ensure that the power cables do not block access to device components or drape where people can trip on them.

7. Connect each power supply to the power sources. Secure power source cables to the power supplies by screwing the ring lugs attached to the cables to the appropriate terminals by using the screw from the terminals (see Figure 133 on page 362 and Figure 132 on page 361).

> ⚠ **CAUTION**: The DC power supply has four terminals labeled V+, V+, V−, and V− for connecting DC power source cables labeled positive (+) and negative (−). The V+ terminals are shunted internally together, as are the V- terminals. The same polarity terminal can be wired together from the same source to provide an additional current path in a higher power chassis. Do not connect the terminals to different sources. For example, connect −48 V from DC source feed A to the input terminals of one power supply and connect −48 V from feed B to the input terminals of the second power supply on the other side of the chassis. This configuration provides the commonly deployed A/B feed redundancy for the system.

a. Secure the ring lug of the positive (+) DC power source cable to the V+ terminal on the DC power supply.

b. Secure the ring lug of the negative (−) DC power source cable to the V− terminal on the DC power supply.

c. Tighten the screws on the power supply terminals until snug using the screwdriver. Do not overtighten—apply between 5 in-lb (0.56 Nm) and 6 in-lb (0.68 Nm) of torque to the screws.

Figure 132: DC Power Supply Faceplate for a QFX3500, QFX3600 or QFX3600-I Device
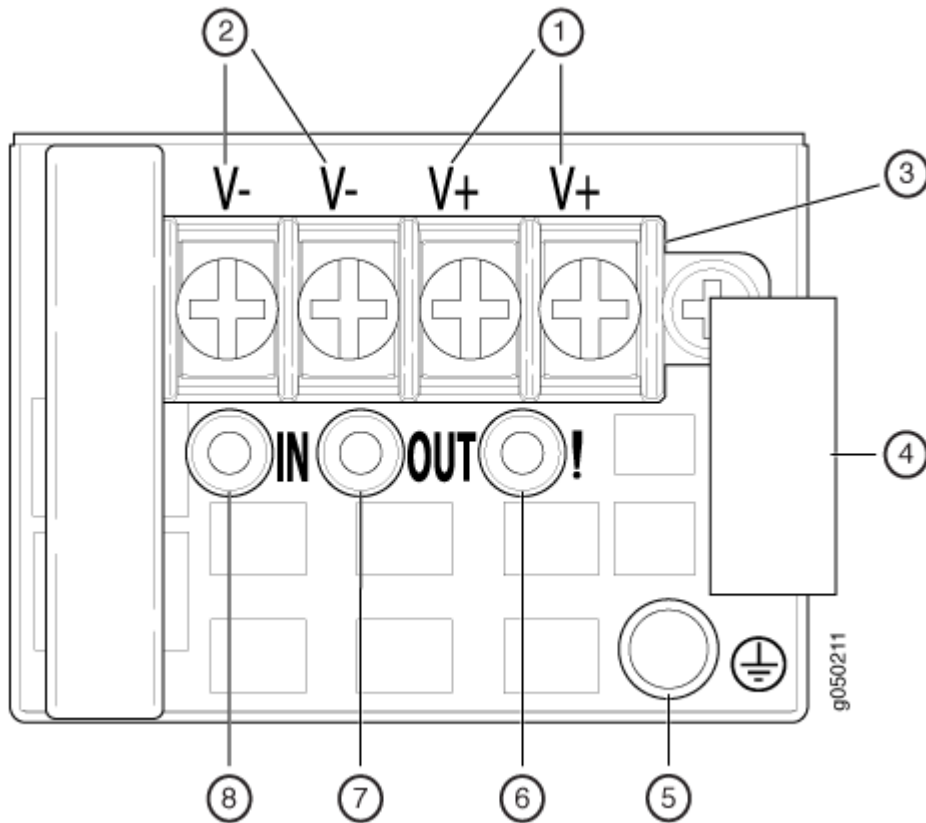
1–	Shunt positive input terminals	5–	ESD grounding point
2–	Shunt negative input terminals	6–	Fault LED
3–	Terminal block	7–	Output LED
4–	Ejector lever	8–	Input LED

⚠ **CAUTION**: The V+ terminals are shunted internally together, as are the V- terminals. The same polarity terminal can be wired together from the same source to provide an additional current path in a higher power chassis. Do not connect the terminals to different sources.

Figure 133: Securing Ring Lugs to the Terminals on the QFX3500, QFX3600 or QFX3600-I DC Power Supply

8. Replace the terminal block cover.

9. Close the input circuit breaker.

> **NOTE**: The device powers on as soon as power is provided to the power supply. There is no power switch on the device.

10. Verify that the **IN** and **OUT** LEDs on the power supply are lit green and are on steadily.

RELATED DOCUMENTATION

DC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

DC Power Supply LEDs on a QFX3500, QFX3600, or QFX3600-I Device

Connecting a QFX Series Device to a Management Console

Ensure that you have an RJ-45 to DB-9 rollover cable available.

> **NOTE**: We no longer include the RJ-45 console cable with the DB-9 adapter as part of the device package. If the console cable and adapter are not included in your device package, or if you need a different type of adapter, you can order the following separately:

- RJ-45 to DB-9 adapter (JNP-CBL-RJ45-DB9)

- RJ-45 to USB-A adapter (JNP-CBL-RJ45-USBA)

- RJ-45 to USB-C adapter (JNP-CBL-RJ45-USBC)

If you want to use RJ-45 to USB-A or RJ-45 to USB-C adapter you must have X64 (64-Bit) Virtual COM port (VCP) driver installed on your PC. See, https://ftdichip.com/drivers/vcp-drivers/ to download the driver.

The QFX Series has a console port with an RJ-45 connector. Use the console port to connect the device to a management console or to a console server.

To connect the QFX Series to a management console (see Figure 134 on page 363 and Figure 135 on page 363):

1. Connect one end of the Ethernet cable to the console port (labeled **CON**).
2. Connect the other end of the Ethernet cable into the console server (see Figure 134 on page 363) or management console (see Figure 135 on page 363).

Figure 134: Connecting the QFX Series to a Management Console Through a Console Server

CON
To Console Port

Laptop CPU

g050108

Figure 135: Connecting the QFX Series Directly to a Management Console

CON
ETH CRAFT
port (on device)

Laptop CPU

g050109

Console Port Connector Pinout Information

Configuring Junos OS to Set Console and Auxiliary Port Properties

Connecting QFX Series and EX Series Switches in a QFX Virtual Chassis

IN THIS SECTION

In a QFX Virtual Chassis, you can connect up to 10 standalone QFX5100, QFX3600, QFX3500, and EX4300 switches except EX4300-48MP and EX4300-48MP-S switches into a QFX Series Virtual Chassis and manage the interconnected switches as a single chassis. Unlike a Virtual Chassis Fabric (VCF), which is cabled in a spine and leaf topology, the QFX Virtual Chassis is cabled in a ring topology. For Virtual Chassis Fabric cabling examples, see Connecting a QFX5100 Device in a Virtual Chassis Fabric.

As of Junos Release 17.3R1, you can also connect select models of the QFX5100 in the line card role in a QFX5110 Virtual Chassis. See Connecting QFX5110 and QFX5100 Members in a QFX5110 Virtual Chassis.

This topic describes how to cable QFX Series switches and EX4300 switches into a QFX Virtual Chassis.

Before You Start

You configure a QFX Series Virtual Chassis by configuring the switch interfaces into Virtual Chassis ports (VCPs). VCPs connect switches together to form a Virtual Chassis, and are responsible for passing all data and control traffic between member switches in the Virtual Chassis. All non-channelized QSFP+ uplink interfaces on standalone QFX5100 switches can be configured into VCPs. All fixed SFP+ interfaces on QFX5100-96S switches can also be configured into VCPs.

Use the following interfaces to create VCPs:

- On QFX5100, non-channelized QSFP+ uplink interfaces. All fixed SFP+ interfaces on the QFX5100-96S switches are also available.

- On EX4300 switches, the built-in QSFP+ ports are dedicated VCPs by default. In 48-port EX4300 switches except EX4300-48MP and EX4300-48MP-S switches, you can use the QSFP+ ports as network ports or as VCPs. You can also use the SFP+ uplink module ports as VCPs by configuring these ports as VCPs.

  In EX4300-48MP and EX4300-48MP-S switches, you can use only the built-in QSFP+ ports as VCPs. You cannot configure the ports on the uplink module in EX4300-48MP and EX4300-48MP-S switches to Virtual Chassis ports (VCPs).

- On QFX3500 and QFX3600, all non-channelized QSFP+ and fixed SFP+ interfaces.

> **BEST PRACTICE**: Use the 40-Gigabit QSFP+ interfaces for the VCPs.

The advantages of connecting multiple switches into a Virtual Chassis include better-managed bandwidth at a network layer, simplified configuration and maintenance because multiple devices can be managed as a single device, increased fault tolerance and high availability (HA) because a Virtual Chassis can remain active and network traffic can be redirected to other member switches when a single member switch fails, and a flatter, simplified Layer 2 network topology that minimizes or eliminates the need for loop prevention protocols such as Spanning Tree Protocol (STP).

You can increase VCP bandwidth between member switches by configuring multiple interfaces between the same two switches into VCPs. When multiple VCPs are interconnecting the same two member switches, a Link Aggregation Group (LAG) bundle is automatically formed when the VCPs are on interfaces supporting identical speeds. For instance, if you have two 40-Gigabit QSFP+ interfaces configured as VCPs between member switches, a LAG with two member links with 80 Gbps of total bandwidth is formed. 10-Gigabit SFP+ and 40-Gigabit QSFP+ interfaces configured as VCPs cannot be members of the same LAG, however. The Virtual Chassis feature is not applicable to QFX devices in a QFabric.

Virtual Chassis can be installed in a single rack, multiple racks, or in wire closets.

Valid Configurations

Valid configurations are:

- All QFX5100 members—in a ring topology this is Virtual Chassis; in a spine and leaf topology this is a Virtual Chassis Fabric (VCF). For a cabling example of spine and leaf, see Connecting a QFX5100 Device in a Virtual Chassis Fabric.

- All QFX3600 members

- All QFX3500 members

- A mixture of QFX3600 and QFX3500 members

- A mixture of QFX5100, QFX3600, and QFX3500 members–use the QFX5100 switches as primary and backup whenever possible.

- A mixture of QFX5100, QFX3600, QFX3500, and EX4300 members except EX4300-48MP and EX4300-48MP-S switches. EX4300 switches as the primary or backup is not supported; use QFX5100 switches in these roles whenever possible.

An all EX4300 member is simply considered an EX4300 Virtual Chassis (see Understanding EX Series Virtual Chassis).

If the QSFP+ interfaces are not available for VCP, 10-Gigbit interfaces can be used.

All members of the Virtual Chassis are required to run the same Junos OS Release. You can check the version and release by issuing the `show chassis version` CLI command.

Cabling QFX3500 Switches in a QFX5100 Virtual Chassis

is the preferred cabling method using the 40-Gigabit QSFP ports. See for an alternative method using the 10-Gigabit SFP+ ports.

Figure 136: QFX3500 Using the 40G Ports as the VCPs

Figure 137: QFX3500 Using the 10G Ports as the VCPs

Cabling QFX3600 Switches in a QFX Virtual Chassis

See Figure 119 on page 342 for a diagram of configuring an exclusive QFX3600 Virtual Chassis.

Figure 138: QFX3600 Using the 40G Ports as the VCPs
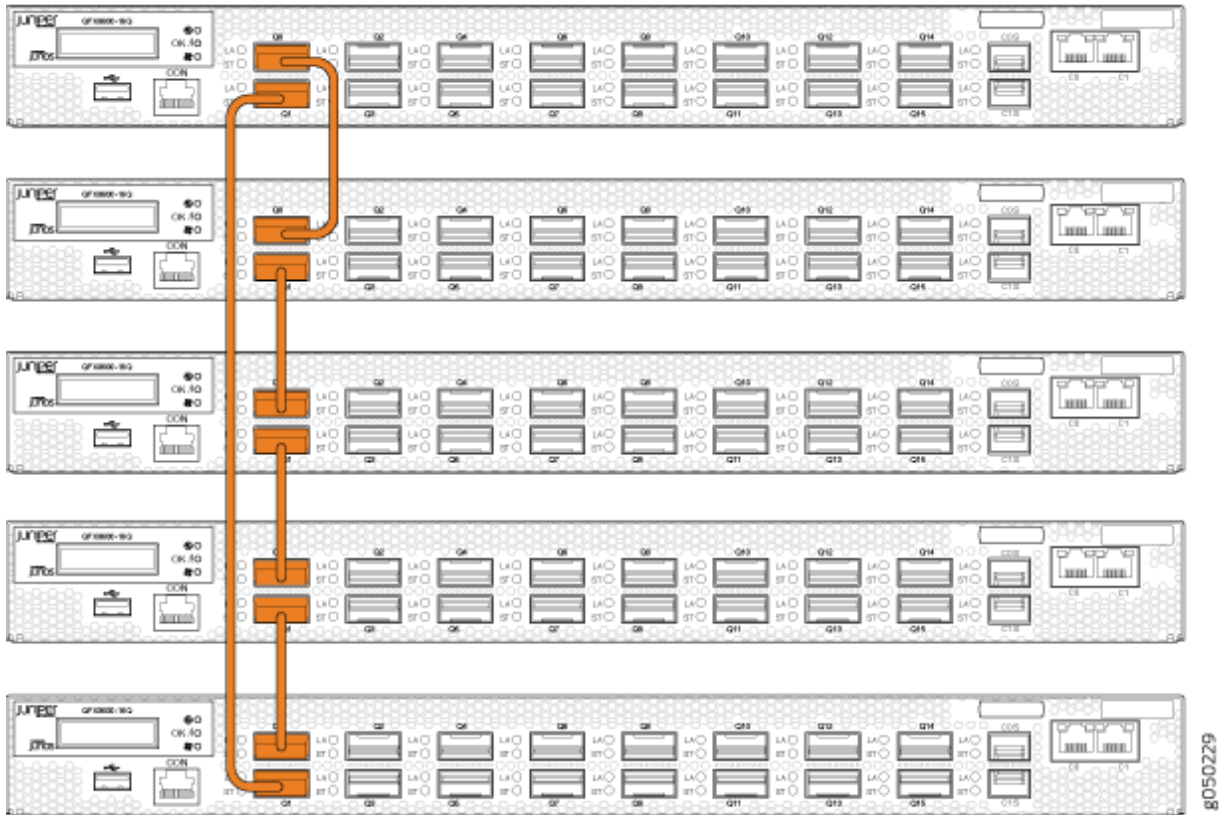
Cabling a Mixed QFX Virtual Chassis

A mixed QFX Virtual Chassis is a mixture of QFX5100 , QFX3500, QFX3600, or EX4300 switches except EX4300-48MP and EX4300-48MP-S switches in a ring topology. Always configure a QFX5100 as the primary and backup devices when they are available. See Figure 120 on page 343 for an example using the 40-Gigabit QSFP+ ports and Figure 121 on page 343 for an example using both 40-Gigabit and 10-Gigabit SFP+ ports. Figure 122 on page 344 shows QFX5100-24Q switches as the primary and backup cabled in a ring to QFX3500 and QFX3600 switches.

Figure 139: QFX3500 and QFX3600 Mixed Using the 40G Ports as the VCPs

g050230
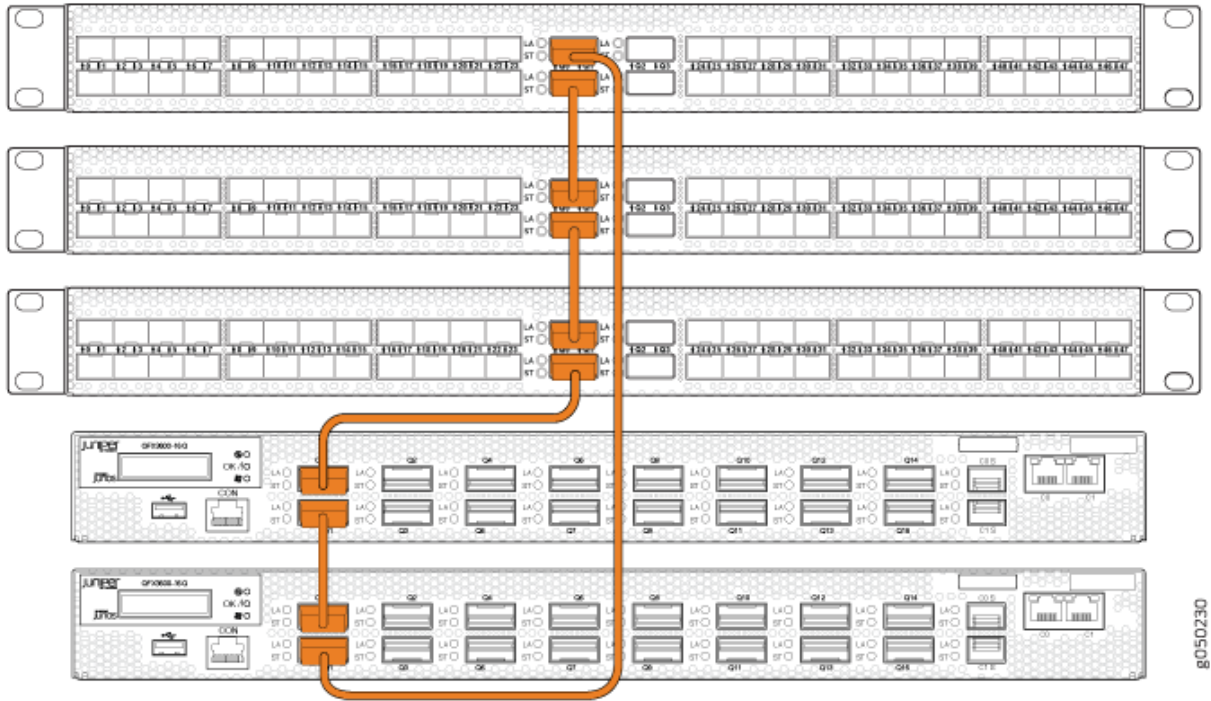
Figure 140: QFX3500 and QFX3600 Mixed Using Both 40G Ports and 10G Ports as the VCPs

g050229
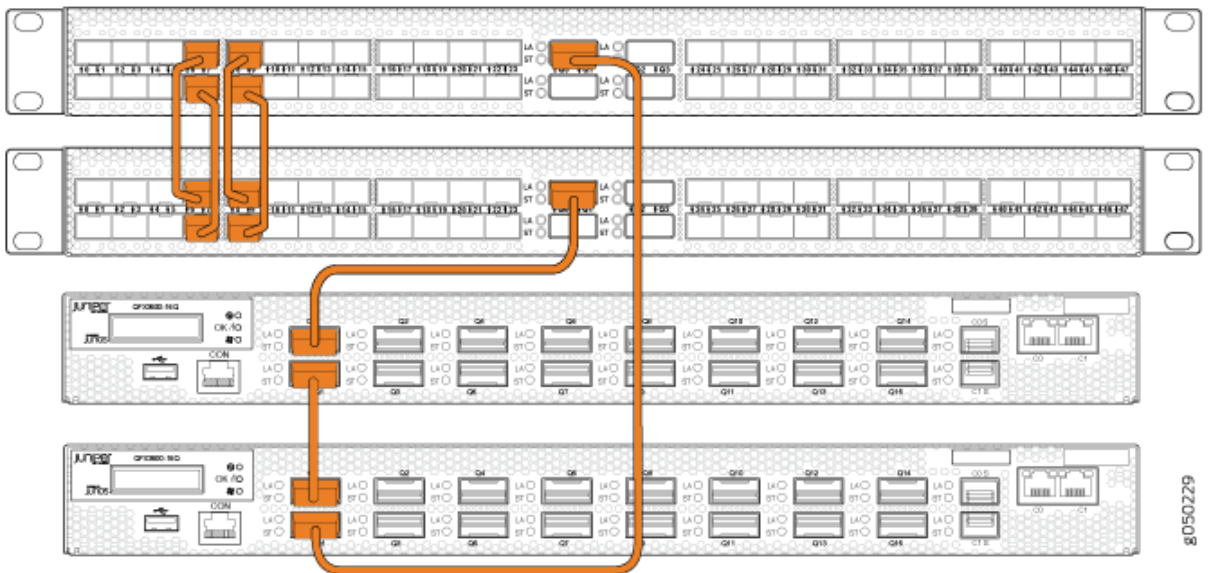
Figure 141: QFX5100 Primary Connecting QFX3600 and QFX3500 Using 40G Ports as VCPs
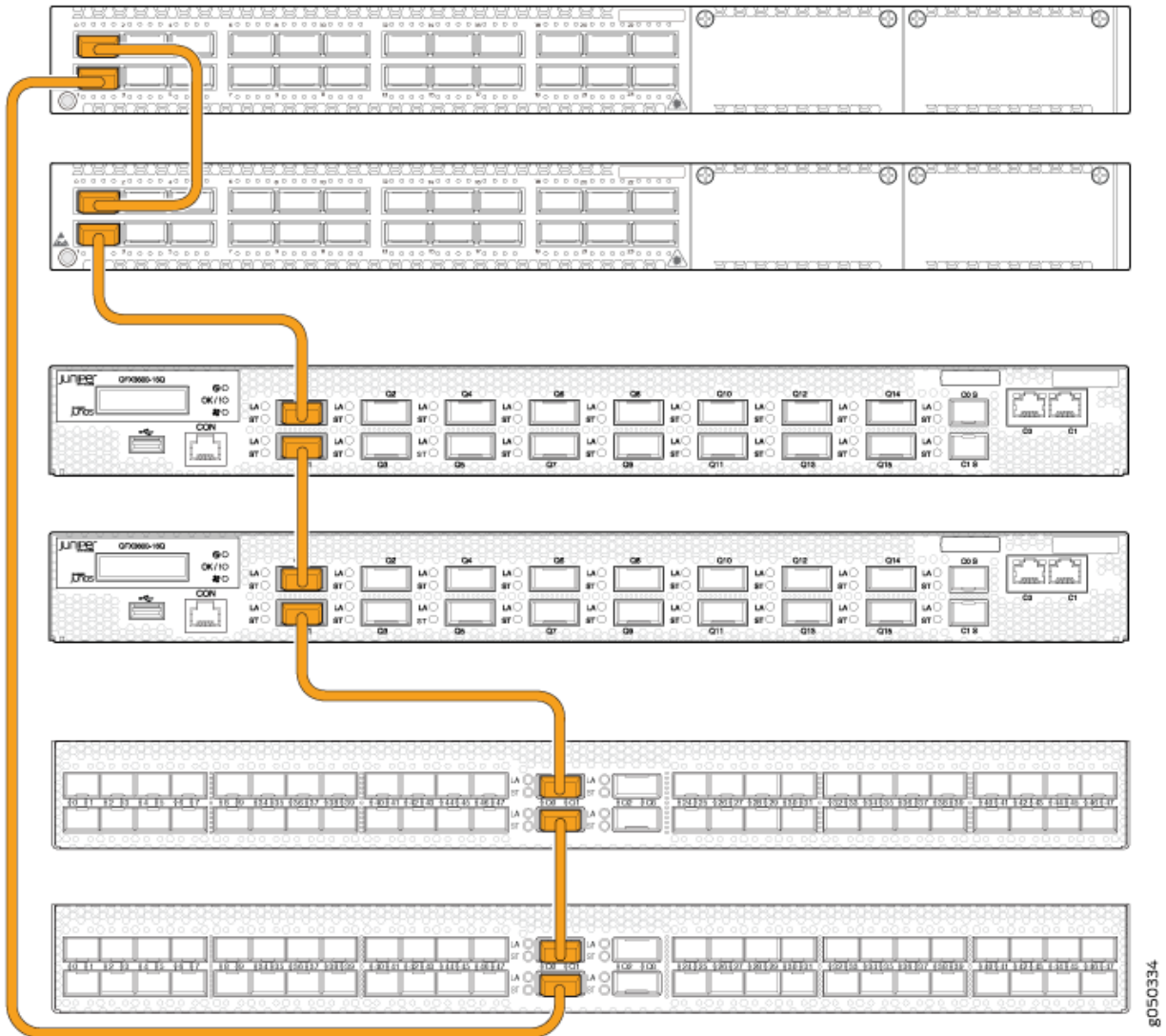
RELATED DOCUMENTATION

Understanding QFX Series Virtual Chassis

Connecting QFX5110 and QFX5100 Members in a QFX5110 Virtual Chassis

Adding a New Switch to an Existing EX4650 or QFX Series Virtual Chassis

Connecting a QFX5100 Device in a Virtual Chassis Fabric

Connecting a QFX3500 Device to a Network for Out-of-Band Management

Ensure that you have an appropriate cable available. See "Cable Specifications for Console and Management Connections for the QFX Series" on page 157 and The Hardware Compatibility Tool.

If you are using the QFX3500 device as a standalone switch, you can monitor and manage the QFX3500 device using a dedicated management channel. QFX3500 devices have two management ports. Depending on which management board your QFX3500 device is configured with the management ports are 1000BASE-T RJ-45 ports or 1-Gbps SFP ports. Use the management ports to connect the QFX3500 device to a network for out-of-band management.

> ⚠ **CAUTION**: Configuring the two management interfaces within the same subnet is not supported.

> **NOTE**: You cannot use the management ports to perform the initial configuration of the QFX3500 device. You must configure the management ports before you can successfully connect to the QFX3500 device using these ports. See Configuring a QFX3500 Device as a Standalone Switch.

To connect a QFX3500 device to a network for out-of-band management (see Figure 142 on page 372):

1. Connect one end of the cable to one of the management ports (labeled **C0** and **C1**) on the QFX3500 device.

2. Connect the other end of the cable to the management device (see Figure 142 on page 372).

Figure 142: Connecting a QFX3500 Device to a Network for Out-of-Band Management
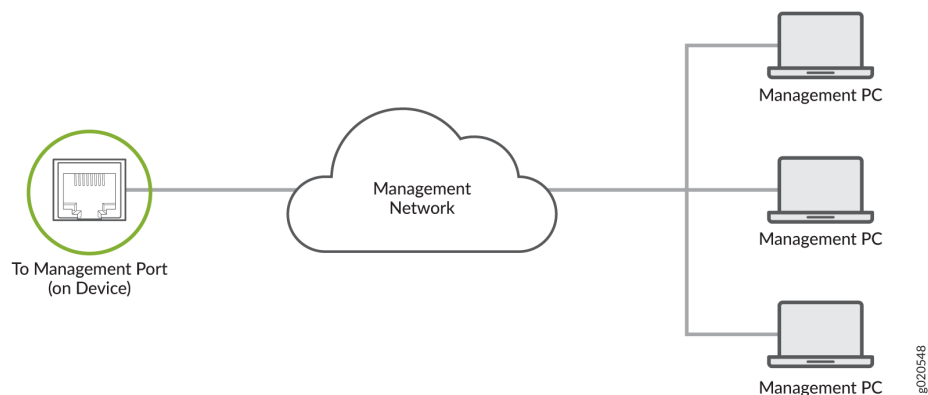
RELATED DOCUMENTATION

Management Board for a QFX3500 Device

Management Port Connector Pinouts for the QFX Series | **143**

Connecting a QFX Series Device to a Management Console | **310**

CHAPTER 26

Installing an EX4300 Switch

Installing and Connecting an EX4300 Switch

To install and connect an EX4300 switch:

1. Follow instructions in *Unpacking an EX4300 Switch*.
2. Install a power supply if it is not preinstalled:

    - *Installing an AC Power Supply in an EX4300 Switch*

    - *Installing a DC Power Supply in an EX4300 Switch*

3. Install a fan module if it is not preinstalled; see *Installing a Fan Module in an EX4300 Switch*.
4. Mount the switch by following instructions appropriate for your site:

    - *Mounting an EX4300 Switch on Two Posts of a Rack or Cabinet* (by using the mounting brackets provided)

    - *Mounting an EX4300 Switch in a Recessed Position in a Rack or Cabinet* (by using the 2-in.-recess front brackets from the separately orderable four-post rack-mount kit)

    - *Mounting an EX4300 Switch on Four Posts of a Rack or Cabinet* (by using the separately orderable four-post rack-mount kit)

    - *Mounting an EX4300 Switch on a Wall* (by using the separately orderable wall-mount kit)

5. Follow instructions in *Connect Earth Ground to an EX Series Switch*.

6. Follow instructions for connecting power as appropriate for your site:

    - *Connecting AC Power to an EX4300 Switch*

    - *Connecting DC Power to an EX4300 Switch*

7. Register your product by following instructions in *Register Products—Mandatory for Validating SLAs*.

8. Perform initial configuration of the switch by following the instructions in *Connecting and Configuring an EX Series Switch (CLI Procedure)* or *Connecting and Configuring an EX Series Switch (J-Web Procedure)*.

9. Set the switch's management options by following the instructions in:

    - *Connect a Device to a Network for Out-of-Band Management*

    - *Connect a Device to a Management Console Using an RJ-45 Connector*

    - *Connect an EX Series Switch to a Management Console Using the Mini-USB Type-B Console Port*

RELATED DOCUMENTATION

Rack Requirements

Cabinet Requirements

Clearance Requirements for Airflow and Hardware Maintenance for EX4300 Switches

Unpacking an EX4300 Switch

EX4300 switches are shipped in a cardboard carton, secured with foam packing material. The carton has an accessory compartment.

> ⚠ **CAUTION**: EX4300 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. Move the shipping carton to a staging area as close to the installation site as possible, but where you have enough room to remove the system components.

2. Position the carton so that the arrows are pointing up.

3. Open the top flaps on the shipping carton.

4. Pull out the packing material holding the switch in place.

5. Verify the parts received against the inventory on the label attached to the carton. See *Parts Inventory (Packing List) for an EX4300 Switch*.

6. Save the shipping carton and packing materials in case you need to move or ship the switch later.

Mounting an EX4300 Switch

You can mount an EX4300 switch:

*   On two posts of a 19-in. rack or a 19-in. cabinet by using the mounting brackets provided with the switch.

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

*   On a wall by using the separately orderable wall-mount kit.

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 EX4300 Switch on Two Posts of a Rack or Cabinet

Mounting an EX4300 Switch in a Recessed Position in a Rack or Cabinet

Mounting an EX4300 Switch on Four Posts of a Rack or Cabinet

Mounting an EX4300 Switch on a Wall

Connect Earth Ground to an EX Series Switch

Mounting an EX4300 Switch on Two Posts of a Rack or Cabinet

Before mounting the switch on two posts of a rack:

- Verify that the site meets the requirements described in *Site Preparation Checklist for EX4300 Switches*.

- 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*, with particular attention to *Chassis and Component Lifting Guidelines*.

- Remove the switch from the shipping carton (see *Unpacking an EX4300 Switch*).

Ensure that you have the following parts and tools available:

- Phillips (+) screwdriver, number 2 (not provided)

- 2 mounting brackets and 8 mounting screws (provided in the accessory box shipped with the switch)

- Screws to secure the chassis to the rack (not provided)

- 2-in.-recess front-mounting brackets if you will mount the switch in a recessed position (part of the separately orderable four-post rack-mount kit)

- Cover panels for uplink module and power supply slots (provided)

You can mount an EX4300 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 EX4300 Switch on Four Posts of a Rack or Cabinet*.

> **NOTE**: If you need to mount the switch in a recessed position on two posts of either a two-post rack or a four-post rack, you can use the 2-in.-recess front-mounting brackets provided in the separately orderable four-post rack-mount kit.

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

> **CAUTION**: If you are mounting multiple switches on a rack, mount a switch in the bottom of the rack first and proceed to mount the rest of the switches from bottom to top.

To mount the switch on two posts of a rack:

1. Place the switch on a flat, stable surface.
2. Align the mounting brackets along the front, rear, or center of the side panels of the switch chassis depending on how you want to mount the switch. For example, if you want to front-mount EX4300 switches except EX4300-48MP and EX4300-48MP-S switches, align the brackets along the front of the side panel (see Figure 143 on page 378). If you want to front-mount an EX4300-48MP or EX4300-48MP-S switch, align the brackets 17.5 mm offset from the front panel (see Figure 144 on page 378 and Figure 145 on page 379).

Figure 143: Attaching the Mounting Bracket to the Side Panel of EX4300 Switches Except EX4300-48MP and EX4300-48MP-S Switches
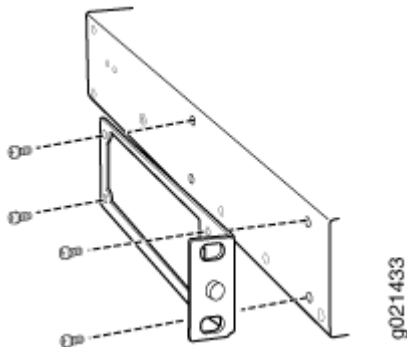
Figure 144: Attaching the Mounting Bracket to the Side Panel of EX4300-48MP and EX4300-48MP-S Switches
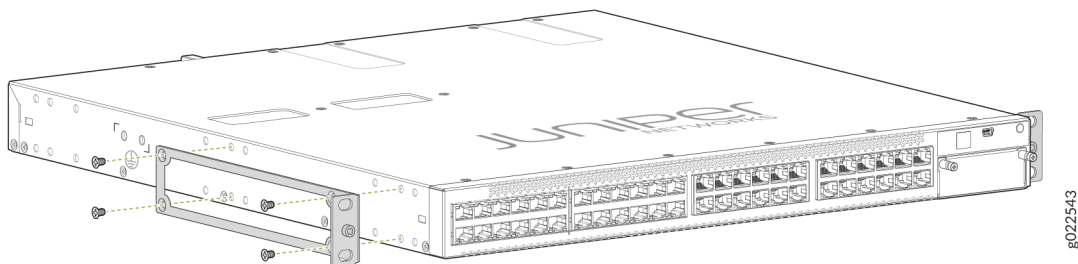
Figure 145: Mounting Bracket Attached to the Side Panel of EX4300-48MP and EX4300-48MP-S Switches
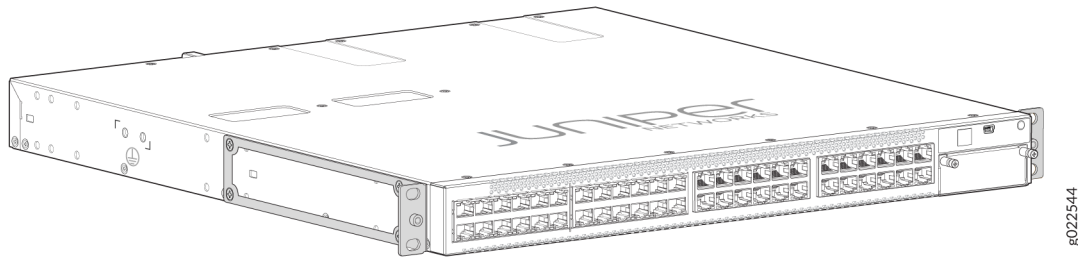
3. Align the bottom holes in the mounting brackets with the holes on the side panels of the switch chassis.

4. Insert mounting screws into the aligned holes. Tighten the screws by using the Phillips (+) screwdriver.

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 by using the Phillips (+) screwdriver.

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 146 on page 380.

Figure 146: Mounting the Switch on Two Posts of a Rack
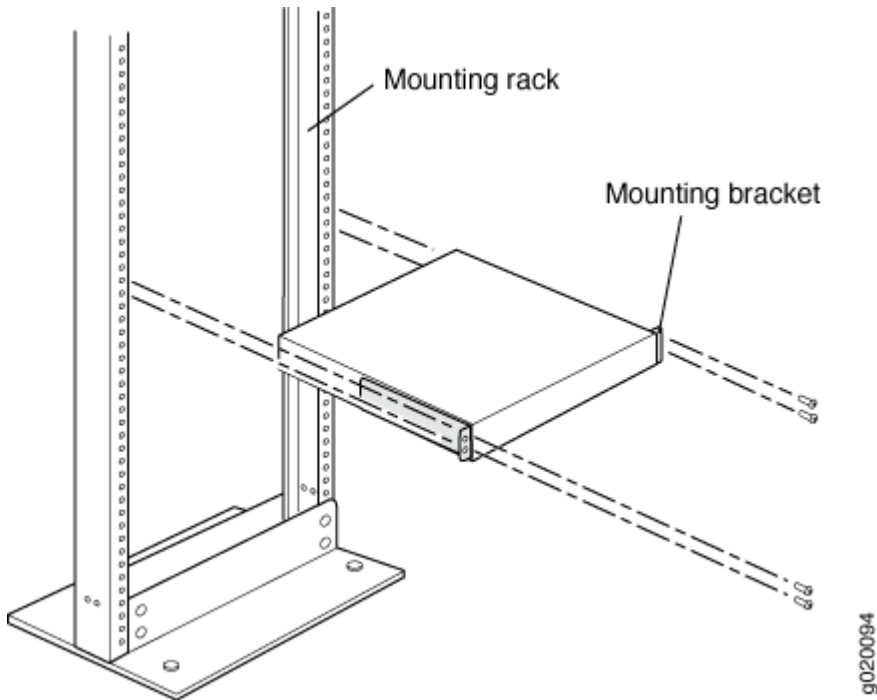
7. Have a second person secure the switch to the rack by using the appropriate screws. Tighten the screws.

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.

> **NOTE**: We recommend that you install cover panels in the unused uplink module and power supply slots.

RELATED DOCUMENTATION

Rack-Mounting and Cabinet-Mounting Warnings

Mounting an EX4300 Switch on Four Posts of a Rack or Cabinet

Before mounting the switch on four posts of a rack:

- Verify that the site meets the requirements described in *Site Preparation Checklist for EX4300 Switches*.

- 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*, with particular attention to *Chassis and Component Lifting Guidelines*.

- Remove the switch from the shipping carton (see *Unpacking an EX4300 Switch*).

Ensure that you have the following parts and tools available:

- Phillips (+) screwdriver, number 2 (not provided)

- 6 flat-head 4-40 Phillips mounting screws (provided with the four-post rack-mount kit)

- 12 flat-head 4x6-mm Phillips mounting screws (provided with the four-post rack-mount kit)

- One pair each of flush or 2-in.-recess front-mounting brackets (provided with the four-post rack-mount kit)

- One pair of side mounting-rails (provided with the four-post rack-mount kit)

- One pair of rear mounting-blades (provided with the four-post rack-mount kit)

- Screws to secure the chassis and the rear mounting-blades to the rack (not provided)

- Cover panels for uplink module and power supply slots (provided)

You can mount an EX4300 switch on four posts of a 19-in. rack or a 19-in. 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 of either a two-post rack or a four-post rack by using the mounting brackets provided with the switch. See *Mounting an EX4300 Switch on Two Posts of a Rack or Cabinet*.

> **NOTE**: If you need to mount the switch in a recessed position on either a two-post rack or a four-post rack, you can use the 2-in.-recess front-mounting brackets provided in the separately orderable four-post rack-mount kit.

> **NOTE**: To ensure that the protective earthing terminal is accessible through the opening in the rear mounting-blade:

- Ensure that the rack is 27.5 in. (70 cm) through 30.5 in. (77.5 cm) deep if you are mounting the switch flush with the rack front on four posts of a rack.

- Ensure that the rack is 29.5 in. (75 cm) through 32.5 in. (82.5 cm) deep if you will mount the switch 2 in. recessed from the rack front.

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

⚠ **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 of a rack:

1. Place the switch on a flat, stable surface.

   NOTE: The four-post rack-mount kit ships with the short front-mounting brackets attached to the side mounting-rails. If you want to recess the switch in the rack, you must unscrew the short front-mounting brackets from the side mounting-rails by using the Phillips (+) screwdriver and attach the long front-mounting brackets to the side mounting-rails.

2. Align the side mounting-rails along the side panels of the switch chassis. Align the two holes in the rear of the side mounting-rails with the two holes on the rear of the side panels.

3. Insert 4x6-mm Phillips flat-head mounting screws into the two aligned holes and tighten the screws by using the screwdriver. Ensure that the remaining four holes in the side mounting-rails are aligned with the four holes in the side panel. See .

Figure 147: Attaching the Side Mounting-Rail to the Switch Chassis
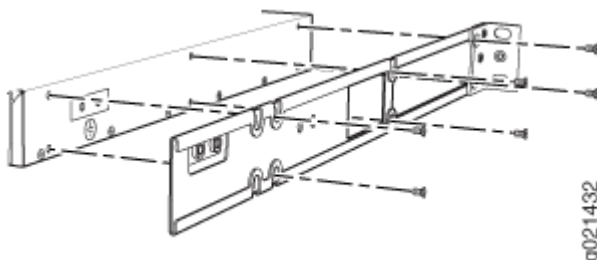
4. Insert the 4x6-mm Phillips flat-head mounting screws into the remaining four holes in the side mounting-rails and tighten the screws by using the screwdriver.

5. Have one person grasp both sides of the switch, lift the switch, and position it in the rack, aligning the side mounting-rail 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 148 on page 383.

Figure 148: Mounting the Switch on Front Posts of a Rack
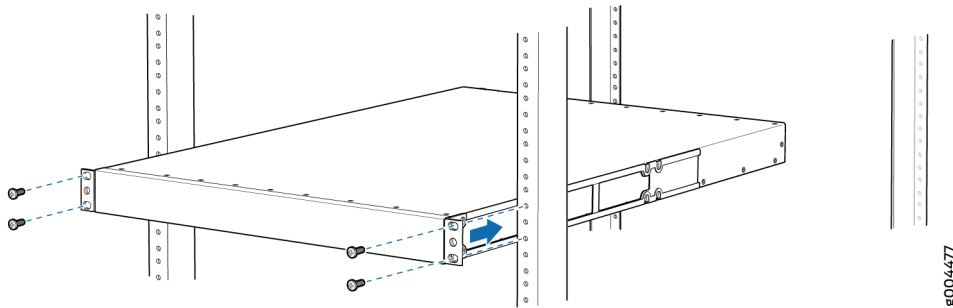
6. Have a second person secure the front of the switch to the rack by using the appropriate screws for your rack.

7. Slide the rear mounting-blades into the side mounting-rails. See Figure 149 on page 383.

Figure 149: Sliding the Rear Mounting-Blades into the Side Mounting-Rails
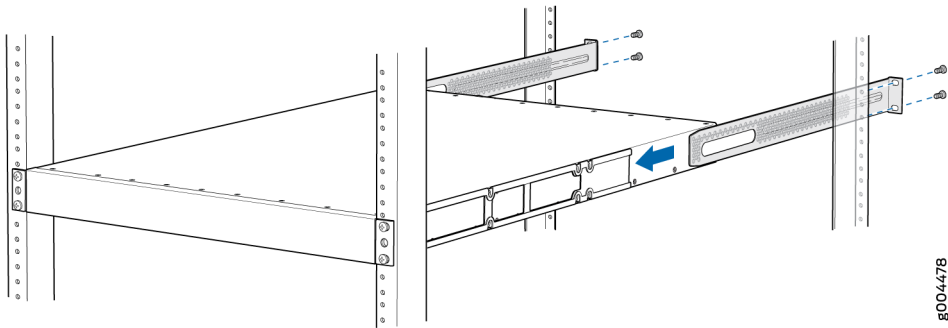
8. Attach the rear mounting-blades to the rear post by using the appropriate screws for your rack. Tighten the screws.

9. 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.

> **NOTE**: We recommend that you install cover panels in the unused uplink module and power supply slots.

Rack-Mounting and Cabinet-Mounting Warnings

Mounting an EX4300 Switch in a Recessed Position in a Rack or Cabinet

You can mount an EX4300 switch in a recessed position on two posts of either a two-post rack or a four-post rack such that the switch is recessed inside the rack from the rack front by 2 inches. To mount the switch in a recessed position, use the front-mounting brackets provided in the separately orderable four-post rack-mount kit.

Reasons to mount the switch in a recessed position include:

- You are mounting the switch in a cabinet and the cabinet doors do 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 two-posts or on four-posts, follow the instructions in *Mounting an EX4300 Switch on Two Posts of a Rack or Cabinet* or *Mounting an EX4300 Switch on Four Posts of a Rack or Cabinet*.

Connect Earth Ground to an EX Series Switch

Rack-Mounting and Cabinet-Mounting Warnings

Mounting an EX4300 Switch on a Wall

Before mounting the switch on a wall:

- Verify that the site meets the requirements described in *Site Preparation Checklist for EX4300 Switches*.

- Read *General Safety Guidelines and Warnings*, with particular attention to *Chassis and Component Lifting Guidelines*.

- Remove the switch from the shipping carton (see *Unpacking an EX4300 Switch*).

Ensure that you have the following parts and tools available:

- Phillips (+) screwdriver, number 2 (not provided)

- 2 wall-mount brackets (provided with the wall-mount kit)

- 12 wall-mount bracket screws (provided with the wall-mount kit)

- 4 mounting screws (8-32 x 1.25 in. or M4 x 30 mm) (not provided)

- Cover panels for uplink module and power supply slots (provided)

- Hollow wall anchors capable of supporting the combined weight of two fully loaded switches, up to 33 lb (15 kg) (not included)—if you are mounting the switch in sheetrock (wall board with a gypsum plaster core) or in wall board not backed by wall studs.

> ⚠ **WARNING**: When mounting EX4300 switches except EX4300-48MP and EX4300-48MP-S switches on a wall, orient the front panel of the chassis downward to ensure proper airflow and meet safety requirements in the event of a fire. When mounting EX4300-48MP and EX4300-48MP-S switches on a wall, orient the front panel of the chassis pointing to the right side or to the left side to ensure proper airflow and meet safety requirements in the event of a fire.

> **NOTE**: For easier lifting, install any additional power supplies only after you mount the switch on the wall.

You can mount an EX4300 switch on a wall by using the separately orderable wall-mount kit.

To mount the switch on a wall:

1. Attach the wall-mount brackets to the sides of the chassis by using four of the wall-mount bracket screws on each side (see the representation in). Use the screwdriver to tighten the screws.

Figure 150: Attaching Wall-Mount Brackets to the Switch Chassis
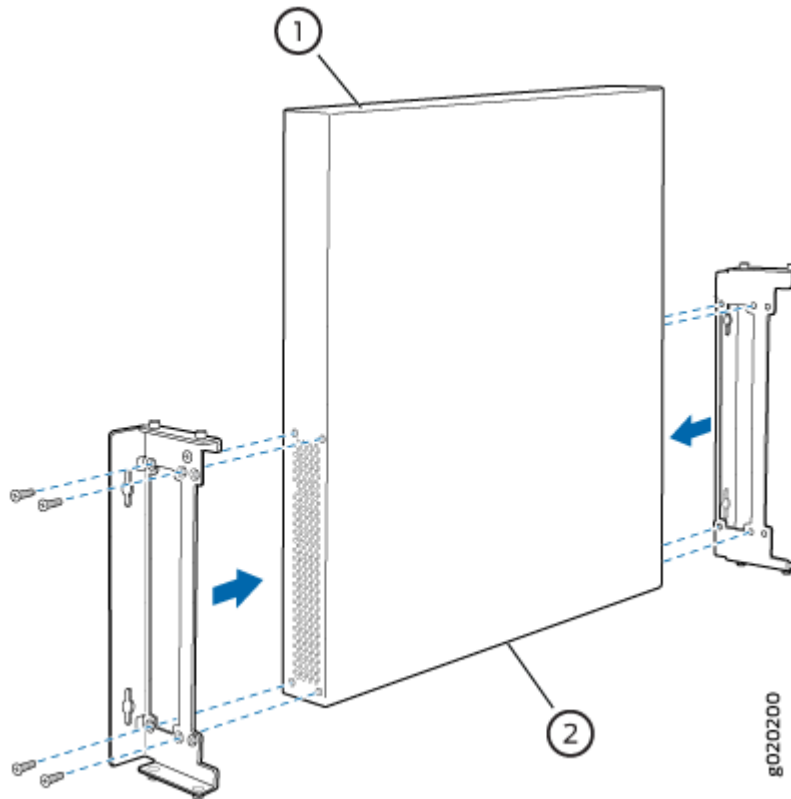
2. If you are mounting two switches together, line the second switch on top of the first and attach it to the mounting brackets by using two wall-mount bracket screws on each side (see the representation in Figure 151 on page 387).

3. Insert the mounting screws in the wall. If you are mounting EX4300 switches except EX4300-48MP and EX4300-48MP-S switches, insert the top pair of mounting screws 474.35 mm apart, and insert the second pair of mounting screws 151.81 mm directly below the first set. If you are mounting EX4300-48MP and EX4300-48MP-S switches, insert the top pair of mounting screws 474.2 mm apart, and insert the second pair of mounting screws 152 mm directly below the first set (see Figure 152 on page 388 and Figure 153 on page 389).

   If the mounting screws are inserted in a wall board with no stud behind it, you must use dry wall anchors rated to support 75 lb (34 kg). Insert the screws into wall studs wherever possible to provide added support for the chassis.

   Drive the screws only part way in, leaving about 1/4 in. (6 mm) distance between the head of the screw and the wall. Use the screwdriver to drive the screws in.

4. Grasp each side of the switch or switches, lift the switch or switches, and hang the brackets from the mounting screws (see the representation in Figure 151 on page 387).

Figure 151: Mounting the Switch on a Wall
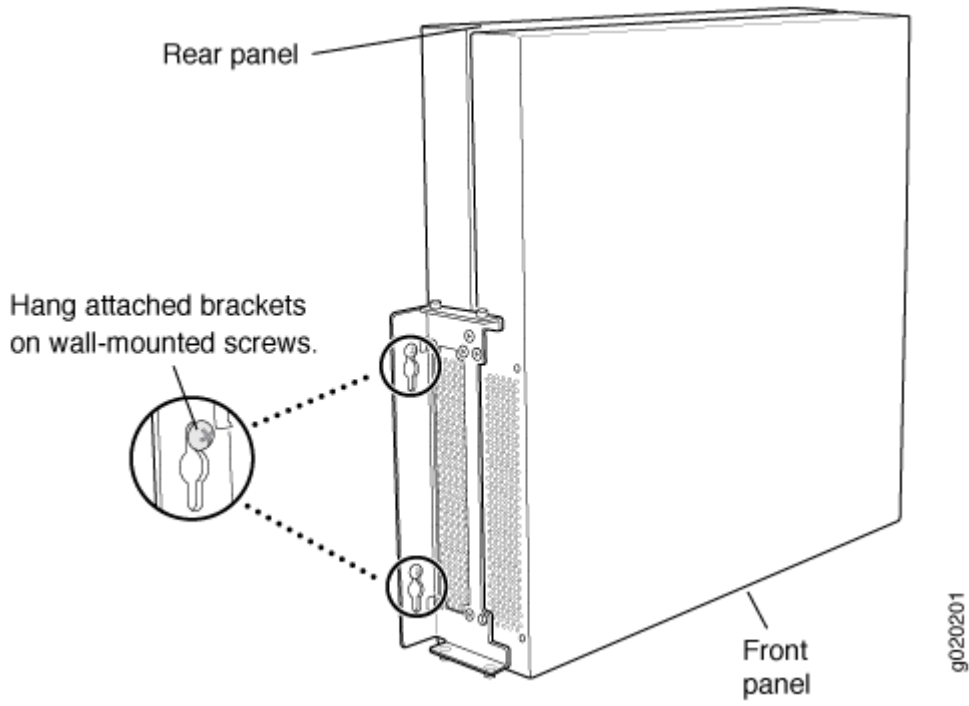
Figure 152: Measurements for Mounting EX4300-48MP and EX4300-48MP-S Switches on a Wall with the Front Panel Pointing to the Right Side
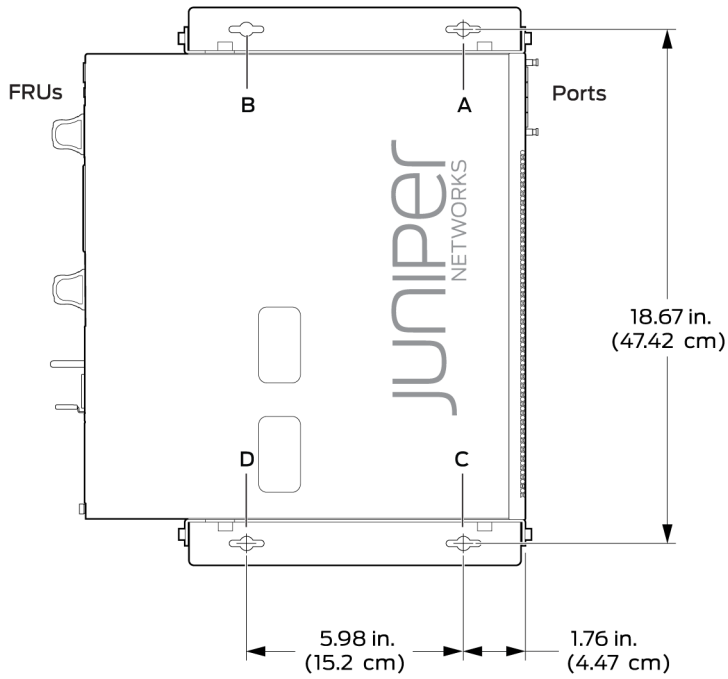
Figure 153: Mounting EX4300-48MP and EX4300-48MP-S Switches on a Wall with the Front Panel Pointing to the Left Side
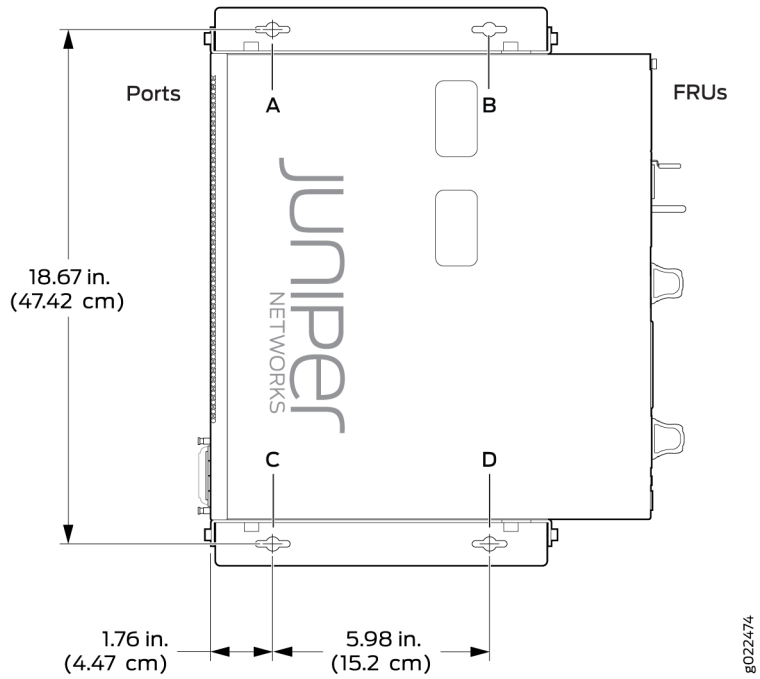
5. Tighten the mounting screws by using the screwdriver.

RELATED DOCUMENTATION

Wall-Mounting Warning for EX4300 Switches

CHAPTER 27

Performing the Initial Configuration

IN THIS CHAPTER

Autoprovisioning a Virtual Chassis Fabric

Autoprovisioning a Virtual Chassis Fabric (VCF) enables you to "plug and play" devices into your VCF after minimal initial configuration. See *Understanding Virtual Chassis Fabric Components* and "Understanding Virtual Chassis Fabric Configuration" on page 5 for details on the supported devices that can be interconnected into a non-mixed or mixed VCF.

Before you begin:

- Update all devices to the same version of Junos OS that supports VCF. See *Installing Software Packages on QFX Series Devices* or *Installing Software on an EX Series Switch with a Virtual Chassis or Single Routing Engine (CLI Procedure)*.

> ⚠️ **CAUTION**: QFX5100 switches running a Junos OS image that includes "-qfx-5-" in the software package filename *must* be upgraded to a package filename that includes "-qfx-5e-" before being added to a QFX5110 Virtual Chassis. See *Upgrading a QFX5100 Switch with a USB Device to Join a QFX5110 Virtual Chassis or Virtual Chassis Fabric*.

To configure a VCF using autoprovisioning:

1. Make a list of the serial numbers of all the spine devices in the VCF. You can configure up to four spine devices in a VCF. You can get the device's serial number in the `show virtual-chassis` output or by following the instructions in *Locating the Serial Number on a QFX5100 Device or Component* for a QFX5100 VCF, or *Locating the Serial Number on a QFX5110 Device or Component* for a QFX5110 VCF.

2. Set each device individually into fabric mode. If needed, also set the devices into mixed mode for a mixed VCF, and at the same time, request the device to reboot as part of the procedure to complete this step.

> **TIP**: This step must be done at least for the spine devices being assigned the Routing Engine role in the VCF, but for the most predictable results, we strongly recommend you also manually set fabric mode and mixed modes for all devices (with the device reboot option) before cabling them into the VCF.

If you are configuring a non-mixed VCF:

```
user@device> request virtual-chassis mode fabric local reboot
```

If you are configuring a mixed mode VCF:

```
user@device> request virtual-chassis mode fabric mixed local reboot
```

> **NOTE**: A spine device whose fabric and mixed mode settings are improperly set will not properly join a mixed VCF. You can check the mode settings by using the `show virtual-chassis mode` command.
>
> We recommend that you set the fabric and mixed mode settings before you interconnect your spine devices into the VCF to avoid the following issues:
>
> - Incurring downtime during VCF formation as the devices reboot to commit the fabric or mixed mode settings.
>
> - Manually correcting potential issues related to VCF formation because a device did not immediately join the VCF.
>
> You can, however, use the `request virtual-chassis mode fabric local` or `request virtual-chassis mode mixed local` commands to set a spine device into fabric or mixed mode after interconnecting your VCF.
>
> The fabric and mixed mode settings are automatically updated for a leaf device when it is interconnected into an autoprovisioned or preprovisioned VCF if the device is zeroized or has the factory default configuration. If the fabric or mixed mode settings are automatically changed when a leaf device is interconnected into a VCF, the leaf device automatically reboots in order to properly join the VCF. To avoid this potentially unexpected reboot and

> impact on VCF operation, as mentioned earlier, for best results, set the fabric and mixed modes and manually reboot each leaf device before cabling it into the VCF.

3. After the reboot completes, log in to one of the spine devices in your VCF.

4. Set the configuration mode to autoprovisioned:

```
[edit]
user@device# set virtual-chassis auto-provisioned
```

5. Configure at least two spine devices into the Routing Engine role:

```
[edit virtual-chassis]
user@device# set member member-id serial-number serial-number role routing-engine
```

For instance, to configure two spine devices with the serial numbers "SERIALNUMB00" and "SERIALNUMB01" into the Routing Engine role as members 0 and 1:

```
[edit virtual-chassis]
user@device# set member 0 serial-number SERIALNUMB00 role routing-engine
user@device# set member 1 serial-number SERIALNUMB01 role routing-engine
```

Keep in mind that any member devices you configure into the Routing Engine role participate in the primary-role election process (see *Primary Routing Engine Election Process*). The VCF will elect one primary and one backup member from the devices configured into this role. Member devices that are not in Routing Engine role are not eligible for primary-role election. Those members automatically operate in linecard role, whether or not you explicitly configured them into linecard role. Members configured into Routing Engine role that were not elected as primary or backup also automatically operate in linecard role.

You usually want spine devices acting as the primary and backup members. If you don't have enough spine devices to do that, you can configure one or two leaf devices into the Routing Engine role to ensure the VCF can reassign the primary and backup members if a spine device Routing Engine member fails.

6. (Recommended) Configure a virtual management Ethernet (VME) interface for management of the VCF configuration:

```
[edit]
user@device# set interfaces vme unit 0 family inet address /ip-address/mask/
```

> **NOTE**: A VME accesses the device in the primary Routing Engine role using a management port. You should cable one of the management ports, em0 or em1, on each spine device in your VCF so that the VME is available regardless of which spine device assumes the primary Routing Engine role. See *Connecting a QFX Series Device to a Management Console*

7. Commit the configuration:

```
user@device# commit
```

8. Cable your VCF.

   After you commit your autoprovisioned VCF configuration, you can cable any additional supported leaf devices (in zeroized or factory default configuration) into the VCF using supported VCPs. The autoprovisioning process automatically configures the VCPs, and if needed, automatically sets mixed mode and fabric mode and reboots the device for those changes to take effect. The devices participate in the VCF with no further user intervention.

   > **NOTE**: Automatic VCP conversion only works when the interfaces on both ends of the link are *not* already configured as VCPs.
   >
   > When adding a QFX4300 leaf device to a QFX5100 VCF, the 40-Gbps QSFP+ interfaces on EX4300 switches are configured as VCPs, by default. You must, therefore, delete the VCP configuration on the 40-Gbps QSFP+ interface using the `request virtual-chassis vc-port delete` command before interconnecting it into the VCF. Then the automatic VCP conversion process is invoked and converts the link into a VCP.

   A device joins the VCF immediately without a reboot if you do not need to change the fabric mode or mixed mode settings.

9. Install the VCF feature licenses.

   For a VCF deployment, we recommend having two license keys for redundancy—one for the device in the primary Routing Engine role and the other for the device in the backup Routing Engine role.

   To purchase a feature license for VCF, contact your Juniper Networks sales representative (https://www.juniper.net/us/en/contact-us/sales-offices). The Juniper sales representative will provide you with the feature license files and license keys. You will be asked to supply the chassis serial number of your switch; you can obtain the serial number by running the `show virtual-chassis` command.

   After obtaining the licenses, follow the instructions in Generating License Keys.

10. (Optional) The VCF forwards broadcast, unknown unicast, and multicast (BUM) traffic among the members of the VCF using multicast distribution trees (MDTs). By default, the VCF creates MDTs for every member of the VCF with that member as the root node of an MDT. If this default MDT

creation method is not optimal for your installation, you can control which members become MDT root nodes.

The `set virtual-chassis member` *member-id* `fabric-tree-root` configuration statement preempts the default method of creating MDTs, and specifies whether or not a member in a VCF can be an MDT root node. If this statement is configured for one or more members, MDTs are created only with the specified members as root nodes. See *Understanding Traffic Flow Through a Virtual Chassis Fabric* and *fabric-tree-root* for more details on why you might want to choose this MDT creation method instead of the default method. Note that if you decide to use this option, we recommend that you specify all the spine members (and only spine members) as MDT root nodes. In an autoprovisioned VCF, this option should be configured for all spine devices (independent of the member's role) after the VCF is running and any additional spine device member IDs have been automatically assigned.

If desired, configure the spine devices in the VCF to be fabric MDT root nodes. For example, if you have four spine members in your VCF, where you configured the first two spine devices to be members 0 and 1, and during autoprovisioning, the two additional spine members were automatically assigned to be members 4 and 5:

```
[edit virtual-chassis]
user@device# set member 0 fabric-tree-root
user@device# set member 1 fabric-tree-root
user@device# set member 4 fabric-tree-root
user@device# set member 5 fabric-tree-root
```

NOTE: This option can also be configured anytime later during VCF operation if you observe internal VCF multicast traffic flow issues with default MDTs.

RELATED DOCUMENTATION

Preprovisioning a Virtual Chassis Fabric

Preprovisioning a Virtual Chassis Fabric (VCF) configuration allows you to assign the member ID and role for each device in the VCF. See *Understanding Virtual Chassis Fabric Components* and "Understanding Virtual Chassis Fabric Configuration" on page 5 for details on the supported devices that can be interconnected into a non-mixed or mixed VCF.

Before you begin:

- Update all devices to the same version of Junos OS that supports VCF. See *Installing Software Packages on QFX Series Devices* or *Installing Software on an EX Series Switch with a Virtual Chassis or Single Routing Engine (CLI Procedure)*.

> ⚠ **CAUTION**: QFX5100 switches running a Junos OS image that includes "-qfx-5-" in the software package filename *must* be upgraded to a package filename that includes "-qfx-5e-" before being added to a QFX5110 Virtual Chassis or VCF. See *Upgrading a QFX5100 Switch with a USB Device to Join a QFX5110 Virtual Chassis or Virtual Chassis Fabric*.

- If automatic software download is enabled, disable this feature by entering the **delete chassis auto-image-upgrade** statement.

To preprovision a VCF:

1. Make a list of the serial numbers of all the devices to be connected in the VCF. You can get a device's serial number in the `show virtual-chassis` output or by following the instructions in *Locating the Serial Number on a QFX5110 Device or Component*, *Locating the Serial Number on a QFX5100 Device or Component*, *Locating the Serial Number on a QFX3600 or QFX3600-I Device or Component*, *Locating the Serial Number on a QFX3500 Device or Component*, or *Locating the Serial Number on an EX4300 Switch or Component*.

   > **NOTE**: Serial number values are case-sensitive.

2. Decide the desired role (`routing-engine` or `line-card`) for each device.

   In a VCF, you configure two supported devices acting in the Routing Engine role into spine devices. All other devices—the spine devices not assuming the primary or backup Routing Engine role and all leaf devices—are configured into the linecard role as leaf devices.

3. Set each device individually into fabric mode. If needed, also set the devices into mixed mode for a mixed VCF, and at the same time, request the device to reboot as part of the procedure to complete this step.

If you are configuring a non-mixed VCF:

```
user@device> request virtual-chassis mode fabric local reboot
```

If you are configuring a mixed VCF:

```
user@device> request virtual-chassis mode fabric mixed local reboot
```

> **NOTE**: A device whose fabric and mixed mode settings are improperly set will not properly join a mixed VCF. You can check the mode settings using the `show virtual-chassis mode` command.
>
> We recommend that you set the fabric and mixed mode before you interconnect your devices into a VCF to avoid the following issues:
>
> - Incurring downtime during VCF formation as the devices reboot to commit the fabric or mixed mode settings.
>
> - Manually correcting potential issues related to VCF formation because the device did not immediately join the VCF.
>
> You can, however, use the `request virtual-chassis mode fabric local` or `request virtual-chassis mode mixed local` commands to set a device into fabric or mixed mode after interconnecting your VCF.
>
> The fabric and mixed mode settings are automatically updated for a leaf device when it is interconnected into an autoprovisioned or preprovisioned VCF if the device is zeroized or has the factory default configuration. If the fabric or mixed mode settings are automatically changed when a leaf device is interconnected into a VCF, the leaf device automatically reboots in order to properly join the VCF. To avoid this potentially unexpected reboot and impact on VCF operation, as mentioned earlier, for best results, set the fabric and mixed modes and manually reboot each leaf device before cabling it into the VCF.

4. After the reboot completes, log in to one of your spine devices that will be configured into the Routing Engine role.

5. Specify the preprovisioned configuration mode:

```
[edit virtual-chassis]
user@device# set preprovisioned
```

6. Associate a member ID with a serial number for each device in your VCF, and configure the role for each device:

```
[edit virtual-chassis]
user@device# set member member-id serial-number serial-number role (line-card | routing-engine)
```

Configure two supported spine devices into the Routing Engine role, and the additional spine devices into the linecard role if your VCF supports three or more spine devices.

Configure your leaf devices into the linecard role.

For instance, if you wanted to preprovision a VCF with twenty member devices that uses member 0 and 1 in the Routing Engine role, members 2 and 3 as spine devices in the line card role, and the remaining devices as leaf devices:

```
[edit virtual-chassis]
user@device# set member 0 serial-number SERIALNUMB00 role routing-engine
user@device# set member 1 serial-number SERIALNUMB01 role routing-engine
user@device# set member 2 serial-number SERIALNUMB02 role line-card
user@device# set member 3 serial-number SERIALNUMB03 role line-card
user@device# set member 4 serial-number SERIALNUMB04 role line-card
user@device# set member 5 serial-number SERIALNUMB05 role line-card
user@device# set member 6 serial-number SERIALNUMB06 role line-card
user@device# set member 7 serial-number SERIALNUMB07 role line-card
user@device# set member 8 serial-number SERIALNUMB08 role line-card
user@device# set member 9 serial-number SERIALNUMB09 role line-card
user@device# set member 10 serial-number SERIALNUMB10 role line-card
user@device# set member 11 serial-number SERIALNUMB11 role line-card
user@device# set member 12 serial-number SERIALNUMB12 role line-card
user@device# set member 13 serial-number SERIALNUMB13 role line-card
user@device# set member 14 serial-number SERIALNUMB14 role line-card
user@device# set member 15 serial-number SERIALNUMB15 role line-card
user@device# set member 16 serial-number SERIALNUMB16 role line-card
user@device# set member 17 serial-number SERIALNUMB17 role line-card
user@device# set member 18 serial-number SERIALNUMB18 role line-card
user@device# set member 19 serial-number SERIALNUMB19 role line-card
```

7. (Recommended) Configure a virtual management Ethernet (VME) interface for management of the VCF configuration:

```
[edit]
user@device# set interfaces vme unit 0 family inet address /ip-address/mask/
```

> **NOTE**: A VME accesses the device in the primary Routing Engine role using a management port, so cable management port em0 or em1 on each spine device in your VCF so the VME is available regardless of which spine device assumes the primary Routing Engine role. See *Connecting a QFX Series Device to a Management Console*.

8. (Optional) The VCF forwards broadcast, unknown unicast, and multicast (BUM) traffic among the members of the VCF using multicast distribution trees (MDTs). By default, the VCF creates MDTs for every member of the VCF with that member as the root node of an MDT. If this default MDT creation method is not optimal for your installation, you can control which members become MDT root nodes.

The `set virtual-chassis member` *member-id* `fabric-tree-root` configuration statement preempts the default method of creating MDTs, and specifies whether a member in a VCF can be an MDT root node. If this statement is configured for one or more members, MDTs are created only with the specified members as root nodes. See *Understanding Traffic Flow Through a Virtual Chassis Fabric* and *fabric-tree-root* for more on why you might want to choose this MDT creation method instead of the default method. Note that if you decide to use this option, we recommend that you specify all the spine members (and only spine members) as MDT root nodes.

If desired, configure the spine devices in the VCF to be fabric MDT root nodes. For example, if you are preprovisioning a VCF with members 0 through 3 as spine devices (independent of the role):

```
[edit virtual-chassis]
user@device# set member 0 fabric-tree-root
user@device# set member 1 fabric-tree-root
user@device# set member 2 fabric-tree-root
user@device# set member 3 fabric-tree-root
```

> **NOTE**: This option can also be configured anytime later during VCF operation if you observe internal VCF multicast traffic flow issues with default MDTs.

9. Commit the configuration:

```
user@device# commit
```

10. (EX4300 switches in a mixed QFX5100 VCF using 40-Gbps QSFP+ interfaces as VCPs only)
Perform one of the following tasks to convert the 40-Gbps QSFP+ interfaces into VCPs:

> **NOTE**: Automatic VCP conversion only works when the interfaces on both ends of a link are *not* already configured as VCPs.
>
> This step is needed on EX4300 switches using 40-Gbps QSFP+ interfaces as VCPs because the 40-Gbps QSFP+ interfaces on EX4300 switches are configured as VCPs by default.
>
> If you are cabling the EX4300 switch to the spine switch with a DAC cable in the 40-Gbps QSFP+ interface, you must use the `request virtual-chassis vc-port set` command to manually convert the 40-Gbps QSFP+ interface on the spine device into a VCP, as described in the second bullet below.

- Delete the VCP configuration on the 40-Gbps QSFP+ interface using the `request virtual-chassis vc-port delete` command.

  For instance, to delete the VCP configuration on all four QSFP+ interfaces on an EX4300-48T switch:

  ```
  user@leaf-device# request virtual-chassis vc-port delete pic-slot 1 port 0
  user@leaf-device# request virtual-chassis vc-port delete pic-slot 1 port 1
  user@leaf-device# request virtual-chassis vc-port delete pic-slot 1 port 2
  user@leaf-device# request virtual-chassis vc-port delete pic-slot 1 port 3
  ```

- Manually configure the 40-Gbps QSFP+ interface on the spine device into a VCP using the `request virtual-chassis vc-port set`. For instance:

  ```
  user@spine-device# request virtual-chassis vc-port set pic-slot 1 port 0
  user@spine-device# request virtual-chassis vc-port set pic-slot 1 port 1
  user@spine-device# request virtual-chassis vc-port set pic-slot 1 port 2
  user@spine-device# request virtual-chassis vc-port set pic-slot 1 port 3
  ```

11. Interconnect the spine device that you configured in the previous steps to all leaf devices by using supported interfaces that can be VCPs.

> **NOTE**: In autoprovisioned or preprovisioned VCFs, the automatic VCP conversion feature is enabled and automatically configures SFP+ and QSFP+ interfaces into VCPs. You do not need to manually configure VCPs.
>
> If you want to configure an SFP+ or QSFP+ interface into a network interface, disable LLDP on that interface.

12. Interconnect all other spine devices to all other leaf devices using supported VCP interfaces.

13. Install the VCF feature licenses.

    For a VCF deployment, two license keys are recommended for redundancy—one for the device in the primary Routing Engine role and the other for the device in the backup Routing Engine role.

    To purchase a feature license for VCF, contact your Juniper Networks sales representative (https://www.juniper.net/us/en/contact-us/sales-offices). The Juniper sales representative will provide you with the feature license files and license keys. You will be asked to supply the chassis serial number of your switch; you can obtain the serial number by running the `show virtual-chassis` command.

    After obtaining the licenses, follow the instructions in Generating License Keys.

RELATED DOCUMENTATION

Configuring a Nonprovisioned Virtual Chassis Fabric

> ⚠️ **CAUTION**: Configure your Virtual Chassis Fabric (VCF) using autoprovisioning or preprovisioning unless you have a compelling reason to use nonprovisioned configuration. You can configure all aspects of a VCF using autoprovisioned or preprovisioned configuration. The process for autoprovisioning your VCF is described in "Autoprovisioning a Virtual Chassis Fabric" on page 390 and the process for

preprovisioning your VCF is described in "Preprovisioning a Virtual Chassis Fabric" on page 395.

Nonprovisioned VCF configuration is highly discouraged. Nonprovisioned VCF configuration should only be used by VCF experts in specialized scenarios.

A nonprovisioned VCF is the configuration mode used when a VCF has not been configured into autoprovisioned or preprovisioned mode.

In a nonprovisioned VCF, you configure the device roles by setting the primary-role priority value of each device. If no primary-role priority values are set, a algorithm process runs and selects the role for each device.

You must manually configure all Virtual Chassis ports (VCPs) in a nonprovisioned VCF. The automatic VCP conversion feature, which automatically configures supported 10-Gbps SFP+ links and 40-Gbps QSFP+ links into VCPs on autoprovisioned and preprovisioned VCFs, is not supported on nonprovisioned VCFs.

Update all devices to the same version of Junos OS that supports VCF. See *Installing Software Packages on QFX Series Devices* or *Installing Software on an EX Series Switch with a Virtual Chassis or Single Routing Engine (CLI Procedure)*.

> **CAUTION**: QFX5100 switches running a Junos OS image that includes "-qfx-5-" in the software package filename *must* be upgraded to a package filename that includes "-qfx-5e-" before being added to a QFX5110 Virtual Chassis. See *Upgrading a QFX5100 Switch with a USB Device to Join a QFX5110 Virtual Chassis or Virtual Chassis Fabric*.

To configure a nonprovisioned VCF:

1. Power on the devices.
2. Configure each individual device into fabric mode. If needed for a mixed VCF, configure the devices into mixed mode.

   Reboot each device to complete this configuration step.

   If you are configuring a non-mixed VCF:

   ```
   user@device> request virtual-chassis mode fabric local reboot
   ```

   If you are configuring a mixed mode VCF:

   ```
   user@device> request virtual-chassis mode fabric mixed local reboot
   ```

> **NOTE**: A device whose fabric or mixed mode setting is improperly set cannot join a mixed VCF. You can check the mode settings using the `show virtual-chassis mode` command.
>
> We recommend setting the fabric and mixed mode settings before interconnecting your devices into a VCF to avoid the following issues:
>
> - Incurring downtime as the devices reboot to commit the mixed mode or fabric settings.
>
> - Manually correcting potential issues related to VCF formation because the device did not immediately join the VCF.
>
> We strongly recommend configuring the mixed and fabric settings before you interconnect a device into a VCF. You can, however, use the `request virtual-chassis mode fabric local` or `request virtual-chassis mode mixed local` commands to set a device into fabric or mixed mode after you have interconnected your VCF.

3. After the device reboots are complete, cable your spine devices to your leaf devices using supported interfaces that can be used as VCPs.

4. (Recommended) Configure a virtual management Ethernet (VME) interface for management of the VCF configuration:

```
[edit]
user@device# set interfaces vme unit 0 family inet address /ip-address/mask/
```

> **NOTE**: A VME accesses the device in the primary Routing Engine role using a management port, so cable management port em0 or em1 on each spine device in your VCF so the VME is available regardless of which spine device assumes the primary Routing Engine role. See *Connecting a QFX Series Device to a Management Console*

5. Configure the desired interfaces into Virtual Chassis ports (VCPs):

```
user@device> request virtual-chassis vc-port set pic-slot pic-slot-number port port-number
user@device> request virtual-chassis vc-port set pic-slot pic-slot-number port port-number
```

The `show virtual-chassis vc-port` must be issued on the ports at both ends of the link in order for that link to be configured into a VCP link.

6. Enter the `show virtual-chassis` command to confirm that the VCPs are operational and to learn the member ID of each member device in your VCF.

If you want to change the member ID that has been assigned to a member device, use the `request virtual-chassis renumber` command.

7. (Optional) Configure the primary-role priority for each member device:

```
[edit virtual-chassis]
user@device# set member member-id mastership-priority number
```

In a nonprovisioned VCF, member roles are determined by a primary-role election algorithm. The first value checked by the primary-role election algorithm is the primary-role priority value. The two devices with the highest primary-role priority values assume the primary and backup Routing Engine role, which must be supported spine devices in a VCF. All other devices assume the linecard role.

In a QFX5100 VCF, QFX5100 switches assume the Routing Engine role, regardless of primary-role priority settings. QFX5100 switches can also assume the linecard role. QFX3600, QFX3500, and EX4300 switches always assume the linecard role in a mixed QFX5100 VCF, regardless of the primary-role priority settings.

In a QFX5110 VCF, spine devices must be QFX5110-32Q switches, and can also assume the linecard role as spine or leaf devices. In a QFX5110 VCF with QFX5100 switches, any QFX5100 members and other QFX5110 members must be leaf devices and assume the linecard role.

> **NOTE**: A spine device that isn't selected as primary or backup Routing Engine assumes the linecard role. The spine devices should still be configured with a higher primary-role priority value than the leaf devices to assure a spine device assumes the Routing Engine role when the primary or backup Routing Engine fails.

If two or more devices have the same primary-role priority value and are candidates for the Routing Engine role, the primary-role election algorithm uses other parameters to determines which device is elected into the Routing Engine role. See *Understanding How the Primary in a Virtual Chassis Is Elected*.

A device with a primary-role priority of 0 never assumes the primary or backup Routing Engine role.

For instance, to configure the primary-role priority for member devices 0 through 19 in your VCF.

```
[edit virtual-chassis]
user@device# set member 0 mastership-priority 255
user@device# set member 1 mastership-priority 255
user@device# set member 2 mastership-priority 100
user@device# set member 3 mastership-priority 100
user@device# set member 4 mastership-priority 95
user@device# set member 5 mastership-priority 95
user@device# set member 6 mastership-priority 95
user@device# set member 7 mastership-priority 95
```

```
user@device# set member 8 mastership-priority 95
user@device# set member 9 mastership-priority 95
user@device# set member 10 mastership-priority 95
user@device# set member 11 mastership-priority 95
user@device# set member 12 mastership-priority 95
user@device# set member 13 mastership-priority 95
user@device# set member 14 mastership-priority 95
user@device# set member 15 mastership-priority 95
user@device# set member 16 mastership-priority 95
user@device# set member 17 mastership-priority 95
user@device# set member 18 mastership-priority 95
user@device# set member 19 mastership-priority 95
```

8. Install the VCF feature licenses.

   For a VCF deployment, two license keys are recommended for redundancy—one for the device in the primary Routing Engine role and the other for the device in the backup Routing Engine role.

   To purchase a feature license for VCF, contact your Juniper Networks sales representative (https://www.juniper.net/us/en/contact-us/sales-offices). The Juniper sales representative will provide you with the feature license files and license keys. You will be asked to supply the chassis serial number of your switch; you can obtain the serial number by running the `show virtual-chassis` command.

   After obtaining the licenses, follow the instructions in Generating License Keys.

RELATED DOCUMENTATION

Understanding Virtual Chassis Fabric Components

CHAPTER 28

Cabling a Virtual Chassis Fabric

Connecting QFX5110 in a QFX5110 Virtual Chassis Fabric

A Juniper Networks QFX5110 Virtual Chassis Fabric (VCF) is constructed using a spine-and-leaf architecture and topology. In the spine-and-leaf architecture, each spine device is interconnected to each leaf device. QFX5110 VCFs support a maximum of 20 members in a VCF. Use QFX5110-32Q as either the spine or as a leaf device. Use QFX5110-48S, QFX5100-24Q, QFX5100-48S, QFX5100-48T, or QFX5100-96S models only as leaf devices.

Figure 154 on page 406 shows cabling for a QFX5110 VCF with two QFX5110-32Q spine devices connected to four QFX5110-48S as leaf devices, all using all QSFP28 ports as VCPs.Figure 155 on page 407 shows the cabling for a QFX5110 VCF using QFX5110-32Q as spines and QFX5100-24Q leaf devices.

Figure 154: All QFX5110 VCF
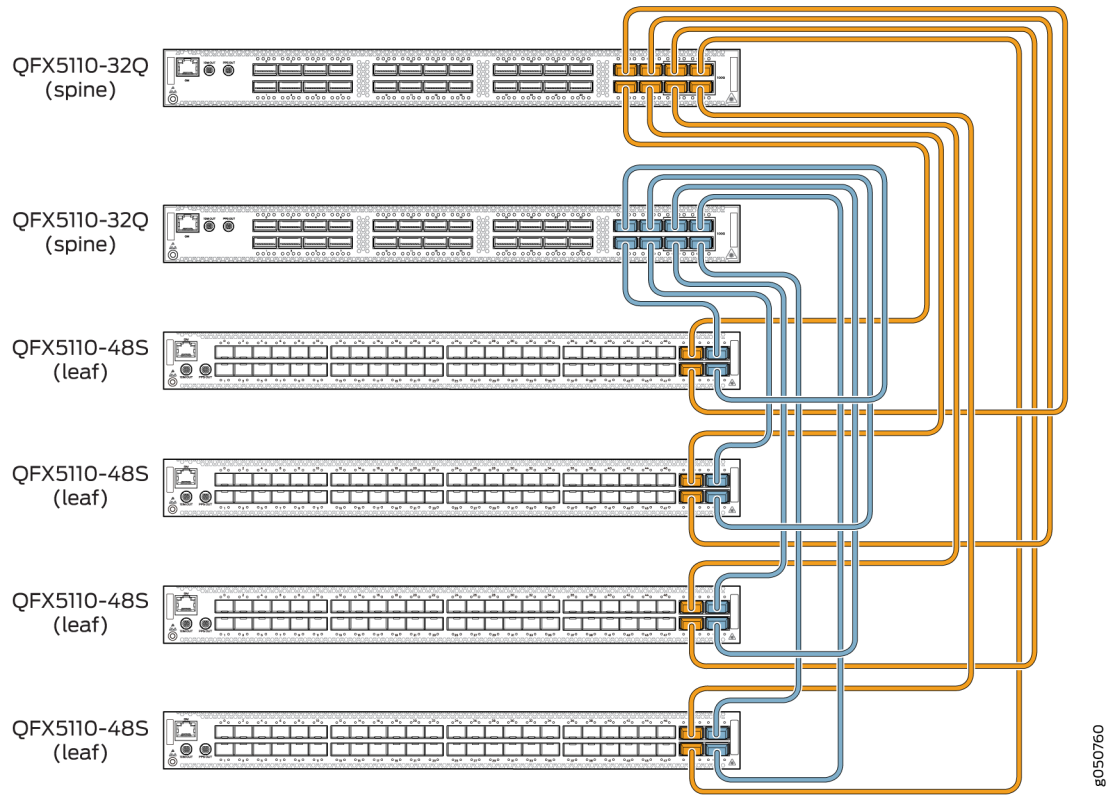
Figure 155: QFX5110 VCF with QFX5100-24Q Leaf Devices

RELATED DOCUMENTATION

Virtual Chassis Fabric Hardware Overview

Plan a Virtual Chassis Fabric Deployment

Connecting a QFX5100 Device in a Virtual Chassis Fabric

The role of a QFX5100 device in a VCF is dependant on the other switch models used in the VCF configuration. To understand the different hardware configurations supported, see *Virtual Chassis Fabric Hardware Overview*.

You can install a VCF in a single rack, multiple racks, or in wire closets. You construct a QFX5100 VCF by cabling and then configuring SFP+ or QSFP+ interfaces into Virtual Chassis ports (VCPs). All non-channelized QSFP+ uplink interfaces on QFX5100 switches can be configured into VCPs. All fixed SFP+ interfaces on QFX5100-96S switches can also be configured into VCPs.

> **BEST PRACTICE**: Use 40-Gigabit QSFP+ ports as VCPs.

Figure 156 on page 408 shows QFX5100 devices in the leaf role in a QFX5110 VCF, while Figure 157 on page 409 shows QFX5100-24Q in the spine role in a QFX5100 VCF. The cabling in these examples all used QSFP+ ports as VCPs.

Figure 156: QFX5100-24Q as a Leaf Device in a QFX5110 VCF
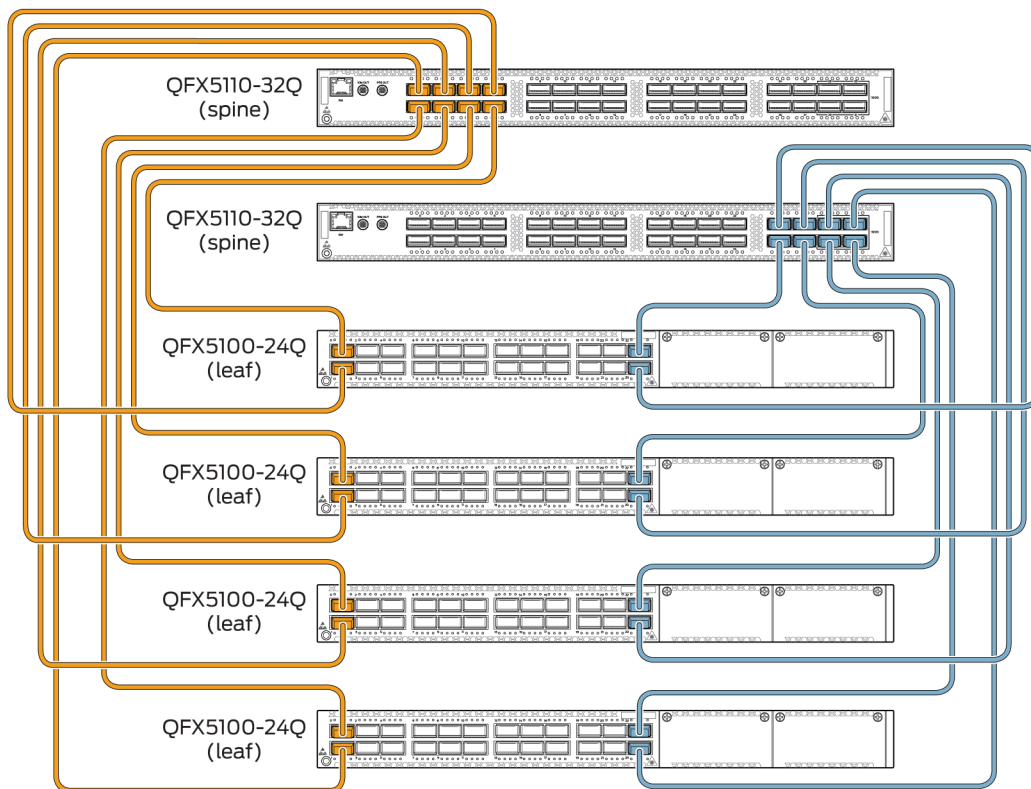
Figure 157: QFX5100-24Q as Spine and QFX5100-48S as Leaf Devices in a QFX5100 VCF
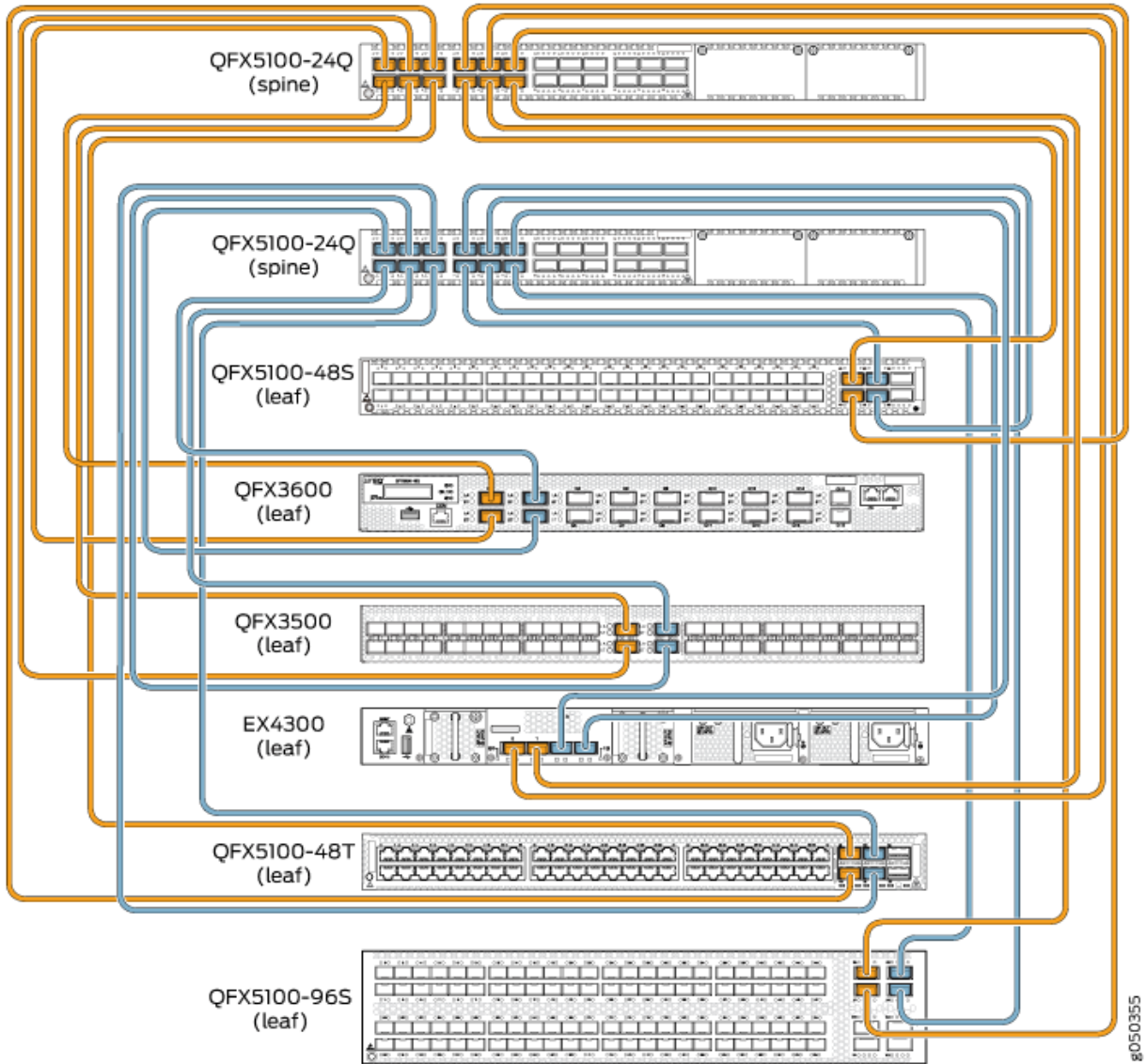
RELATED DOCUMENTATION

Virtual Chassis Fabric Hardware Overview

Plan a Virtual Chassis Fabric Deployment

Connecting QFX5110 in a QFX5110 Virtual Chassis Fabric

Connecting a QFX3500 or QFX3600 Switch in a QFX5100 Virtual Chassis Fabric

A Juniper Networks QFX5100 Virtual Chassis Fabric (VCF) is constructed using a spine-and-leaf architecture and topology. In the spine-and-leaf architecture, each spine device is interconnected to each leaf device. A VCF supports up to 20 total devices, and up to 4 devices can be configured into spine devices. QFX3500 or QFX3600 devices are supported in the leaf role in a QFX5100 VCF. To understand the different hardware configurations supported, see *Virtual Chassis Fabric Hardware Overview*.

Although the best practice is to use all QFX5100 switches in a QFX5100 VCF, you can use QFX3500 or QFX3600 switches as leaf devices.

You can install a VCF in a single rack, multiple racks, or in wire closets. You construct a VCF by cabling and then configuring SFP+ or QSFP+ interfaces into Virtual Chassis ports (VCPs). All non-channelized QSFP+ uplink interfaces on QFX3600 and QFX3500 switches can be configured into VCPs. All fixed SFP + interfaces on QFX3500 switches can also be configured into VCPs.

> **BEST PRACTICE**: Use 40-Gigabit QSFP+ ports as VCPs.

shows two QFX5100-24Q spine devices connected to a QFX5100-48S, QFX3600, QFX3500, QFX5100-96S, EX4300, and QFX5100-48T leaf devices using all QSFP+ ports as VCPs. A VCF with more than one model in the design is called *mixed-mode*.

Figure 158: Mixed Mode QFX5100 VCF with QFX3500 and QFX3600 Leaf Devices
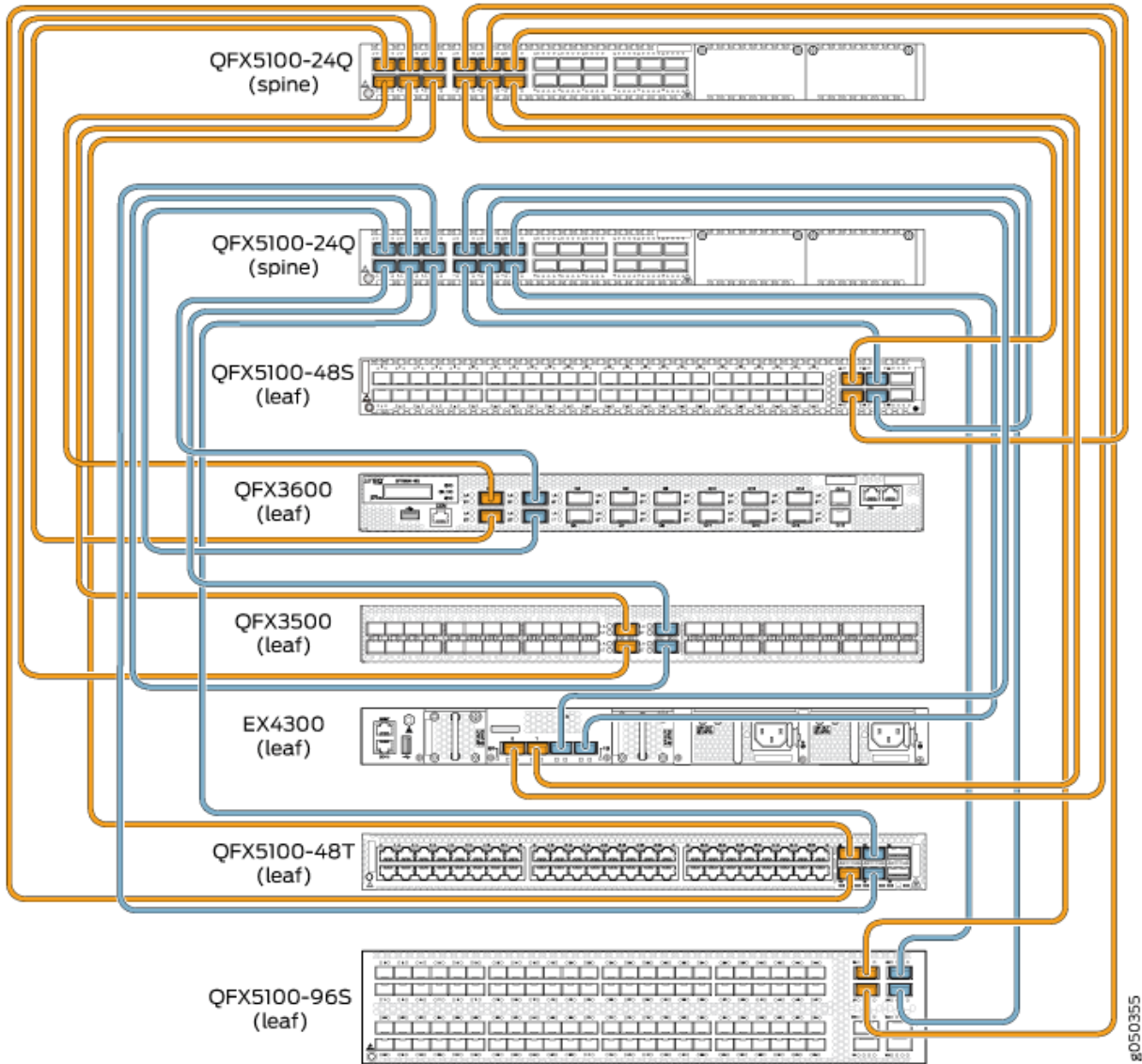
RELATED DOCUMENTATION

Site Preparation Checklist for a QFX5100 Device

Site Preparation Checklist for a QFX3500 Device

Site Preparation Checklist for a QFX3600 or QFX3600-I Device

Site Preparation Checklist for EX4300 Switches

Connecting EX Series Switches in a QFX5100 Virtual Chassis Fabric

A Juniper Networks QFX5100 Virtual Chassis Fabric (VCF) is constructed using a spine-and-leaf architecture and topology. In the spine-and-leaf architecture, each spine device is interconnected to each leaf device. A VCF supports up to 20 total devices, and up to 4 devices can be configured into spine devices. EX4300 switches except EX4300-48MP and EX4300-48MP-S are supported in the leaf role in a QFX5100 VCF. To understand the different hardware configurations supported, see "Virtual Chassis Fabric Hardware Overview" on page 8.

Although best practice is to use all QFX5100 switches in the VCF, you can also use EX4300 switches except EX4300-48MP and EX4300-48MP-S as leaf devices.

Installations with combinations of QFX5100-48T, QFX3600, QFX3500, and EX4300 switches except EX4300-48MP and EX4300-48MP-S as leaf devices in the QFX5100 VCF are called *mixed mode*. All VCF installations can support 20 total devices, of which four QFX5100 devices can be configured into spine devices.

You can install a VCF in a single rack, multiple racks, or in wire closets. You construct a VCF by configuring and then cabling QSFP+ interfaces into Virtual Chassis ports (VCPs).

On EX4300 switches, QSFP+ ports 0 and 1 are configured as VCP by default. Non-channelized QSFP+ interfaces on EX4300 switches except EX4300-48MP and EX4300-48MP-S can be configured into VCPs. You can also use the SFP+ uplink module ports as VCPs by configuring these ports as VCPs. The SFP+ network ports cannot be configured into VCPs. In EX4300-48MP and EX4300-48MP-S switches, you can use only the built-in QSFP+ ports as VCPs. You cannot configure the ports on the uplink module in EX4300-48MP and EX4300-48MP-S switches to Virtual Chassis ports (VCPs).

> **BEST PRACTICE**: Use 40-Gigabit QSFP+ ports as VCPs when available.

Figure 159 on page 413 shows two QFX5100-24Q spine devices connected to a QFX5100-48S, QFX3600, QFX3500, EX4300, and QFX5100-96S leaf devices using all QSFP+ ports as VCPs.

Figure 159: Mixed Mode QFX5100 VCF with an EX4300 Leaf
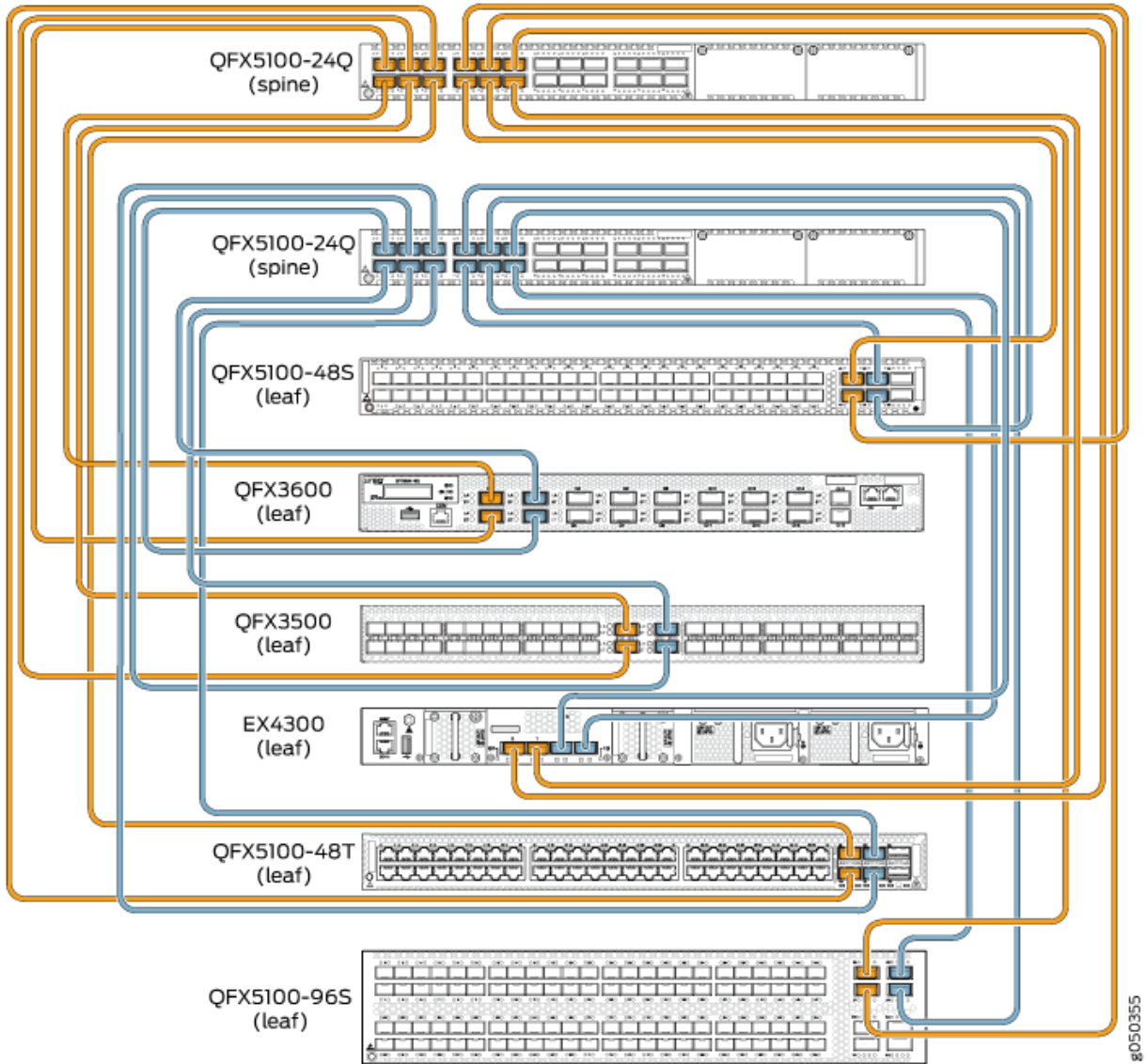
RELATED DOCUMENTATION

Virtual Chassis Fabric Overview | 2

Understanding Virtual Chassis Fabric Components

Understanding EX Series Virtual Chassis

5
PART

Maintenance

CHAPTER 29

Removing or Replacing a Device

Adding a Device to a Virtual Chassis Fabric

This topic describes how to add a device to a Virtual Chassis Fabric (VCF). See *Understanding Virtual Chassis Fabric Components* and "Understanding Virtual Chassis Fabric Configuration" on page 5 for details on the supported devices that can be interconnected into a non-mixed or mixed VCF.

All devices in a VCF must be running the same or a compatible version of Junos OS, so before you begin to add a device to an existing VCF, update your device to the same version of Junos OS running on the devices in the VCF. See *Installing Software Packages on QFX Series Devices* or *Installing Software on an EX Series Switch with a Virtual Chassis or Single Routing Engine (CLI Procedure)*. Then follow the applicable procedure to add the device based on how your VCF is configured.

> ⚠️ **CAUTION**: QFX5100 switches running a Junos OS image that includes "-qfx-5-" in the software package filename *must* be upgraded to a package filename that includes "-qfx-5e-" before being added to a QFX5110 Virtual Chassis or VCF. See *Upgrading a QFX5100 Switch with a USB Device to Join a QFX5110 Virtual Chassis or Virtual Chassis Fabric*.

This topic contains the following sections:

Adding a Leaf Device to an Autoprovisioned Virtual Chassis Fabric

To add a leaf device to an autoprovisioned VCF:

1. Log onto the device that you are adding to the VCF.
2. (Optional) Perform this step if you want to avoid the downtime associated with an extra reboot when your device is interconnected into your VCF. If you do not perform this step, the VCF auto-detects the fabric and mixed mode settings and, if needed, reboots the device as part of the process of changing these settings.

   Configure the leaf device into fabric mode. Configure your device into mixed mode for a mixed VCF .

   > **NOTE**: If the leaf device has not previously been configured, also specify the `reboot` option to reboot the leaf device now and apply the mode settings. Otherwise, if the leaf device has been previously configured, in the next step you zeroize and reboot the device to clear prior configuration stanzas. In that step the reboot also applies the mode settings (maintained during zeroizing), so you do not need to reboot in this step and again in the next step.

   If you are configuring a non-mixed VCF:

   ```
   user@device> request virtual-chassis mode fabric local <reboot>
   ```

   If you are configuring a mixed VCF:

   ```
   user@device> request virtual-chassis mode fabric mixed local <reboot>
   ```

3. If the leaf device that you are adding to the VCF has not previously been configured, proceed to the next step.

   If your device has been configured previously, zeroize your device and reboot:

   ```
   user@device> request system zeroize
   warning: System will be rebooted and may not boot without configuration
   Erase all data, including configuration and log files? [yes,no] (yes) yes
   ```

   > **NOTE**: You must zeroize your device if you have previously entered one or more configuration commands, including basic configuration commands.
   >
   > Your device will not properly join the VCF as a "plug and play" device if it contains any configuration, until it has been zeroized.
   >
   > You cannot use other methods to set a device into factory default mode before inserting it into a VCF if it was previously configured in another Virtual Chassis or VCF. You must use **request system zeroize**.

   > **NOTE**: The **request virtual-chassis mode fabric local** and **request virtual-chassis mode fabric mixed local** commands are entered in operational mode, so those settings are maintained when the device is zeroized.

   For additional information on this procedure, see *Reverting to the Factory-Default Configuration for the EX Series Switch* or *Reverting to the Default Factory Configuration*.

4. (Required only if you are adding a device that turns a non-mixed VCF into a mixed VCF) Log in to the VCF and set all devices in the VCF to mixed mode. Configure all devices to reboot to complete this procedure.

   ```
   user@device> request virtual-chassis mode mixed all-members reboot
   ```

   The VCF experiences downtime as part of the reboot step.

5. Interconnect your leaf device into the existing spine devices, using at least one interface that can be a Virtual Chassis port (VCP) to connect to each spine device in the VCF.

   An autoprovisioned VCF automatically adds a supported device that is zeroized or in factory default mode to the VCF when it is connected to a spine device using a supported VCP link. Both sides of the link are automatically converted into VCPs, and fabric and mixed mode settings are detected and updated automatically if necessary, as part of this process. If fabric or mixed mode settings are

updated, the newly-added leaf device is automatically rebooted to complete the configuration and join the VCF.

> ◤ **BEST PRACTICE**: When adding a leaf device to an existing VCF, interconnect the new device to the spine member that is in the primary Routing Engine role first, which is the most efficient way to synchronize the new member with the current VCF configuration and state. Interconnecting a new member only to the backup or another spine member can cause flooding of messages within the VCF as the primary tries to synchronize the new member through other leaf and spine member VCP links.
>
> After the new member is fully incorporated into the VCF, you can interconnect the remaining redundant VCP links to the backup and other spine devices without affecting traffic within the VCF.

No further configuration is required.

Adding a Spine Device to an Autoprovisioned Virtual Chassis Fabric

To add a spine device to an autoprovisioned VCF:

1. Log in to your VCF.
2. If you are replacing a spine device that is already part of the VCF, power off the spine device in the VCF.

   Follow the steps in to remove the device from the VCF.
3. Modify the configuration.

   If your new spine device is replacing an existing spine, modify the configuration to remove the old spine.

   You can skip this step if you are not replacing an existing spine device.

   ```
   [edit virtual-chassis]
   user@device# delete member member-id
   ```

   where *member-id* is the member ID of the spine that is removed from this procedure.

   Add the spine device to the configuration:

   ```
   [edit virtual-chassis]
   user@device# set member member-id serial-number serial-number role [line-card | routing-
   engine]
   ```

For instance, to configure a spine device acting in the linecard role with the serial number OU81234567890 as member 3:

```
[edit virtual-chassis]
user@device# set member 3 serial-number OU81234567890 role line-card
```

The `set virtual-chassis member` *member-id* `fabric-tree-root` configuration statement specifies that only certain devices will be root nodes in the multicast distribution trees (MDTs) created for directing traffic within the VCF. This configuration item preempts the default VCF behavior to create one MDT for every device in the VCF with that device as a root node. (See *Understanding Traffic Flow Through a Virtual Chassis Fabric* and *fabric-tree-root* for more information about this option.) If your VCF uses this option to configure the spine devices as fabric tree roots (which is the recommended usage), then configure the new spine device as a fabric tree root as well:

```
[edit virtual-chassis]
user@device# set member member-id fabric-tree-root
```

For instance, to configure the spine device configured as member 3 as a fabric tree root node:

```
[edit virtual-chassis]
user@device# set member 3 fabric-tree-root
```

4. Commit the configuration.

```
[edit]
user@device# commit
```

5. Log in to the device that is going to be added to the VCF.

6. Configure the device into fabric mode. If needed, also configure the device into mixed mode. Reboot the device to complete this configuration step.

If you are configuring a non-mixed VCF:

```
user@device> request virtual-chassis mode fabric local reboot
```

If you are configuring a mixed mode VCF:

```
user@device> request virtual-chassis mode fabric mixed local reboot
```

> **NOTE**: We recommend setting the fabric and mixed mode settings before interconnecting your devices into a VCF to avoid the following issues:
>
> - Incurring downtime as the devices reboot to commit the mixed mode or fabric settings.
>
> - Manually correcting potential issues related to VCF formation because the device did not immediately join the VCF.
>
> You can, however, use the `request virtual-chassis mode fabric local` or `request virtual-chassis mode mixed local` commands to set a device into fabric or mixed mode after interconnecting your VCF.

7. (Required only if you are adding a device that turns a non-mixed VCF into a mixed VCF) Log in to the VCF and set all devices in the VCF to mixed mode. Configure all devices to reboot to complete this procedure.

```
user@device> request virtual-chassis mode mixed all-members reboot
```

The VCF experiences downtime as part of the reboot procedure.

8. After the device reboots, interconnect the new device into the VCF by cabling the device to the leaf devices in the VCF using supported interfaces that can be VCPs.

The interconnecting links are converted into VCPs automatically.

The new spine device should be operational after the cabling is completed.

Adding a Spine or Leaf Device to a Preprovisioned Virtual Chassis Fabric

To add a spine or leaf device to a preprovisioned VCF:

1. Log in to your VCF.
2. If you are replacing a device that is already part of the VCF, power off the device in the VCF.

   Follow the steps in to remove the device from the VCF.
3. Modify the configuration.

   If your new device is replacing an existing device, modify the configuration to remove the old device.

You can skip this portion of the procedure if you are not replacing an existing device.

```
[edit virtual-chassis]
user@device# delete member member-id
```

where *member-id* is the member ID of the device that is removed in this procedure.

Add the new device to the VCF configuration:

```
[edit virtual-chassis]
user@device# set member member-id serial-number serial-number role [line-card | routing-
engine]
```

For instance, to configure a device with the serial number OU81234567890 into the Routine Engine role as member 3:

```
[edit virtual-chassis]
user@device# set member 3 serial-number OU81234567890 role routing-engine
```

(For spine devices only) The set virtual-chassis member *member-id* fabric-tree-root configuration statement specifies that only certain devices will be root nodes in the multicast distribution trees (MDTs) created for directing traffic within the VCF. This configuration item preempts the default VCF behavior to create one MDT for every device in the VCF with that device as a root node. (See *Understanding Traffic Flow Through a Virtual Chassis Fabric* and *fabric-tree-root* for more information about this option.) If your VCF uses this option to configure the spine devices as fabric tree roots (which is the recommended usage), then configure the new spine device as a fabric tree root as well:

```
[edit virtual-chassis]
user@device# set member member-id fabric-tree-root
```

For instance, to configure the spine device configured as member 3 as a fabric tree root node:

```
[edit virtual-chassis]
user@device# set member 3 fabric-tree-root
```

4. Commit the VCF configuration.

```
[edit]
user@device# commit
```

5. Log in to the device that is going to be added to the VCF.

6. Configure the device into fabric mode. If needed, also configure the device into mixed mode. Reboot the device to complete this configuration step.

If you are configuring a non-mixed VCF:

```
user@device> request virtual-chassis mode fabric local reboot
```

If you are configuring a mixed-mode VCF:

```
user@device> request virtual-chassis mode fabric mixed local reboot
```

> **NOTE**: If you are adding a device that turns a non-mixed VCF into a mixed VCF, as the next step, you must also log in to the VCF and set all of the devices in the VCF into mixed mode. This step requires a VCF reboot, which incurs some downtime.

> **NOTE**: We recommend that you set the fabric and mixed mode settings, zeroize (if necessary), and reboot leaf devices before interconnecting them into the VCF to avoid the following issues:
>
> - Incurring downtime as the devices reboot to commit the mixed mode or fabric settings.
>
> - Manually correcting potential issues related to VCF formation because the device did not immediately join the VCF.
>
> You can, however, use the `request virtual-chassis mode fabric local` or `request virtual-chassis mode mixed local` commands to recover a device that was not set into fabric or mixed mode before you interconnect it into your VCF.

7. (Required only if you are adding a device that turns a non-mixed VCF into a mixed VCF) Log in to the VCF and set all devices in the VCF to mixed mode, also configuring all devices to reboot to complete this step.

```
user@device> request virtual-chassis mode mixed all-members reboot
```

The VCF experiences downtime during the reboot.

8. After the device reboots, interconnect the new device into the VCF using supported interfaces that can be VCPs. The interconnecting links are converted into VCPs automatically.

The new device should be operational shortly after the cabling is complete.

> **BEST PRACTICE**: When adding a leaf device to an existing VCF, interconnect the new device to the spine member that is in the primary Routing Engine role first, which is the most efficient way to synchronize the new member with the current VCF configuration and state. Interconnecting a new member only to the backup or another spine member can cause flooding of messages within the VCF as the primary tries to synchronize the new member through other leaf and spine member VCP links.
>
> After the new member is fully incorporated into the VCF, you can interconnect the remaining redundant VCP links to the backup and other spine devices without affecting traffic within the VCF.

Adding a Spine or Leaf Device to a Nonprovisioned Virtual Chassis Fabric

> **CAUTION**: Configure your VCF using autoprovisioning or preprovisioning unless you have a compelling reason to use nonprovisioned configuration. You can configure all aspects of a VCF using autoprovisioned or preprovisioned configuration.
>
> Nonprovisioned VCF configuration is highly discouraged. Nonprovisioned VCF configuration should only be used by VCF experts in specialized scenarios.

To add a spine or leaf device to a nonprovisioned VCF:

1. Log in to your VCF.

2. If you are replacing a device that is already part of the VCF, power off the device in the VCF. Uncable the device once the power off is complete.

You can skip this step if you are adding a new device without replacing an existing device. You must skip this step if there is no configuration for the device that you are removing from the VCF.

If the device is configured, delete the device from the VCF configuration:

```
[edit virtual-chassis]
user@device# delete member member-id
```

where *member-id* is the member ID of the device that you are removing.

3. Log in to the device that you are going to add to the VCF.

4. Configure the device into fabric mode. If needed, also configure the device into mixed mode. Reboot the device to complete this configuration step.

If you are configuring a non-mixed VCF:

```
user@device> request virtual-chassis mode fabric local reboot
```

If you are configuring a mixed mode VCF:

```
user@device> request virtual-chassis mode fabric mixed local reboot
```

> **NOTE**: If you are adding a device that turns a non-mixed VCF into a mixed VCF, you must also log in to the VCF and set all of the devices in the VCF into mixed mode.
>
> Log in to the VCF and enter the **request virtual-chassis mode mixed all-members reboot** command to perform this task.
>
> The VCF reboots and incurs downtime to complete this procedure.

> **NOTE**: We recommend that you set the fabric and mixed mode settings before you interconnect your devices into a VCF to avoid the following issues:
>
> - Incurring downtime as the devices reboot to commit the mixed mode or fabric settings.
>
> - Manually correcting potential issues related to VCF formation because the device did not immediately join the VCF.
>
> You can, however, use the `request virtual-chassis mode fabric local` or `request virtual-chassis mode mixed local` commands to set a device into fabric or mixed mode after interconnecting your VCF.

5. (Required only if you are adding a device that turns a non-mixed VCF into a mixed VCF) Log in to the VCF and set all devices in the VCF to mixed mode. Configure all devices to reboot to complete this procedure.

```
user@device> request virtual-chassis mode mixed all-members reboot
```

The VCF experiences downtime as part of the reboot procedure.

6. After the device reboots, interconnect it into the VCF using supported interfaces that can be VCPs. Configure the interconnecting interfaces into Virtual Chassis ports (VCPs):

```
user@device> request virtual-chassis vc-port set pic-slot pic-slot-number port port-number
user@device> request virtual-chassis vc-port set pic-slot pic-slot-number port port-number
```

The *request virtual-chassis vc-port* must be configured on the ports at both ends of the link in order for that link to be configured into a VCP.

> BEST PRACTICE: When adding a leaf device to an existing VCF, interconnect the new device to the spine member that is in the primary Routing Engine role first, which is the most efficient way to synchronize the new member with the current VCF configuration and state. Interconnecting a new member only to the backup or another spine member can cause flooding of messages within the VCF as the primary tries to synchronize the new member through other leaf and spine member VCP links.
>
> After the new member is fully incorporated into the VCF, you can interconnect the remaining redundant VCP links to the backup and other spine devices without affecting traffic within the VCF.

7. (Optional) Log in to the VCF and set the primary-role priority of the new device:

```
[edit virtual-chassis]
user@device# set member member-id mastership-priority number
```

If needed, enter the show virtual-chassis command to learn the member ID of the new member device in the VCF.

RELATED DOCUMENTATION

Removing a Device From a Virtual Chassis Fabric

This topic describes how to remove a device from a Virtual Chassis Fabric (VCF):

To remove a device from a VCF:

1. Power off the device that you are removing from the VCF.
2. Uncable the device that you are removing from the VCF.
3. Log in to the Virtual Management ethernet (VME) interface. Remove the device from the VCF configuration.

   You can skip this step if you are removing a device that was never configured.

   ```
   [edit virtual-chassis]
   user@device# delete member member-id
   ```

4. Delete the Virtual Chassis port (VCP) or ports on the devices that are still in the VCF but were connected to the removed device.

   ```
   user@device> request virtual-chassis vc-port delete pic-slot pic-slot port port-number member
   member-id
   ```

   When a device is removed from a VCF, the interface on the other end of the VCP link that was connected to the removed device remains configured as a VCP.

   You can check the results of this command using the *show virtual-chassis vc-port* command.

5. (Required only if you are removing a device that turns a mixed VCF into a homogenous VCF) Log in to the VCF and disable mixed mode for all of the devices in the VCF, Configure all devices to reboot to complete this procedure.

   ```
   user@device> request virtual-chassis mode mixed disable all-members reboot
   ```

   This step should only be taken if you are removing a QFX3600, QFX3500, or EX4300 device from a mixed QFX5100 VCF and the only devices remaining in the VCF are QFX5100 devices.

The VCF experiences downtime as part of the reboot procedure.

6. Commit the configuration.

```
[edit]
user@device# commit
```

7. Power on the device that was removed from the VCF, and log in to it.

8. (Optional, but recommended) Delete the VCP or VCPs on the device that was removed:

```
user@device> request virtual-chassis vc-port delete pic-slot pic-slot port port-number member
member-id
```

9. (Optional, but recommended) Reset the fabric and mixed mode settings.

If you are removing a device that was part of a VCF composed entirely of the same device:

```
user@device> request virtual-chassis mode fabric disable reboot
```

If you are removing a device that was part of a mixed VCF:

```
user@device> request virtual-chassis mode fabric mixed disable reboot
```

Reboot the device to complete the process.

We recommend resetting the fabric and mixed mode settings immediately after removing it from the VCF to avoid any potential issues with your device if it is placed in your network in another role.

RELATED DOCUMENTATION

Understanding Virtual Chassis Fabric Components

Powering Off a QFX5110

Before you remove the power cord to power off a QFX5110:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.

- 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 ESD grounding strap

- An external management device such as a PC

- An RJ-45 to DB-9 rollover cable to connect the external management device to the console port

To power off a QFX5110 switch:

1. Connect to the switch using one of the following methods:

   - Connect a management device to the console (**CON**) port on a QFX5110. For instructions about connecting a management device to the console (**CON**) port, see *Connect a Device to a Management Console Using an RJ-45 Connector*.

   - You can shut down the QFX5110 from a management device on your out-of-band management network. For instructions about connecting a management device to the management (**C0**) port, see *Connect a Device to a Network for Out-of-Band Management*.

2. Shut down Junos OS from the external management device by issuing the `request system halt` operational mode CLI command. This command shuts down the switch gracefully and preserves system state information. A message appears on the console, confirming that the operating system has halted.

   You see the following output (or something similar, depending on the hardware being shut down) after entering the command:

```
System going down in 1 minute


*** System shutdown message from root@ ***


System going down in 30 seconds



*** FINAL System shutdown message from root@ ***


System going down IMMEDIATELY
```

```
Stopping cron.
Waiting for PIDS: 3494.
.

.
Waiting (max 60 seconds) for system process `vnlru' to stop...done
Waiting (max 60 seconds) for system process `bufdaemon' to stop...done
Waiting (max 60 seconds) for system process `syncer' to stop...
Syncing disks, vnodes remaining...0 0 0 0 0 done
All buffers synced.
Uptime: 3m26s
usbus0: controller did not stop
unloading fpga driver
Khelp module "jsocket" can't unload until its refcount drops from 5 to 0.
Rebooting...
cpu_reset: Stopping other CPUs
Consoles: serial port
BIOS drive C: is disk0
BIOS drive D: is disk1
BIOS drive E: is disk2
BIOS drive F: is disk3
BIOS 639kB/3144576kB available memory
```

> ⚠ **CAUTION**: The final output of any version of the `request system halt` command is "The operating system has halted." Wait at least 60 seconds after first seeing this message before following the instructions in Step 4 and Step 5 to power off the switch.

3. Attach the grounding strap to your bare wrist and to a site ESD point.
4. Disconnect power to the switch by performing one of the following tasks:

   - AC power supply—If the AC power source outlet has a power switch, set it to the off (O) position. If the AC power source outlet does not have a power switch, gently pull out the plug end of the power cord connected to the power source outlet.

   - DC power supply—Switch the circuit breaker on the panel board that services the DC circuit to the off position.

5. Remove the power source cable from the power supply faceplate:

   - AC power supply—Remove the power cord from the power supply faceplate by detaching the power cord retainer and gently pulling out the socket end of the power cord connected to the power supply faceplate.

- DC power supply—Remove the screws securing the ring lugs attached to the power source cables to the power supply using the screwdriver, and remove the power source cables from the power supply. Replace the screws on the terminals and tighten them.

6. Uncable the switch before removing it from the rack or cabinet.

RELATED DOCUMENTATION

QFX5110 Power System

Connecting the QFX5110 to Power

Power Off a QFX5100 Device

Before you power off a QFX5100 switch:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.

- Ensure that you do not need to forward traffic through the switch.

> **NOTE**: Use the following procedure to turn off power on a QFX5100 device that is in standalone mode, a member in a QFX Virtual Chassis, or either a spine device or a leaf device in a Virtual Chassis Fabric. QFX5100 devices that are configured either as Node devices or as an Interconnect device in a QFabric system running OS Junos release 14.1 or later, must use a different procedure and CLI to ensure there is no traffic loss. See *Adding or Replacing a Node Device in a QFabric Node Group* .

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

- An ESD grounding strap

- An external management device such as a PC

- An RJ-45 to DB-9 rollover cable to connect the external management device to the console port

To power off a QFX5100 switch:

1. Connect to the switch using one of the following methods:

   - Connect a management device to the console (**CON**) port on a QFX5100 switch. For instructions about connecting a management device to the console (**CON**) port, see *Connect a Device to a Management Console Using an RJ-45 Connector*.

- You can shut down the QFX5100 switch from a management device on your out-of-band management network. For instructions about connecting a management device to the management (**CO** or **C1**) port, see *Connect a Device to a Network for Out-of-Band Management*.

2. Shut down Junos OS from the external management device by issuing the `request system halt` operational mode CLI command. This command shuts down the switch gracefully and preserves system state information. A message appears on the console, confirming that the operating system has halted.

You see the following output (or something similar, depending on the hardware being shut down) after entering the command:

```
System going down IMMEDIATELY


Terminated
Poweroff for hypervisor to respawn
Aug 26 16:49:04 init: event-processing (PID 1325) exited with status=1
Aug 26 16:49:04 init: packet-forwarding-engine (PID 1809) exited with status=8
.
Waiting (max 60 seconds) for system process `vnlru_mem' to stop...done
Waiting (max 60 seconds) for system process `vnlru' to stop...done
Waiting (max 60 seconds) for system process `bufdaemon' to stop...done
Waiting (max 60 seconds) for system process `syncer' to stop...
Syncing disks, vnodes remaining...0 0 0 0 0 done

syncing disks... All buffers synced.
Uptime: 11m7s
recorded reboot as normal shutdown
unloading fpga driver
Powering system off using ACPI
Stopping crond: [  OK  ]

Running guests on default URI: no running guests.
Stopping libvirtd daemon: [  OK  ]
Shutting down ntpd: [  OK  ]
Shutting down system logger: [  OK  ]
Shutting down sntpc: [  OK  ]
Stopping sshd: [  OK  ]
Stopping vehostd: [  OK  ]
Stopping watchdog: [  OK  ]
Stopping xinetd: [  OK  ]
Sending all processes the TERM signal... haveged: haveged: Stopping due to signal 15

[  OK  ]
```

```
Sending all processes the KILL signal... [  OK  ]
Saving random seed:  [  OK  ]
Syncing hardware clock to system time [  OK  ]
Unmounting file systems:  [  OK  ]
init: Re-executiRE-FPGA-DRV: reboot notifier called with 0x0003
ng /sbin/init
Halting system...
tmc-fpga: TMC FPGA driver shutdown called.
Power down.
```

> ⚠️ **CAUTION**: The final output of any version of the `request system halt` command is "Power down." Wait at least 60 seconds after first seeing this message before following the instructions in Step 4 and Step 5 to power off the switch.

3. Attach the grounding strap to your bare wrist and to a site ESD point.

4. Disconnect power to the switch by performing one of the following tasks:

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

- DC power supply—Switch the circuit breaker on the panel board that services the DC circuit to the OFF position.

5. Remove the power source cable from the power supply faceplate:

- AC power supply—Remove the power cord from the power supply faceplate by detaching the power cord retainer and gently pulling out the socket end of the power cord connected to the power supply faceplate.

- DC power supply—Remove the screws securing the ring lugs attached to the power source cables to the power supply using the screwdriver, and remove the power source cables from the power supply. Replace the screws on the terminals and tighten them.

6. Uncable the switch before removing it from the rack or cabinet.

RELATED DOCUMENTATION

Connect the QFX5100 to Power

Powering Off a QFX3600 Device

Before you power off a QFX3600 device:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.

- Ensure that you do not need to forward traffic through the device.

- Ensure that you have the following parts and tools available to power off the device:

  - An ESD grounding strap.

  - An external management device such as a PC.

  - An RJ-45 to DB-9 rollover cable to connect the external management device to the console (**CON**) port.

NOTE: Use the following procedure to turn off power on a QFX3600 device that is in standalone mode, a member in a QFX Virtual Chassis, or a leaf device in a Virtual Chassis Fabric. QFX3600 devices that are Node devices in a QFabric system running OS Junos release 14.1 or later must use a different procedure and CLI to ensure there is no traffic loss. See *Powering Off an Existing QFabric Node Device*. To remove power from a QFX3600-I Interconnect device, see *Adding or Replacing an Interconnect Device in a QFX3000-M QFabric System*.

To power off a QFX3600 device:

1. Connect to the QFX3600 device using one of the following methods:

   - Connect a management device to the console (**CON**) port on a QFX3600 device. For instructions about connecting a management device to the console (**CON**) port, see *Connecting a QFX Series Device to a Management Console*.

   - If you are using the QFX3600 device as a standalone switch, you can shut down the QFX3600 device from a management device on your out-of-band management network. For instructions about connecting a management device to the management (**CO**, **C1**, **C0S**, or **C1S**) port, see *Connect a Device to a Network for Out-of-Band Management*.

   - Shut down the QFX3600 device from a management device on your out-of-band management network.

2. Shut down Junos OS from the external management device by issuing the `request system halt` operational mode CLI command. This command shuts down the device gracefully and preserves system state information. A message appears on the console, confirming that the operating system has halted.

You see the following output (or something similar, depending on the hardware being shut down) after entering the command:

```
Shutdown NOW!
[pid 1764]

user@device>

*** FINAL System shutdown message from user@device ***
System going down IMMEDIATELY


JWaiting (max 300 seconds) for system process `vnlru_mem' to stop...done
Waiting (max 300 seconds) for system process `vnlru' 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...4 1 1 1 0 0 done

syncing disks... All buffers synced.
Uptime: 1d19h22m25s

The operating system has halted.
Please press any key to reboot.
```

> ⚠️ **CAUTION**: The final output of any version of the `request system halt` 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 Step 4 and Step 5 to power off the device.

3. Attach the grounding strap to your bare wrist and to a site ESD point.

4. Disconnect power to the device by performing one of the following tasks:

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

- DC power supply—Switch the circuit breaker on the panel board that services the DC circuit to the OFF position.

5. Remove the power source cable from the power supply faceplate:

- AC power supply—Remove the power cord from the power supply faceplate by detaching the power cord retainer and gently pulling out the socket end of the power cord connected to the power supply faceplate.

- DC power supply—Remove the screws securing the ring lugs attached to the power source cables to the power supply using the screwdriver, and remove the power source cables from the power supply. Replace the screws on the terminals and tighten them.

Adding or Replacing an Interconnect Device in a QFX3000-M QFabric System

Connecting AC Power to a QFX3500, QFX3600, or QFX3600-I Device

Connecting DC Power to a QFX3500, QFX3600, or QFX3600-I Device

Powering Off a QFX3500 Device

Before you power off a QFX3500 device:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.

- Ensure that you do not need to forward traffic through the device.

> **NOTE**: Use the following procedure to turn off power on a QFX3500 device that is in standalone mode, a member in a QFX Virtual Chassis, or a spine device in a Virtual Chassis Fabric. QFX3500 devices that are Node devices in a QFabric system running OS Junos release 14.1 or later must use a different procedure and CLI to ensure there is no traffic loss. See *Powering Off an Existing QFabric Node Device*.

Ensure that you have the following parts and tools available to power off the device:

- An ESD grounding strap

- An external management device such as a PC

- An RJ-45 to DB-9 rollover cable to connect the external management device to the console port

To power off a QFX3500 device:

1. Connect to the device using one of the following methods:

- Connect a management device to the console (**CON**) port on a QFX3500 device. For instructions about connecting a management device to the console (**CON**) port, see *Connecting a QFX Series Device to a Management Console*.

- If you are using the QFX3500 device as a standalone switch, you can shut down the QFX3500 device from a management device on your out-of-band management network. For instructions about connecting a management device to the management (**CO** or **C1**) port, see *Connect a Device to a Network for Out-of-Band Management*.

- Shut down the QFX3500 device from a management device connected through the QFX3100 Director device in a QFabric system. See *request component login* for information about gaining access to individual devices in your QFabric system.

2. Shut down Junos OS from the external management device by issuing the `request system halt` operational mode CLI command. This command shuts down the device gracefully and preserves system state information. A message appears on the console, confirming that the operating system has halted.

You see the following output (or something similar, depending on the hardware being shut down) after entering the command:

```
Shutdown NOW!
[pid 1764]

user@device>

*** FINAL System shutdown message from user@device ***
System going down IMMEDIATELY


JWaiting (max 300 seconds) for system process `vnlru_mem' to stop...done
Waiting (max 300 seconds) for system process `vnlru' 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...4 1 1 1 0 0 done

syncing disks... All buffers synced.
Uptime: 1d19h22m25s

The operating system has halted.
Please press any key to reboot.
```

> ⚠️ **CAUTION**: The final output of any version of the `request system halt` 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 Step 4 and Step 5 to remove power from device.

3. Attach the grounding strap to your bare wrist and to a site ESD point.

4. Disconnect power to the device by performing one of the following tasks:

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

   - DC power supply—Switch the circuit breaker on the panel board that services the DC circuit to the OFF position.

5. Remove the power source cable from the power supply faceplate:

   - AC power supply—Remove the power cord from the power supply faceplate by detaching the power cord retainer and gently pulling out the socket end of the power cord connected to the power supply faceplate.

   - DC power supply—Remove the screws securing the ring lugs attached to the power source cables to the power supply using the screwdriver, and remove the power source cables from the power supply. Replace the screws on the terminals and tighten them.

RELATED DOCUMENTATION

Connecting AC Power to a QFX3500, QFX3600, or QFX3600-I Device

Installing a Management Board in a QFX3500 Device

Removing a Management Board from a QFX3500 Device

Removing a QFX5110 from a Rack

Before removing a QFX5110 from a rack:

Ensure that you have the following parts and tools available:

- A Phillips (+) screwdriver, number 2 or number 3, depending on the size of your rack mounting screws, for removing the QFX5110 from the rack.

If you need to relocate an installed QFX5110, use the procedure described in this topic.

> **NOTE**: When you remove multiple switches from a rack, remove the switch in the top of the rack first, then proceed to remove the rest of the switches from top to bottom.

- Ensure that the rack is stable and secured to the building.

- Ensure that there is enough space to place the removed QFX5110 in its new location and along the path to the new location.

- Read *General Safety Guidelines and Warnings*.

- Use the power off sequence described in *Powering Off a QFX5110* to safely power off the device.

- Disconnect the power cords.

- Ensure that you have disconnected any cables or wires attached to the QFX5110 switch ports or Precision Time Protocol (PTP) ports.

To remove a QFX5110 from a rack or cabinet:

1. Have one person support the weight of the switch while another person uses the screwdriver to remove the front mounting screws that attach the chassis mounting brackets to the rack or cabinet.
2. Remove the QFX5110 from the rack or cabinet.
3. Use the screwdriver to remove the mounting screws that attach the mounting blades attached to the rear of the rack or cabinet.
4. Place the removed screws and mounting blades in a labeled bag. You will need them when you reinstall the chassis.
5. Transport the QFX5110 to your new location.

RELATED DOCUMENTATION

Mounting a QFX5110 in a Rack

Removing a QFX5100 Device from a Rack or Cabinet

Before removing a QFX5100 device from a rack:

Ensure that you have the following parts and tools available:

- A Phillips (+) screwdriver, number 2 or number 3, depending on the size of your rack mounting screws, for mounting the QFX5100 device on the rack.

If you need to relocate an installed QFX5100 device, use the procedure described in this topic. (The remainder of this topic uses "rack" to mean "rack or cabinet.")

> **NOTE**: When you remove multiple devices from a rack, remove the device in the top of the rack first and proceed to remove the rest of the devices from top to bottom.

- Ensure that the rack is stable and secured to the building.

- Ensure that there is enough space to place the removed QFX5100 device in its new location and along the path to the new location.

- Read *General Safety Guidelines and Warnings*.

- Use the appropriate power off sequence for your configuration to safely powered off the device.

  - If the QFX5100 device is being used as a standalone switch, a member in a QFX Virtual Chassis, or either a spine device or a leaf device in a Virtual Chassis Fabric (VCF), see *Power Off a QFX5100 Device*.

  - If the QFX5100 device is configured as either a Node device or as a Interconnect device in a QFabric system, see *Adding or Replacing a Node Device in a QFabric Node Group* .

- Disconnect the power cords.

- Ensure that you have disconnected any cables or wires attached to the QFX5100 switch ports.

To remove a QFX5100 device from a rack or cabinet:

1. Have one person support the weight of the switch while another person uses the screwdriver to remove the front mounting screws that attach the chassis mounting brackets to the rack or cabinet.
2. Remove the QFX5100 device from the rack or cabinet.
3. Use the screwdriver to remove the mounting screws that attach the mounting blades attached to the rear of the rack or cabinet.
4. Place the removed screws and mounting blades in a labeled bag. You will need them when you reinstall the chassis.
5. Transport the QFX5100 device to your desired new location.

Removing a QFX3600 or QFX3600-I Device from a Rack or Cabinet

Before removing a QFX3600 or QFX3600-I device from a rack:

Ensure that you have the following parts and tools available:

- A Phillips (+) screwdriver, number 2 or number 3, depending on the size of your rack mounting screws, for mounting the QFX3600 or QFX3600-I device on the rack.

If you need to relocate an installed QFX3600 or QFX3600-I device, use the procedure described in this topic. (The remainder of this topic uses "rack" to mean "rack or cabinet.")

NOTE: When you remove multiple devices from a rack, remove the device in the top of the rack first and proceed to remove the rest of the devices from top to bottom.

- Ensure that the rack is stable and secured to the building.

- Ensure that there is enough space to place the removed QFX3600 or QFX3600-I device in its new location and along the path to the new location.

- Read *General Safety Guidelines and Warnings*.

- Ensure that the QFX3600 or QFX3600-I device has been safely powered off (see) and that you have unplugged (disconnected) the power cords.

- Ensure that you have disconnected any cables or wires attached to the QFX3600 or QFX3600-I device ports.

To remove a QFX3600 or QFX3600-I device from a rack or cabinet:

1. Have one person support the weight of the device while another person uses the screwdriver to remove the mounting screws that attach the chassis front-mounting or mid-mounting brackets to the rack or cabinet.
2. Remove the QFX3600 or QFX3600-I device from the rack or cabinet.
3. If you installed the chassis on a four-post rack using the installation blades, use the screwdriver to remove the mounting screws that attach the installation blades to the rear of the rack.
4. Save the removed screws and installation blades. You will need them when you reinstall the chassis.
5. Transport the QFX3600 or QFX3600-I device to your desired new location.

RELATED DOCUMENTATION

Mounting a QFX3600 or QFX3600-I Device on Two Posts in a Rack or Cabinet

Mounting a QFX3600 or QFX3600-I Device on Four Posts in a Rack or Cabinet

Removing a QFX3500 Device from a Rack or Cabinet

Before removing a QFX3500 device from a rack:

Ensure that you have the following parts and tools available:

- A Phillips (+) screwdriver, number 2 or number 3, depending on the size of your rack mounting screws, for mounting the QFX3500 device on the rack.

If you need to relocate an installed QFX3500 device, use the procedure described in this topic. (The remainder of this topic uses "rack" to mean "rack or cabinet.")

> **NOTE**: When you remove multiple devices from a rack, remove the device in the top of the rack first and proceed to remove the rest of the devices from top to bottom.

- Ensure that the rack is stable and secured to the building.

- Ensure that there is enough space to place the removed QFX3500 device in its new location and along the path to the new location.

- Read *General Safety Guidelines and Warnings*.

- Ensure that the QFX3500 device has been safely powered off (see "Powering Off a QFX3500 Device" on page 435) and that you have unplugged (disconnected) the power cords.

- Ensure that you have disconnected any cables or wires attached to the QFX3500 device ports.

To remove a QFX3500 device from a rack or cabinet:

1. Have one person support the weight of the device while another person uses the screwdriver to remove the mounting screws that attach the chassis front-mounting brackets to the rack or cabinet.
2. Remove the QFX3500 device from the rack or cabinet.
3. Use the screwdriver to remove the mounting screws that attach the mounting blades attached to the rear of the rack or cabinet.
4. Place the removed screws and mounting blades in a labeled bag. You will need them when you reinstall the chassis.
5. Transport the QFX3500 device to your desired new location.

RELATED DOCUMENTATION

Mounting a QFX3500 Device in a Rack or Cabinet

CHAPTER 30

Replacing QFX5110 Components

IN THIS CHAPTER

Installing a Fan Module in a QFX5110

Before you install a fan module in a QFX5110, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).

The fan modules in a QFX5110 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.

⚠ **CAUTION**: Replace a failed fan module with a new fan module within 1 minute of removal to prevent chassis overheating. Before removing the fan module, ensure you have a replacement fan module at hand.

NOTE: The fan module provides FRU-to-port or port-to-FRU airflow, depending on the switch product SKU you purchase. In legacy switches, or switches with an LCD, this airflow is called front to back and back to front.

To install a fan module in a QFX5110 (see):

1. Attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Taking care not to touch the connectors, remove the fan module from its bag.
3. Align the module with the open slot on the management panel of the chassis and slide it in until it is fully seated.

Figure 160: Installing a Fan Module in a QFX5110
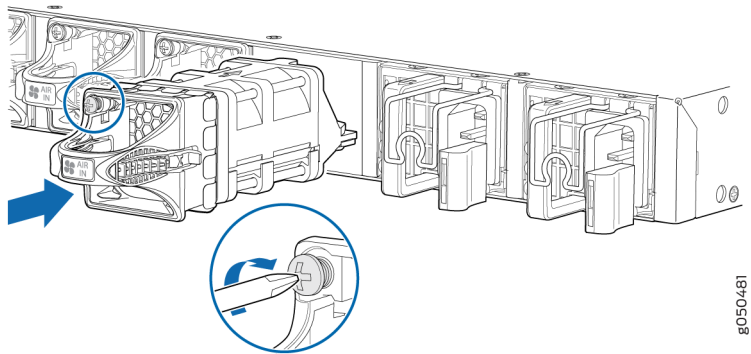
> ⚠ **CAUTION**: Damage can occur if you attempt to install a fan module into a chassis with a different airflow direction. Compare the switch product SKU with the airflow marking on the handle to ensure that you are installing a fan module with the same airflow direction as the chassis. The fan modules are designed so that they can only be inserted into the QFX5110 product SKU that supports the same airflow type. See *QFX5110 Cooling System and Airflow Description* for more information.

4. Using a Phillips screwdriver, turn the locking screw until it is tight.

Removing a Fan Module from a QFX5110

Before you remove a fan module from a QFX5110, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).

Ensure that you have the following parts and tools available to remove a fan module from a QFX5110:

- ESD grounding strap

- Antistatic bag or an antistatic mat

The fan modules in the QFX5110 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.

> ⚠️ **CAUTION**: Replace a failed fan module with a new fan module within 1 minute of removal to prevent chassis overheating. Before removing the fan module, ensure you have a replacement fan module at hand.

To remove a fan module from a QFX5110 (see Figure 161 on page 444):

1. Place the antistatic bag or the antistatic mat on a flat, stable surface.
2. Attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
3. Using a Phillips screwdriver, loosen the locking screw (three or four turns).
4. Grasp the handle on the fan module and squeeze the outside of the handle to release the module.

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

5. Pull firmly to slide the fan module halfway out of the chassis.
6. When the fan stops spinning, slide the fan module completely out of the chassis.
7. Place the fan module in the antistatic bag or on the antistatic mat placed on a flat, stable surface.

Figure 161: Removing a Fan Module from a QFX5110
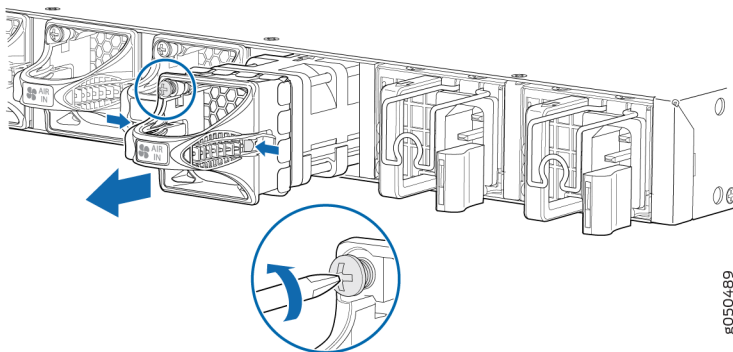
> **NOTE**: When a fan module is removed, the CLI message "**Fan/Blower is Absent**" is logged in the system log, and the system raises a minor alarm.

Installing a Power Supply in a QFX5110

- Before you install a power supply in a QFX5110, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).

- Ensure that the airflow direction of the power supply is the same as the chassis. Labels on the power supply handle indicate the direction of airflow. See *QFX5110 Cooling System and Airflow Description* for more information.

All QFX5110 switches, except the QFX5110-32Q-CHAS are shipped from the factory with two power supplies. Each power supply is a hot-removable and hot-insertable field-replaceable unit (FRU) when the second power supply is installed and running. You can install replacement power supplies in the two slots next to the fan modules without powering off the switch or disrupting the switching function.

To install a power supply in a QFX5110 (see):

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

2. Taking care not to touch power supply components, pins, leads, or solder connections, remove the power supply from its bag.

> ⚠️ **CAUTION**: Verify that the direction of the arrow on the power supply handle matches the direction of airflow in the chassis. Ensure that each power supply you install in the chassis has the same airflow direction. If you install power supplies with two different airflow directions, Junos OS raises an alarm, and the status (**ALM**) LED blinks amber.

3. Using both hands, lift the power supply and place it over the EMI gasket (if present) in the power supply slot and slide the power supply into place.

Figure 162: Installing a Power Supply in a QFX5110-32Q with EMI Gasket

Lift the power supply
over the edge of the gasket
before inserting.

EMI gasket

g050745
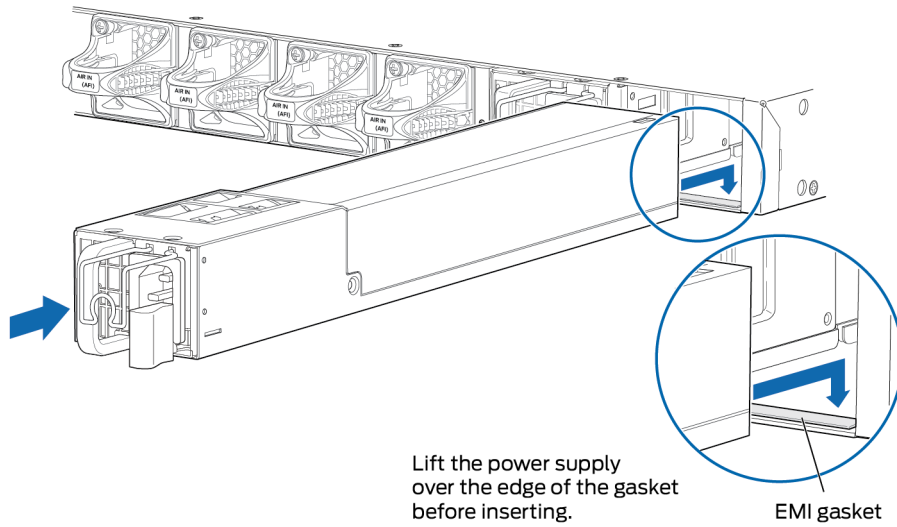
> **NOTE**: The EMI gasket is not present in QFX5110-48S switch.

4. Ensure the power supply is fully seated and the locking lever is in place.

Figure 163: Installing a Power Supply in a QFX5110-48S

g050268

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

> **NOTE**: If you have a Juniper Care service contract, register any addition, change, or upgrade of hardware components at https://www.juniper.net/customers/support/tools/updateinstallbase/. Failure to do so can result in significant delays if you need replacement parts. This note does not apply if you replace existing components with the same type of component.

Removing a Power Supply from a QFX5110

Before you remove a power supply from a QFX5110, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).

Ensure that you have the following parts and tools available to remove a power supply from a QFX5110:

- ESD grounding strap

- Antistatic bag or an antistatic mat

- Phillips (+) screwdriver, number 2 (DC power supply)

All QFX5110 switches, except the QFX5110-32Q-CHAS are shipped from the factory with two power supplies. Each power supply is a hot-removable and hot-insertable field-replaceable unit (FRU) when the second power supply is installed and running. You can install replacement power supplies in the two slots next to the fan modules without powering off the switch or disrupting the switching function.

> ⚠ **CAUTION**: Replace the power supply with a new power supply within 1 minute of removal to prevent chassis overheating.

To remove a power supply from a QFX5110 (see Figure 164 on page 448):

1. Place the antistatic bag or the antistatic mat on a flat, stable surface.
2. Attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.

> **NOTE**: If only one power supply is installed in your QFX5110, you need to power off the switch before removing the power supply. See *Powering Off a QFX5110*.

3. Disconnect power to the switch:

- AC power supply—If the AC power source outlet has a power switch, set it to the off (O) position. If the AC power source outlet does not have a power switch, gently pull out the plug end of the power cord connected to the power source outlet.

- DC power supply—Switch the circuit breaker on the panel board that services the DC circuit to the off position.

4. Remove the power source cable from the power supply faceplate:

- AC power supply—Remove the power cord from the power supply faceplate by detaching the power cord retainer and gently pulling out the socket end of the power cord connected to the power supply faceplate.

- DC power supply—Remove the screws securing the ring lugs attached to the power source cables to the power supply using the screwdriver, and remove the power source cables from the power supply. Replace the screws on the terminals and tighten them.

5. Slide the locking lever toward the handle until it stops.

6. Grasp the power supply handle and pull firmly to slide the power supply halfway out of the chassis.

7. Place one hand under the power supply to support it and slide it completely out of the chassis. Take care not to touch power supply components, pins, leads, or solder connections.

8. Place the power supply in the antistatic bag or on the antistatic mat placed on a flat, stable surface.

Figure 164: Removing a Power Supply from a QFX5110
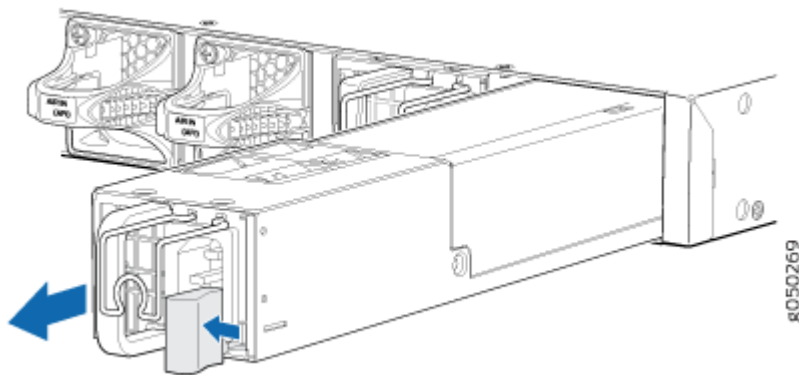
CHAPTER 31

Replacing QFX5100 Components

Installing and Removing QFX5100 Device Hardware Components

The QFX5100 switch chassis is a rigid sheet-metal structure that houses the hardware components. The field-replaceable units (FRUs) in QFX5100 devices are:

- Power supply

- Fan module

- Expansion module (QFX5100-24Q and QFX5100-24Q-AA only)

- SFP+ transceiver

- QSFP+ transceiver

All of the QFX5100 device FRUs are hot-insertable and hot-removable: you can remove and replace them without powering off the switch or disrupting switch functions.

> ⚠️ **CAUTION**: Replace a failed power supply with a new power supply within 1 minute of removal to prevent chassis overheating. Replace a failed fan module with a new fan within 1 minute of removal to prevent chassis overheating.

To install a power supply in a QFX5100 device, follow the instructions in *Installing a Power Supply in a QFX5100 Device*. To remove a power supply from a QFX5100 device, follow the instructions in *Removing a Power Supply from a QFX5100 Device*.

To install a fan module in a QFX5100 device, follow the instructions in *Installing a Fan Module in a QFX5100 Device*. To remove a fan module from a QFX5100 device, follow the instructions in *Removing a Fan Module from a QFX5100 Device*.

To install an SFP+ or QSFP+ transceiver in a QFX5100 device, follow the instructions in *Installing a Transceiver in a QFX Series Device*. To remove an SFP+ or QSFP+ transceiver from a QFX5100 device, follow the instructions in *Removing a Transceiver from a QFX Series Device*.

To connect a fiber-optic cable to an SFP+ or QSFP+ transceiver in a QFX5100 device, follow the instructions in *Connecting a Fiber-Optic Cable to a QFX Series Device*. To disconnect a fiber-optic cable from an SFP+ or QSFP+ transceiver from a QFX5100 device, follow the instructions in *Disconnecting a Fiber-Optic Cable from a QFX Series Device*.

Installing a Power Supply in a QFX5100 Device

- Before you install a power supply in a QFX5100 device, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).

- Ensure that the airflow direction of the power supply is the same as the chassis. Labels on the power supply handle indicate the direction of airflow. See *Cooling System and Airflow in a QFX5100 Device* for more information.

The QFX5100 is shipped from the factory with two power supplies. Each power supply is a hot-removable and hot-insertable field-replaceable unit (FRU) when the second power supply is installed and running. You can install replacement power supplies in the two slots next to the fan modules without powering off the switch or disrupting the switching function.

To install a power supply in a QFX5100 device (see Figure 165 on page 451 and Figure 166 on page 451):

1. Attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Taking care not to touch power supply components, pins, leads, or solder connections, remove the power supply from its bag.

⚠ **CAUTION**: Verify that the direction of the arrow on the power supply handle matches the direction of airflow in the chassis. Ensure that each power supply you install in the chassis has the same airflow direction. If you install power supplies with two different airflow directions, Junos OS raises an alarm, and the status (**ALM**) LED blinks amber.

3. Using both hands, place the power supply in the power supply slot on the FRU panel of the switch and slide it in until it is fully seated and the locking lever slides into place.

Figure 165: Installing a Power Supply in a 1 U QFX5100 Device
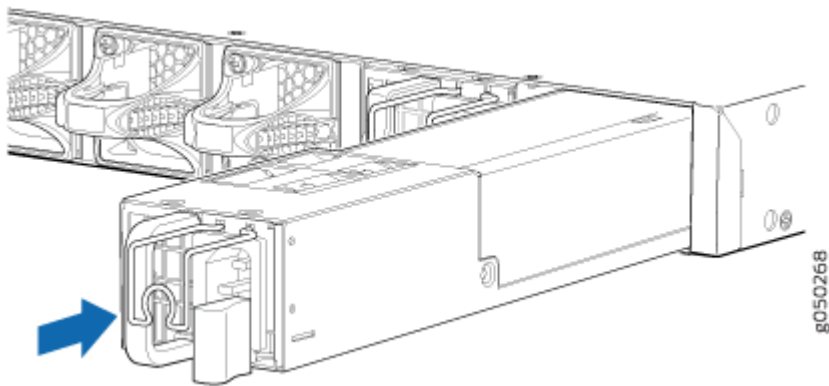
Figure 166: Installing a Power Supply in a QFX5100-96S Device

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

> **NOTE**: If you have a Juniper Care service contract, register any addition, change, or upgrade of hardware components at https://www.juniper.net/customers/support/tools/updateinstallbase/ . Failure to do so can result in significant delays if you need replacement parts. This note does not apply if you replace existing components with the same type of component.

Removing a Power Supply from a QFX5100 Device

Before you remove a power supply from a QFX5100 device, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).

Ensure that you have the following parts and tools available to remove a power supply from a QFX5100 device:

- ESD grounding strap

- Antistatic bag or an antistatic mat

- Phillips (+) screwdriver, number 2 (DC power supply)

The QFX5100 is shipped from the factory with two power supplies. Each power supply is a hot-removable and hot-insertable field-replaceable unit (FRU) when the second power supply is installed and running. You can install replacement power supplies in the two slots next to the fan modules without powering off the switch or disrupting the switching function.

> ⚠ **CAUTION**: Replace the power supply with a new power supply within 1 minute of removal to prevent chassis overheating.

To remove a power supply from a QFX5100 device (see Figure 167 on page 453 and Figure 168 on page 454):

1. Place the antistatic bag or the antistatic mat on a flat, stable surface.
2. Attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.

> **NOTE**: If only one power supply is installed in your QFX5100 device, you need to power off the switch before removing the power supply. See *Power Off a QFX5100 Device*.

3. Disconnect power to the switch:

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

- DC power supply—Switch the circuit breaker on the panel board that services the DC circuit to the OFF position.

4. Remove the power source cable from the power supply faceplate:

- AC power supply—Remove the power cord from the power supply faceplate by detaching the power cord retainer and gently pulling out the socket end of the power cord connected to the power supply faceplate.

- DC power supply—Remove the screws securing the ring lugs attached to the power source cables to the power supply using the screwdriver, and remove the power source cables from the power supply. Replace the screws on the terminals and tighten them.

5. Slide the locking lever toward the handle until it stops.

6. Grasp the power supply handle and pull firmly to slide the power supply halfway out of the chassis.

7. Place one hand under the power supply to support it and slide it completely out of the chassis. Take care not to touch power supply components, pins, leads, or solder connections.
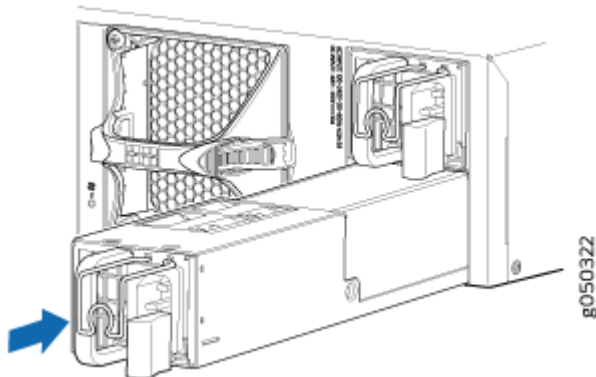
8. Place the power supply in the antistatic bag or on the antistatic mat placed on a flat, stable surface.

Figure 167: Removing a Power Supply from a 1 U QFX5100 Device
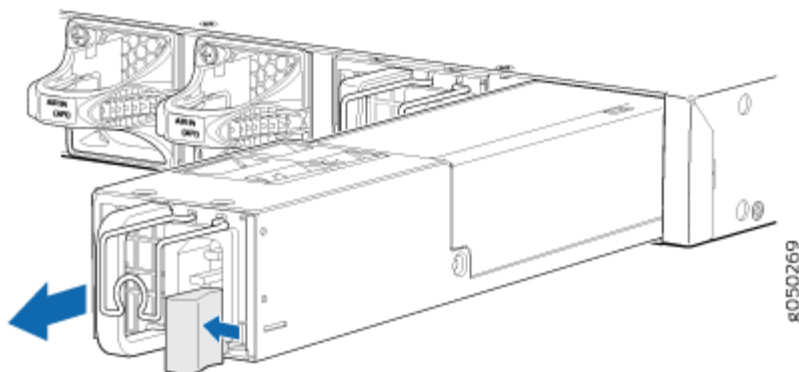
Figure 168: Removing a Power Supply from a QFX5100-96S Device
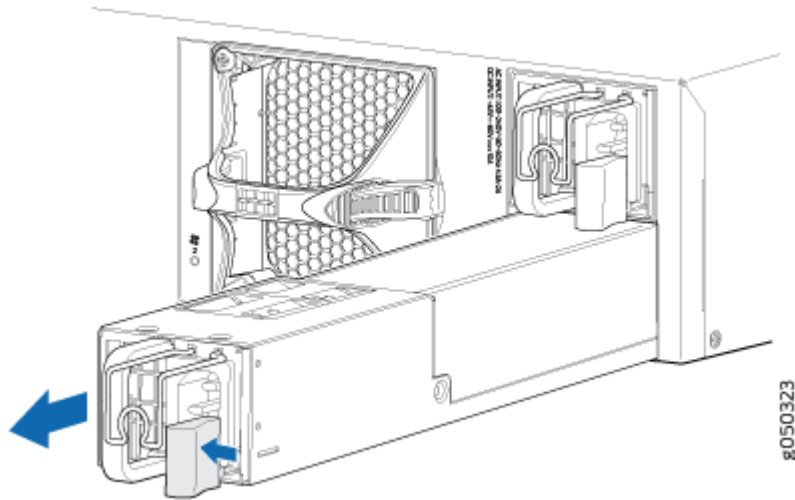
Installing an Expansion Module in a QFX5100 Device

Before you begin installing an expansion module in the switch, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).

Ensure that you have the following parts and tools available:

- 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

The QFX5100-24Q device allows up to two expansion modules to be added to the port panel to increase port density. The QFX5100-24Q device holds two bays of expansion modules that can be mixed and matched as desired. The supported modules are:

- QFX-EM-4Q–Each module adds four Quad Enhanced Small Form-Factor Pluggable (QSFP+) ports. See .

Figure 169: QFX-EM-4Q Expansion Module
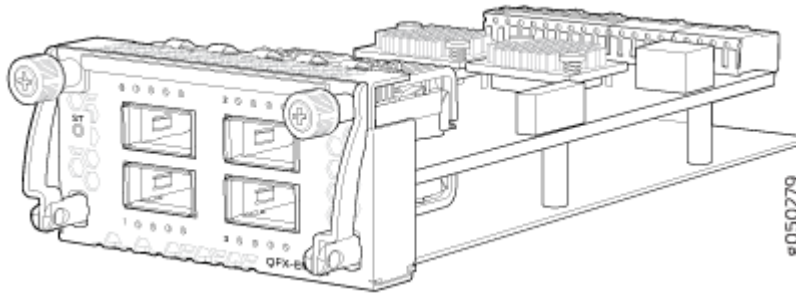
- EX4600-EM-8F—Each module adds eight 10 Gigabit SFP+ ports. See .

Figure 170: EX4600-EM-8F Expansion Module
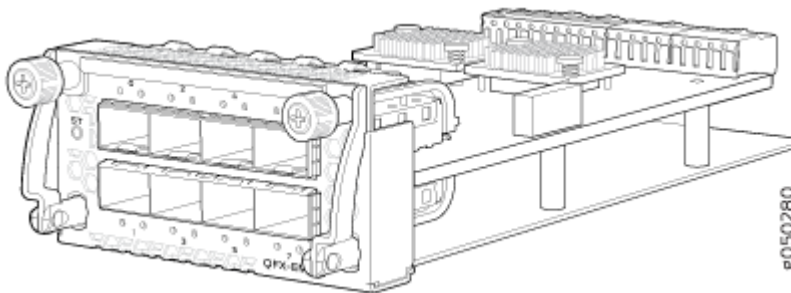
The QFX5100-24Q device is configured for the QFX-EM-4Q by default, but any combination of the two modules is supported. Expansion modules can be hot-inserted or hot-removed. However, when an EX4600-EM-8F is inserted instead of the default QFX-EM-4Q, the new configuration causes the PFE to reboot and all of the interfaces to go down temporarily, causing a short disruption in traffic.

The QFX5100-24Q-AA switch supports the double-wide QFX-PFA-4Q expansion module, in addition to the QFX-EM-4Q (see) and the EX4600-EM-8F (see). The QFX-PFA-4Q module adds four 40-Gigabit Ethernet QSFP+ ports (see).

Figure 171: QFX-PFA-4Q Expansion Module
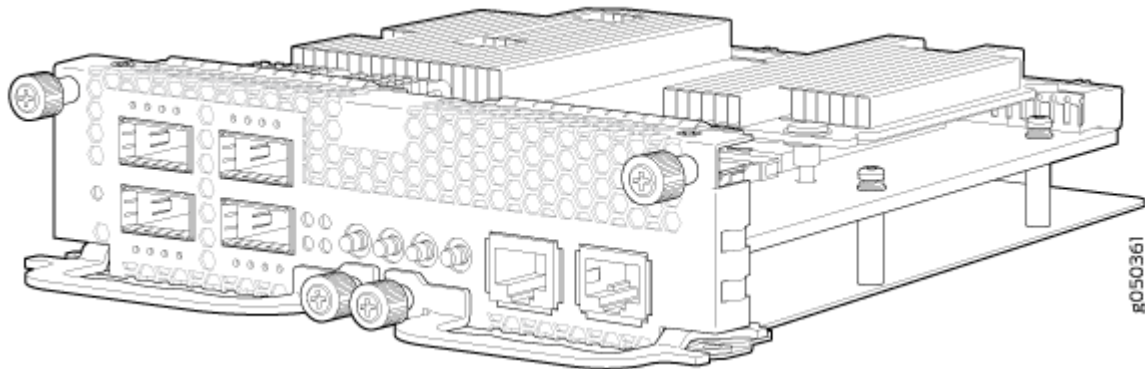
> NOTE: When an expansion module is installed in the switch or an existing expansion module is replaced with another expansion module, the switch detects the ports on the expansion module. The switch creates the required interfaces when transceivers are installed in these ports.

To install an expansion module in a QFX5100-24Q or a QFX5100-24Q-AA device (see Figure 172 on page 457 and Figure 173 on page 457):

1. Attach the 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 expansion module in its antistatic bag in one hand and touch the exposed metallic part of the switch with the other hand to ground yourself and the component.

2. If the module slot has a cover panel on it, remove the cover panel by using the screwdriver and save it for later use.

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

4. Loosen the captive screws on the front faceplate of the expansion module by using your fingers. If you are unable to loosen the captive screws by using your fingers, use the screwdriver.

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

   > NOTE: After you have removed an expansion module, wait for at least 5 seconds before you install an expansion module. If you do not wait for at least 5 seconds, the interfaces on the expansion module might not come up.

6. Raise the handle and tighten the captive screws by using your fingers or the screwdriver. For the QFX5100-24Q-AA, retract the ejector handles and tighten the captive screws by using your fingers

or the screwdriver (see Figure 173 on page 457). When the **ST** LED turns green, the expansion
module is ready for use.

Figure 172 on page 457 shows how to install a QSFP+ expansion module on the port panel of a
QFX5100-24Q device.

Figure 172: Installing a QFX-EM-4Q Expansion Module in a QFX5100-24Q Device
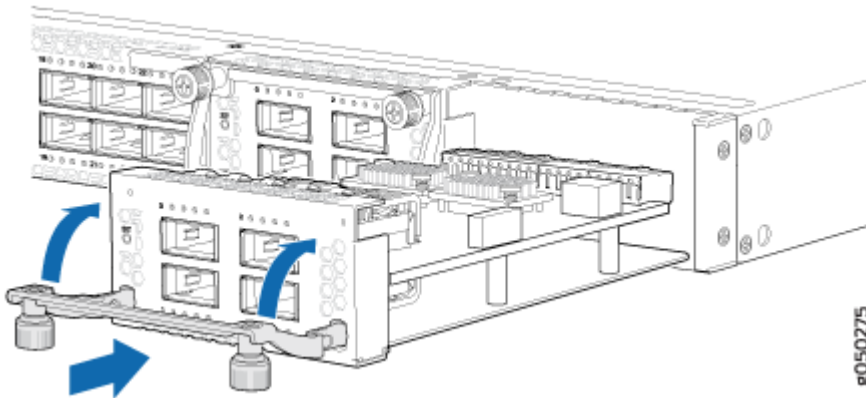
Figure 173 on page 457 shows how to install a QFX-PFA-4Q on the port panel of a QFX5100-24Q-AA
switch.

Figure 173: Installing a QFX-PFA-4Q Expansion Module in a QFX5100-24Q-AA Device
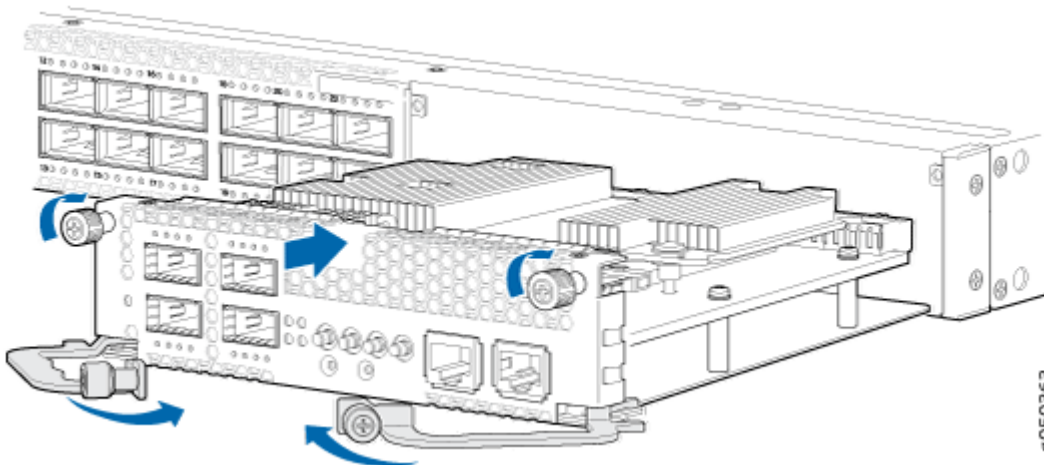
> **NOTE**: When you install the QFX-PFA-4Q expansion module in a QFX5100-24Q-AA switch and reboot the switch, the two NIC ports in the NIC inside the QFX5100-24Q-AA switch are enabled automatically. When you install other expansion modules (QFX-EM-4Q or EX4600-EM-8F), the NIC ports are enabled only when an EX4600-EM-8F is installed in slot 2 (QIC1), that is, the expansion module slot located on your right as you face the QFX5100-24Q-AA. To verify that the NIC ports are enabled, run the `show interfaces terse` command. For a QFX-PFA-4Q, the NIC interface names are displayed in the command output as, `xe-0/0/40` and `xe-0/0/41`. For an EX4600-EM-8F installed in slot 2 (QIC1), the NIC interfaces are displayed as `xe-0/0/24` and `xe-0/0/25`.

> **NOTE**: If you have a Juniper Care service contract, register any addition, change, or upgrade of hardware components at https://www.juniper.net/customers/support/tools/updateinstallbase/ . 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 expansion module. It does not apply if you replace these components with the same type of component.

Removing an Expansion Module from a QFX5100 Device

Before you begin removing an expansion module from the switch:

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

- If there are any transceivers installed in the expansion module, remove them before you remove the expansion module. For instructions on removing transceivers, see *Removing a Transceiver from a QFX Series Device*.

Ensure that you have the following parts and tools available:

- ESD grounding strap

- Phillips screwdriver, number 2

- A replacement optional module or cover panel

- An antistatic bag or antistatic mat

The expansion modules used in QFX5100-24Q and QFX5100-24Q-AA devices 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: You must take the QFX5100-24Q-AA switch offline, before replacing the QFX-PFA-4Q expansion module.

CAUTION: We recommend that you install either a replacement optional module or a cover panel in the empty module slot to avoid chassis overheating and dust accumulation.

To remove an expansion module from the switch (see and):

1. Attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Unscrew both captive screws on the faceplate of the expansion module by using your fingers. If you are unable to unscrew the captive screws by using your fingers, use the screwdriver.
3. Hold the handle and gently pull the expansion module toward you and out of the module slot. For a QFX5100-24Q-AA switch, unscrew the captive screws of the ejector handles and pull the expansion module toward you and out of the module slot (see).
4. Place the expansion module in an antistatic bag or on an antistatic mat placed on a flat, stable surface.
5. If you are not replacing the expansion module with an optional module, install the cover panel over the slot.

NOTE: After you have removed an expansion module, wait for at least 5 seconds before you install an expansion module. If you do not wait for at least 5 seconds, the interfaces on the expansion module might not come up.

shows removing a QFX-EM-4Q expansion module from the port panel of a QFX5100-24Q device.

Figure 174: Removing a QFX-EM-4Q Expansion Module from a QFX5100-24Q Device
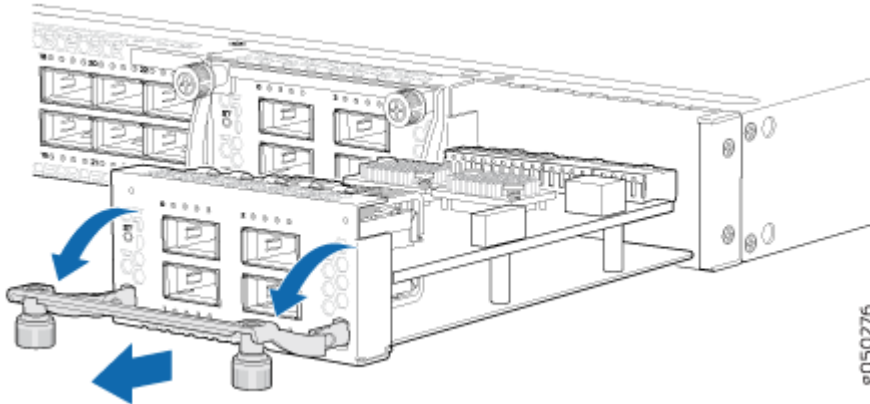
shows removing a QFX-PFA-4Q expansion module from the port panel of a QFX5100-24Q-AA switch.

NOTE: You must take the QFX-PFA-4Q offline before replacing it.

Figure 175: Removing a QFX-PFA-4Q Expansion Module from a QFX5100-24Q-AA Device
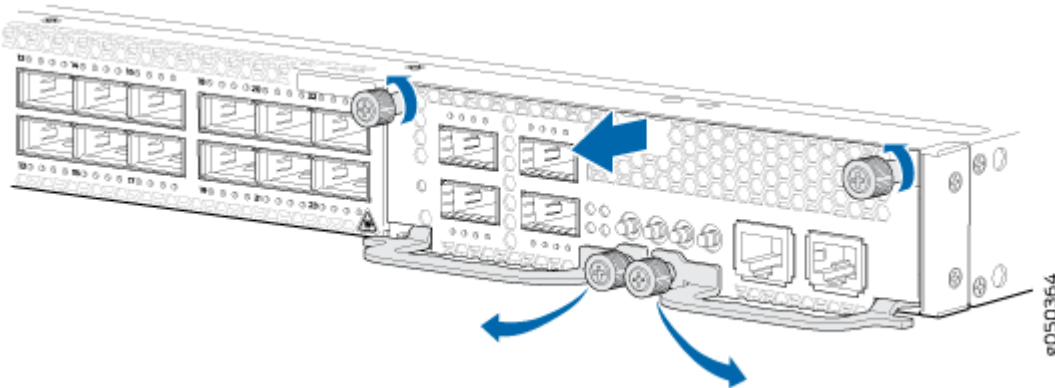
Installing a Fan Module in a QFX5100 Device

Before you install a fan module in a QFX5100 device, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).

The fan modules in a QFX5100 device 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.

> ⚠️ **CAUTION**: Replace a failed fan module with a new fan module within 1 minute of removal to prevent chassis overheating. Before removing the fan module, ensure you have a replacement fan module at hand.

> **NOTE**: The fan module provides FRU-to-port or port-to-FRU airflow depending on the switch product SKU you purchase. In legacy switches, or switches with an LCD, this airflow is called front to back and back to front.

To install a fan module in a QFX5100 device (see Figure 176 on page 461 and Figure 177 on page 462):

1. Attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Taking care not to touch the connectors, remove the fan module from its bag.
3. Align the module with the open slot on the management panel of the chassis and slide it in until it is fully seated.

> ⚠️ **CAUTION**: Damage can occur if you attempt to install a fan module into a chassis with a different airflow direction. Compare the switch product SKU with the airflow marking on the handle to ensure that you are installing a fan module with the same airflow direction as the chassis. The fan modules are designed so that they can only be inserted into the QFX5100 product SKU that supports the same airflow type. See *Cooling System and Airflow in a QFX5100 Device* for more information.

4. Using a Phillips screwdriver, turn the locking screw until it is tight.

Figure 176: Installing a Fan Module in a 1 U QFX5100 Device
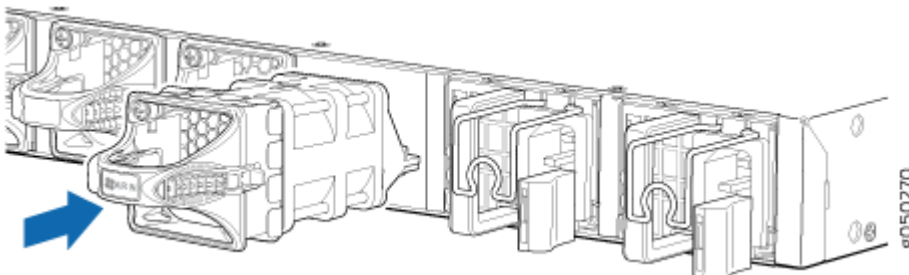
Figure 177: Installing a Fan Module in a 2 U QFX5100-96S Device
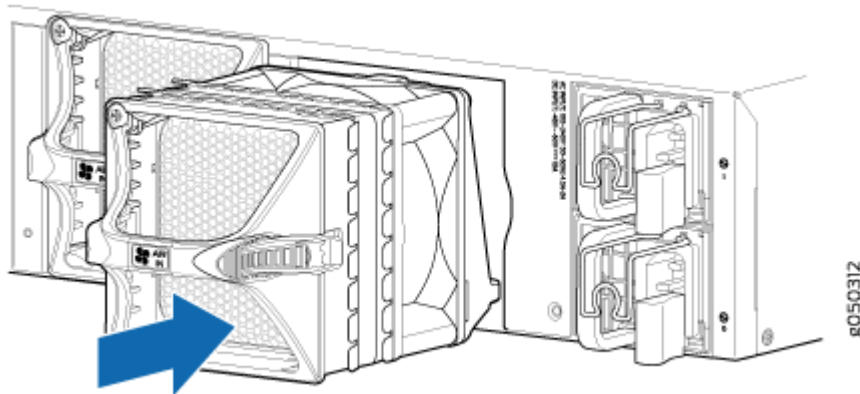
Removing a Fan Module from a QFX5100 Device

Before you remove a fan module from a QFX5100 device, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).

Ensure that you have the following parts and tools available to remove a fan module from a QFX5100 device:

- ESD grounding strap

- Antistatic bag or an antistatic mat

The fan modules in QFX5100 devices 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.

> ⚠ **CAUTION**: Replace a failed fan module with a new fan module within 1 minute of removal to prevent chassis overheating. Before removing the fan module, ensure you have a replacement fan module at hand.

To remove a fan module from a QFX5100 device (see Figure 178 on page 463 and Figure 179 on page 463):

1. Place the antistatic bag or the antistatic mat on a flat, stable surface.
2. Attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
3. Using a Phillips screwdriver, loosen the locking screw (3 or 4 turns).

4. Grasp the handle on the fan module and squeeze the outside of the handle to release the module.

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

5. Pull firmly to slide the fan module halfway out of the chassis.

6. When the fan stop spinning, slide the fan module completely out of the chassis.

7. Place the fan module in the antistatic bag or on the antistatic mat placed on a flat, stable surface.

Figure 178: Removing a Fan Module from a 1 U QFX5100 Device
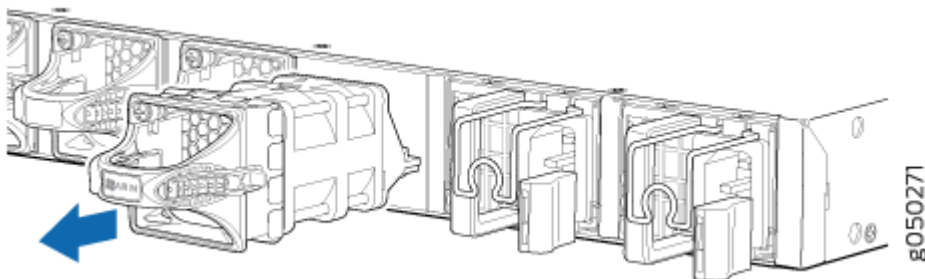
Figure 179: Removing a Fan Module from a 2 U QFX5100-96S Device
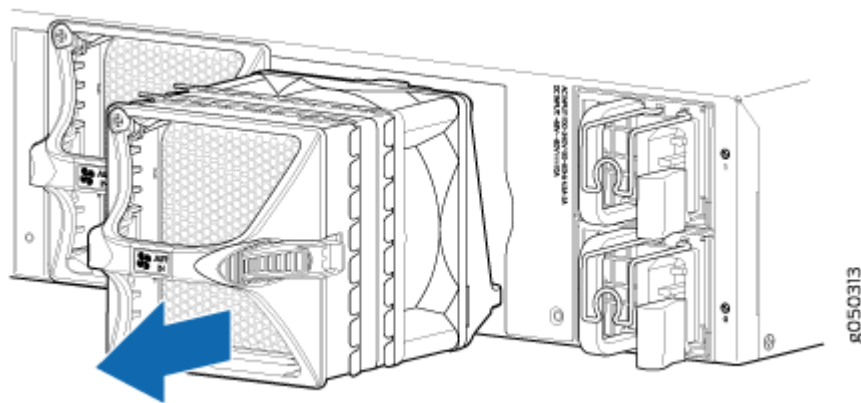
> **NOTE**: When a fan module is removed, the CLI message **Fan/Blower is Absent** is logged in the system log, and the system raises a minor alarm.

CHAPTER 32

Replacing QFX3600 Components

Installing and Removing QFX3600 or QFX3600-I Device Hardware Components

The QFX3600 or QFX3600-I device chassis is a rigid sheet-metal structure that houses the hardware components. The field-replaceable units (FRUs) in QFX3600 and QFX3600-I devices are:

- Power supplies

- Fan trays

- SFP transceivers on management ports labeled **C0S** and **C1S**

- QSFP+ transceivers on access and uplink ports labeled **Q0** through **Q15**

All of the QFX3600 and QFX3600-I device FRUs are hot-insertable and hot-removable: you can remove and replace them without powering off the device or disrupting device functions.

> ⚠️ **CAUTION**: Replace a failed power supply with a blank panel or new power supply within 1 minute of removal to prevent chassis overheating. Replace a failed fan tray with a new fan tray within 1 minute of removal to prevent chassis overheating.

To install a power supply in a QFX3600 or QFX3600-I device, follow the instructions in *Installing a Power Supply in a QFX3600 or QFX3600-I Device*. To remove a power supply from a QFX3600 or

QFX3600-I device, follow the instructions in *Removing a Power Supply from a QFX3600 or QFX3600-I Device*.

To install a fan tray in a QFX3600 or QFX3600-I device, follow the instructions in *Installing a Fan Tray in a QFX3600 or QFX3600-I Device*. To remove a fan tray from a QFX3600 or QFX3600-I device, follow the instructions in *Removing a Fan Tray from a QFX3600 or QFX3600-I Device*.

To install an SFP or QSFP+ transceiver in a QFX3600 or QFX3600-I device, follow the instructions in *Installing a Transceiver in a QFX Series Device*. To remove an SFP or QSFP+ transceiver from a QFX3600 or QFX3600-I device, follow the instructions in *Removing a Transceiver from a QFX Series Device*.

To connect a fiber-optic cable to an SFP or QSFP+ transceiver in a QFX3600 or QFX3600-I device, follow the instructions in *Connecting a Fiber-Optic Cable to a QFX Series Device*. To disconnect a fiber-optic cable from an SFP or QSFP+ transceiver from a QFX3600 or QFX3600-I device, follow the instructions in *Disconnecting a Fiber-Optic Cable from a QFX Series Device*.

RELATED DOCUMENTATION

AC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

DC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

Cooling System and Airflow for QFX3600 and QFX3600-I Devices

Front Panel of a QFX3600 Device

Rear Panel of QFX3600 and QFX3600-I Devices

Determining Transceiver Support for QFabric Systems

Removing a Power Supply from a QFX3600 or QFX3600-I Device

Before you remove a power supply from a QFX3600 or QFX3600-I device, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).

Ensure that you have the following parts and tools available to remove a power supply from a QFX3600 or QFX3600-I device:

- ESD grounding strap

- An antistatic bag or an antistatic mat

The power supplies in QFX3600 and QFX3600-I devices are hot-removable and hot-insertable field-replaceable units (FRUs): you can remove and replace them without powering off the device or disrupting device functions.

> ⚠️ **CAUTION**: Replace a failed power supply with a blank panel or new power supply within 1 minute of removal to prevent chassis overheating.

To remove a power supply from a QFX3600 or QFX3600-I device (see Figure 180 on page 467):

1. Place the antistatic bag or the antistatic mat on a flat, stable surface.
2. Attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.

> **NOTE**: If only one power supply is installed in your QFX3600 or QFX3600-I device, you need to power off the switch before removing the power supply. See "Powering Off a QFX3600 Device" on page 433.

3. Disconnect power to the power supply:

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

   - DC power supply—Switch the circuit breaker on the panel board that services the DC circuit to the OFF position.

4. Remove the power source cable from the power supply faceplate:

   - AC power supply—Remove the power cord from the power supply faceplate by detaching the power cord retainer and gently pulling out the socket end of the power cord connected to the power supply faceplate.

   - DC power supply—Remove the screws securing the ring lugs attached to the power source cables to the power supply using the screwdriver, and remove the power source cables from the power supply. Replace the screws on the terminals and tighten them.

5. Slide the locking lever toward the handle until it stops.
6. Grasp the power supply handle and pull firmly to slide the power supply halfway out of the chassis.
7. Place one hand under the power supply to support it and slide it completely out of the chassis. Take care not to touch power supply components, pins, leads, or solder connections.
8. Place the power supply in the antistatic bag or on the antistatic mat placed on a flat, stable surface.

Figure 180: Removing a Power Supply from a QFX3600 or QFX3600-I Device


> **NOTE**: If you have a Juniper Care service contract, register any addition, change, or upgrade of hardware components at https://www.juniper.net/customers/support/tools/updateinstallbase/ . Failure to do so can result in significant delays if you need replacement parts. This note does not apply if you replace existing components with the same type of component.

RELATED DOCUMENTATION

AC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

DC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

Field-Replaceable Units for QFX3600 and QFX3600-I Devices

Rear Panel of QFX3600 and QFX3600-I Devices

Connecting AC Power to a QFX3500, QFX3600, or QFX3600-I Device

Connecting DC Power to a QFX3500, QFX3600, or QFX3600-I Device

Installing a Power Supply in a QFX3600 or QFX3600-I Device

Installing a Power Supply in a QFX3600 or QFX3600-I Device

Before you install a power supply in a QFX3600 device, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).

Ensure that you have the following parts and tools available to install a power supply in a QFX3600 device:

- ESD grounding strap

The QFX3600 and QFX3600-I devices are shipped from the factory with two 650 W power supplies pre-installed. Each power supply is a hot-removable and hot-insertable field-replaceable unit (FRU) when the second power supply is installed and running. You can install replacement power supplies on the rear panel without powering off the device or disrupting the switching function.

To install a power supply in a QFX3600 device (see Figure 181 on page 468):

1. Attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Taking care not to touch power supply components, pins, leads, or solder connections, remove the power supply from its bag.
3. Using both hands, place the power supply in the power supply slot on the rear panel of the device and slide it in until it is fully seated and the locking lever slides into place.

Figure 181: Installing a Power Supply in a QFX3600 or QFX3600-I Device

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

> **NOTE**: If you have a Juniper Care service contract, register any addition, change, or upgrade of hardware components at https://www.juniper.net/customers/support/tools/updateinstallbase/ . Failure to do so can result in significant delays if you need replacement parts. This note does not apply if you replace existing components with the same type of component.

AC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

DC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

Field-Replaceable Units for QFX3600 and QFX3600-I Devices

Rear Panel of QFX3600 and QFX3600-I Devices

AC Power Cord Specifications for a QFX Series Device

Connecting AC Power to a QFX3500, QFX3600, or QFX3600-I Device

Connecting DC Power to a QFX3500, QFX3600, or QFX3600-I Device

Removing a Power Supply from a QFX3600 or QFX3600-I Device

Removing a Fan Tray from a QFX3600 or QFX3600-I Device

Before you remove a fan tray from a QFX3600 or QFX3600-I device, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).

Ensure that you have the following parts and tools available to remove a fan tray from a QFX3600 or QFX3600-I device:

- ESD grounding strap

- An antistatic bag or an antistatic mat

The fan trays in QFX3600 and QFX3600-I devices are hot-removable and hot-insertable field-replaceable units (FRUs): you can remove and replace them without powering off the device or disrupting device functions.

> ⚠️ **CAUTION**: Replace a failed fan tray with a new fan tray within 1 minute of removal to prevent chassis overheating.

To remove a fan tray from a QFX3600 or QFX3600-I device (see):

1. Place the antistatic bag or the antistatic mat on a flat, stable surface.
2. Attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.

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

3. Grasp the handle on the fan tray and pull firmly to slide the fan tray halfway out of the chassis.

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

5. Place the fan tray in the antistatic bag or on the antistatic mat placed on a flat, stable surface.

Figure 182: Removing a Fan Tray from a QFX3600 or QFX3600-I Device

> **NOTE**: When a fan tray is removed, the CLI message **Fan/Blower is Absent** is logged in the system log, and the system raises a minor alarm.

RELATED DOCUMENTATION

Cooling System and Airflow for QFX3600 and QFX3600-I Devices

Field-Replaceable Units for QFX3600 and QFX3600-I Devices

Rear Panel of QFX3600 and QFX3600-I Devices

Installing a Fan Tray in a QFX3600 or QFX3600-I Device

Installing a Fan Tray in a QFX3600 or QFX3600-I Device

Before you install a fan tray in a QFX3600 or QFX3600-I device, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).

Ensure that you have the following parts and tools available to install a fan tray in a QFX3600 or QFX3600-I device:
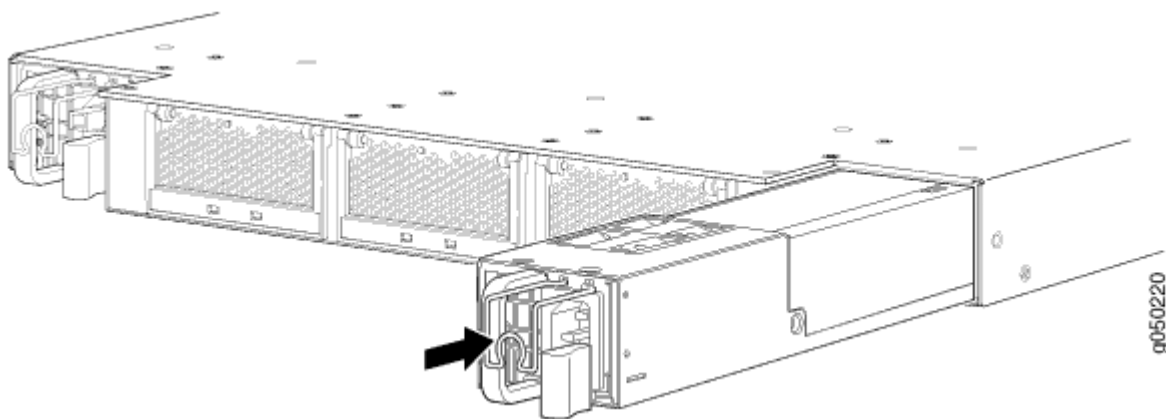
- ESD grounding strap

The fan trays in QFX3600 and QFX3600-I devices are hot-removable and hot-insertable field-replaceable units (FRUs): you can remove and replace them without powering off the device or disrupting device functions.

To install a fan tray in a QFX3600 or QFX3600-I device (see Figure 183 on page 471):

1. Attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Taking care not to touch the connectors, remove the fan tray from its bag.
3. Using both hands, align the tray with the fan tray slot on the rear panel of the chassis and slide it in until it is fully seated.

Figure 183: Installing a Fan Tray in a QFX3600 or QFX3600-I Device
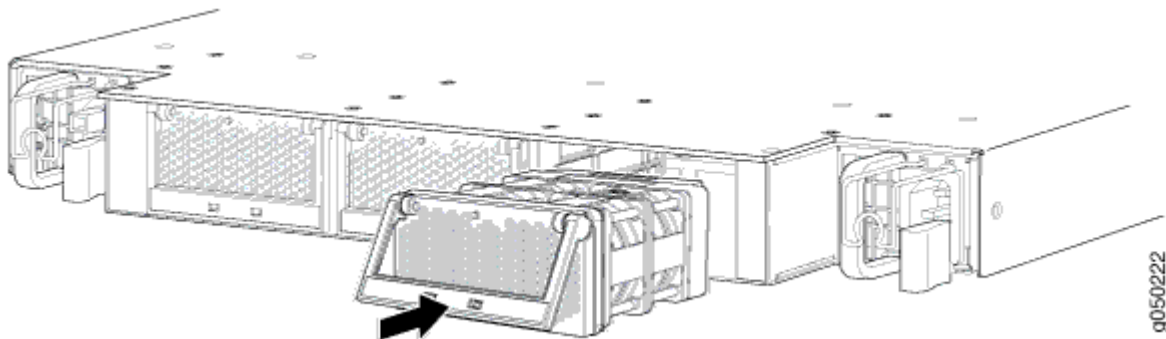
RELATED DOCUMENTATION

Cooling System and Airflow for QFX3600 and QFX3600-I Devices

Field-Replaceable Units for QFX3600 and QFX3600-I Devices

Rear Panel of QFX3600 and QFX3600-I Devices

Removing a Fan Tray from a QFX3600 or QFX3600-I Device

CHAPTER 33

Replacing QFX3500 Components

IN THIS CHAPTER

Installing and Removing QFX3500 Device Hardware Components

The QFX3500 device chassis is a rigid sheet-metal structure that houses the hardware components. The field-replaceable units (FRUs) in QFX3500 devices are:

- Power supply

- Fan tray

- Management board

- SFP transceiver

- SFP+ transceiver

- QSFP+ transceiver

All of the QFX3500 device FRUs except the management board are hot-insertable and hot-removable: you can remove and replace them without powering off the device or disrupting device functions. You must power off the QFX3500 device before replacing the management board.

> ⚠️ **CAUTION**: Replace a failed power supply with a blank panel or new power supply within 1 minute of removal to prevent chassis overheating. Replace a failed fan tray with a new fan tray within 1 minute of removal to prevent chassis overheating.

To install a power supply in a QFX3500 device, follow the instructions in *Installing a Power Supply in a QFX3500 Device*. To remove a power supply from a QFX3500 device, follow the instructions in *Removing a Power Supply from a QFX3500 Device*.

To install a fan tray in a QFX3500 device, follow the instructions in *Installing a Fan Tray in a QFX3500 Device*. To remove a fan tray from a QFX3500 device, follow the instructions in *Removing a Fan Tray from a QFX3500 Device*.

To install a management board in a QFX3500 device, follow the instructions in *Installing a Management Board in a QFX3500 Device*. To remove a management board from a QFX3500 device, follow the instructions in *Removing a Management Board from a QFX3500 Device*.

To install an SFP, SFP+, or QSFP+ transceiver in a QFX3500 device, follow the instructions in *Installing a Transceiver in a QFX Series Device*. To remove an SFP, SFP+, or QSFP+ transceiver from a QFX3500 device, follow the instructions in *Removing a Transceiver from a QFX Series Device*.

To connect a fiber-optic cable to an SFP, SFP+, or QSFP+ transceiver in a QFX3500 device, follow the instructions in *Connecting a Fiber-Optic Cable to a QFX Series Device*. To disconnect a fiber-optic cable from an SFP, SFP+, or QSFP+ transceiver from a QFX3500 device, follow the instructions in *Disconnecting a Fiber-Optic Cable from a QFX Series Device*.

RELATED DOCUMENTATION

AC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

Cooling System and Airflow for a QFX3500 Device

Rear Panel of a QFX3500 Device

Determining Transceiver Support for QFabric Systems

Installing a Power Supply in a QFX3500 Device

- Before you install a power supply in a QFX3500 device, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).

- Ensure that the airflow direction of the power supply is the same as the chassis. Labels on the power supply handle indicate the direction of airflow. See *Cooling System and Airflow for a QFX3500 Device* for more information.

- Ensure that you have the following parts and tools available to install a power supply in a QFX3500 device:

  - ESD grounding strap

The QFX3500 is shipped from the factory with two 650 W power supplies pre-installed. Each power supply is a hot-removable and hot-insertable field-replaceable unit (FRU) when the second power supply is installed and running. You can install replacement power supplies without powering off the device or disrupting the switching function.

To install a power supply in a QFX3500 device (see):

1. Attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Taking care not to touch power supply components, pins, leads, or solder connections, remove the power supply from its bag.

   ⚠ **CAUTION**: Verify that the direction of the arrow on the power supply handle matches the direction of airflow in the chassis. Ensure that each power supply you install in the chassis has the same airflow direction. If you install power supplies with two different airflow directions, Junos OS raises an alarm, and the status (OK/!) LED blinks amber.

3. Using both hands, place the power supply in the power supply slot on the front panel of the device and slide it in until it is fully seated and the locking lever slides into place.

Figure 184: Installing a Power Supply in a QFX3500 Device
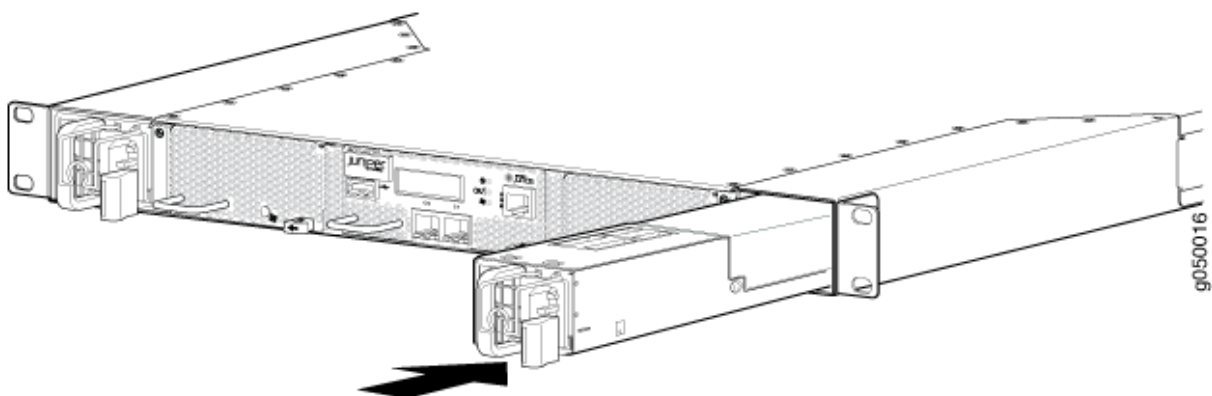
> **NOTE**: Each power supply must be connected to a dedicated power source outlet.

> **NOTE**: If you have a Juniper Care service contract, register any addition, change, or upgrade of hardware components at https://www.juniper.net/customers/support/tools/updateinstallbase/ . Failure to do so can result in significant delays if you need replacement parts. This note does not apply if you replace existing components with the same type of component.

RELATED DOCUMENTATION

AC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

Field-Replaceable Units in a QFX3500 Device

Front Panel of a QFX3500 Device

AC Power Cord Specifications for a QFX Series Device

Connecting AC Power to a QFX3500, QFX3600, or QFX3600-I Device

Connecting DC Power to a QFX3500, QFX3600, or QFX3600-I Device

Removing a Power Supply from a QFX3500 Device

Removing a Power Supply from a QFX3500 Device

Before you remove a power supply from a QFX3500 device, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).

Ensure that you have the following parts and tools available to remove a power supply from a QFX3500 device:

- ESD grounding strap

- Antistatic bag or an antistatic mat

- Phillips (+) screwdriver, number 2 (DC power supply)

The QFX3500 is shipped from the factory with two 650 W power supplies pre-installed. Each power supply is a hot-removable and hot-insertable field-replaceable unit (FRU) when the second power supply

is installed and running. You can install replacement power supplies without powering off the device or disrupting the switching function.

> ⚠️ **CAUTION**: Replace the power supply with a blank panel or new power supply within 1 minute of removal to prevent chassis overheating.

To remove a power supply from a QFX3500 device (see Figure 185 on page 477):

1. Place the antistatic bag or the antistatic mat on a flat, stable surface.
2. Attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.

> **NOTE**: If only one power supply is installed in your QFX3500 device, you need to power off the device before removing the power supply. See "Powering Off a QFX3500 Device" on page 435.

3. Disconnect power to the device:

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

   - DC power supply—Switch the circuit breaker on the panel board that services the DC circuit to the OFF position.

4. Remove the power source cable from the power supply faceplate:

   - AC power supply—Remove the power cord from the power supply faceplate by detaching the power cord retainer and gently pulling out the socket end of the power cord connected to the power supply faceplate.

   - DC power supply—Remove the screws securing the ring lugs attached to the power source cables to the power supply using the screwdriver, and remove the power source cables from the power supply. Replace the screws on the terminals and tighten them.

5. Slide the locking lever toward the handle until it stops.
6. Grasp the power supply handle and pull firmly to slide the power supply halfway out of the chassis.
7. Place one hand under the power supply to support it and slide it completely out of the chassis. Take care not to touch power supply components, pins, leads, or solder connections.
8. Place the power supply in the antistatic bag or on the antistatic mat placed on a flat, stable surface.

Figure 185: Removing a Power Supply from a QFX3500 Device
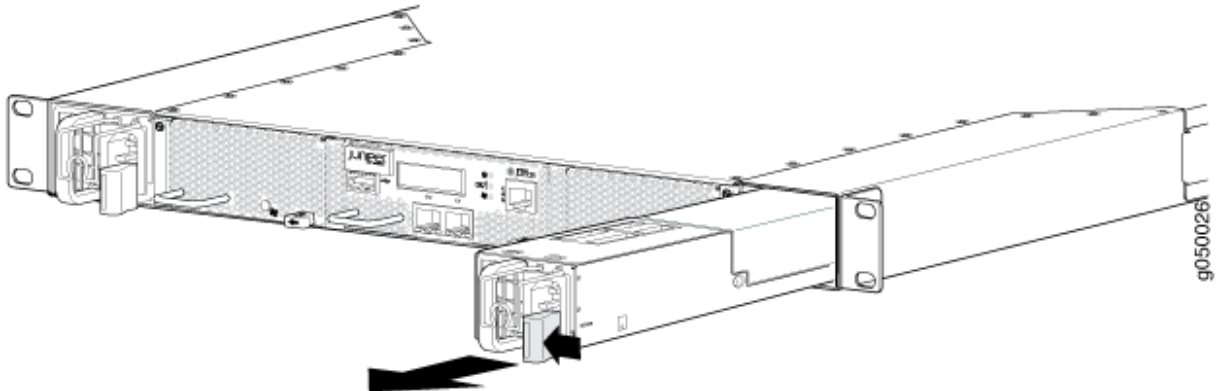
AC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

Connecting AC Power to a QFX3500, QFX3600, or QFX3600-I Device

Installing a Power Supply in a QFX3500 Device

Installing a Fan Tray in a QFX3500 Device

Before you install a fan tray in a QFX3500 device, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).

Ensure that you have the following parts and tools available to install a fan tray in a QFX3500 device:

- ESD grounding strap

The fan trays in a QFX3500 device are hot-removable and hot-insertable field-replaceable units (FRUs): you can remove and replace them without powering off the device or disrupting device functions.

> ⚠️ **CAUTION**: Replace a failed fan tray with a new fan tray within 1 minute of removal to prevent chassis overheating. Before removing the fan tray, ensure you have a replacement fan tray.

> **NOTE**: The fan tray provides FRU-to-port or port-to-FRU airflow depending on the device model you purchase.

To install a fan tray in a QFX3500 device (see Figure 186 on page 478):

1. Attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
2. Taking care not to touch the connectors, remove the fan tray from its bag.
3. Using both hands, align the tray with the fan tray slot on the front panel of the chassis and slide it in until it is fully seated and the locking lever slides into place.

> ⚠ **CAUTION**: Damage can occur if you attempt to install a fan tray into a chassis with a different airflow direction. Check the device model to ensure that you are installing a fan tray with the same airflow direction as the chassis. The fan trays are designed so that they can only be inserted into the QFX3500 device model that supports the same airflow type. See *Cooling System and Airflow for a QFX3500 Device* for more information.

Figure 186: Installing a Fan Tray in a QFX3500 Device
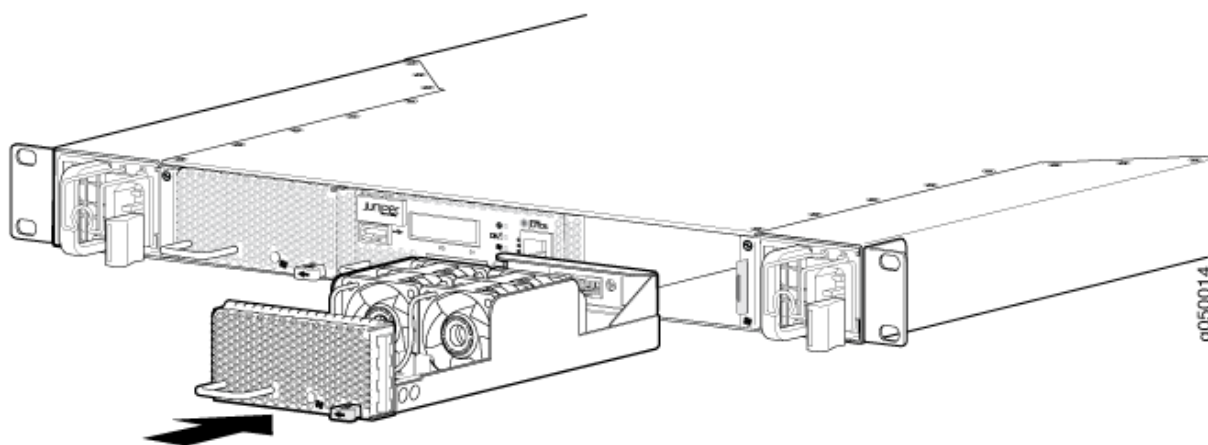
RELATED DOCUMENTATION

Removing a Fan Tray from a QFX3500 Device

Removing a Fan Tray from a QFX3500 Device

Before you remove a fan tray from a QFX3500 device, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).

Ensure that you have the following parts and tools available to remove a fan tray from a QFX3500 device:

- ESD grounding strap

- Antistatic bag or an antistatic mat

The fan trays in QFX3500 devices are hot-removable and hot-insertable field-replaceable units (FRUs): you can remove and replace them without powering off the device or disrupting device functions.

> ⚠ **CAUTION**: Replace a failed fan tray with a new fan tray within 1 minute of removal to prevent chassis overheating. Before removing the fan tray, ensure you have a replacement fan tray.

To remove a fan tray from a QFX3500 device (see Figure 187 on page 480):

1. Place the antistatic bag or the antistatic mat on a flat, stable surface.
2. Attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.
3. Slide the locking lever toward the handle until it stops.

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

4. Grasp the handle on the fan tray and pull firmly to slide the fan tray halfway out of the chassis.
5. When the fans stop 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 187: Removing a Fan Tray from a QFX3500 Device
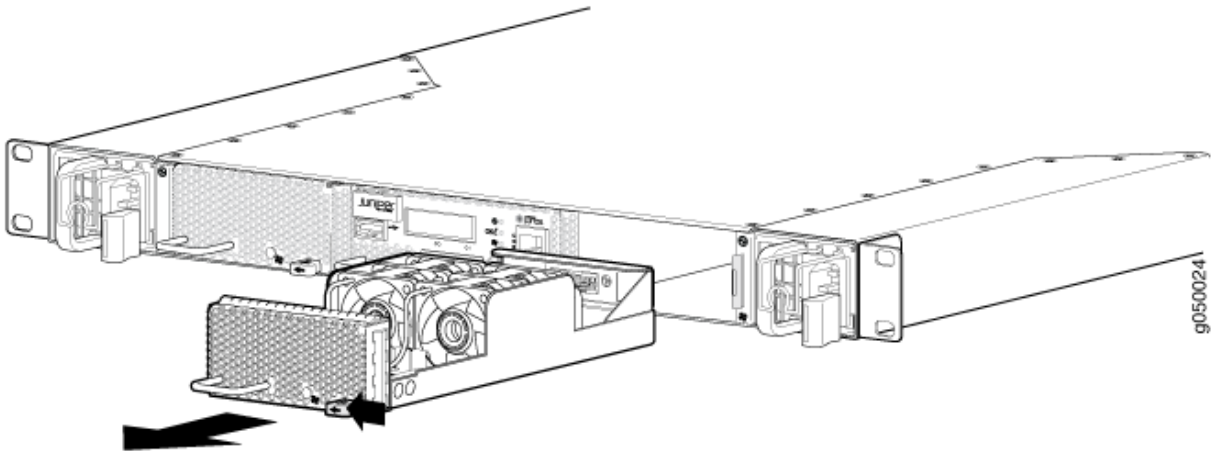
> **NOTE**: When a fan tray is removed, the CLI message **Fan/Blower is Absent** is logged in the system log, and the system raises a minor alarm.

RELATED DOCUMENTATION

Cooling System and Airflow for a QFX3500 Device

Field-Replaceable Units in a QFX3500 Device

Front Panel of a QFX3500 Device

Installing a Fan Tray in a QFX3500 Device

Installing a Management Board in a QFX3500 Device

Before you install a management board in a QFX3500 device, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).

Ensure that you have the following parts and tools available to install a management board in a QFX3500 device:

- ESD grounding strap

A QFX3500 device has a single field-replaceable unit (FRU) management board.

> ⚠ **CAUTION**: You must power off the QFX3500 device before replacing the management board.

> ◣ **NOTE**: The management board provides FRU-to-port or port-to-FRU airflow depending on the device model you purchase.

To install a management board in a QFX3500 device (see Figure 188 on page 482):

1. Ensure that the QFX3500 device is powered off (see "Powering Off a QFX3500 Device" on page 435). If the QFX3500 is operating as a Node device in a QFabric system, ensure that traffic is diverted in an orderly shutdown by using the shutdown procedure in *Adding or Replacing a Node Device in a QFabric Node Group* .
2. Attach the ESD grounding strap to your bare wrist and to a site ESD point.
3. Taking care not to touch the connectors, remove the management board from its bag.
4. Using both hands, align the tray with the management board slot on the front panel of the chassis and slide it in until it is fully seated and the locking lever slides into place.

> ⚠ **CAUTION**: Damage can occur if you attempt to install a management board into a chassis with a different airflow direction. Check the device model to ensure that you are installing a management board with the same airflow direction as the chassis. The management boards are designed so that they can only be inserted into the QFX3500 device model that supports the same airflow type. See *Cooling System and Airflow for a QFX3500 Device* for more information.

Figure 188: Installing a Management Board in a QFX3500 Device
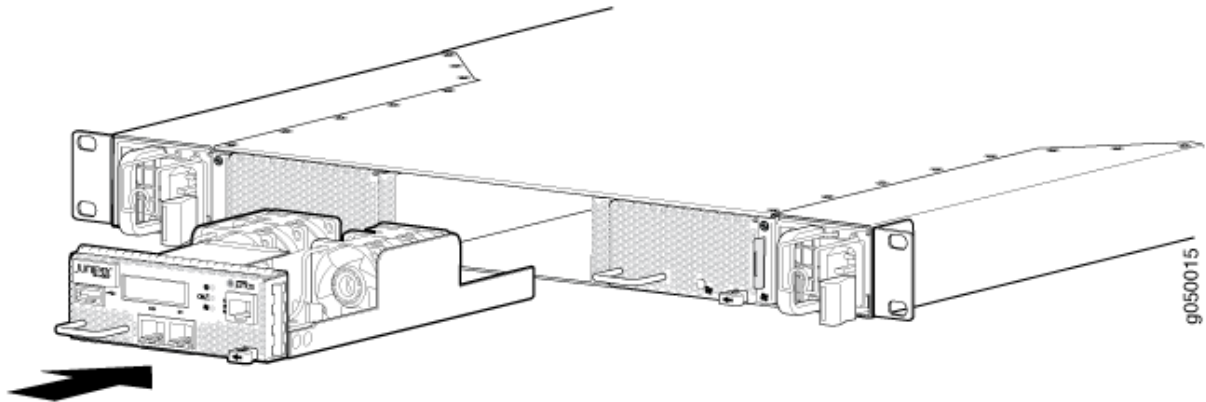
RELATED DOCUMENTATION

Management Board for a QFX3500 Device

Field-Replaceable Units in a QFX3500 Device

Connecting a QFX Series Device to a Management Console

Connecting a QFX3500 Node Device to a Copper-Based QFX3000-G QFabric System Control Plane Network

Connecting a QFX3500 Device to a Network for Out-of-Band Management | **372**

Removing a Management Board from a QFX3500 Device

Removing a Management Board from a QFX3500 Device

Before you remove a management board from a QFX3500 device, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).

Ensure that you have the following parts and tools available to remove a management board from a QFX3500 device:

- ESD grounding strap

- Antistatic bag or an antistatic mat

QFX3500 devices have a single field-replaceable unit (FRU) management board on the front panel.

> **CAUTION**: You must power off the QFX3500 device before replacing the management board. If the QFX3500 is operating as a Node device in a QFabric system, ensure that traffic is diverted in an orderly shutdown by using the shutdown procedure in *Adding or Replacing a Node Device in a QFabric Node Group* .

To remove a management board from a QFX3500 device (see Figure 189 on page 483):

1. Place the antistatic bag or the antistatic mat on a flat, stable surface.
2. Ensure that the QFX3500 device is powered off. See "Powering Off a QFX3500 Device" on page 435 or *Adding or Replacing a Node Device in a QFabric Node Group* in QFabric systems.
3. Attach the ESD grounding strap to your bare wrist and to a site ESD point.
4. Slide the locking lever toward the handle until it stops.

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

5. Grasp the management board handle and pull firmly to slide the management board halfway out of the chassis.
6. When the fans stop spinning, slide the management board completely out of the chassis.
7. Place the management board in the antistatic bag or on the antistatic mat placed on a flat, stable surface.

Figure 189: Removing a Management Board from a QFX3500 Device
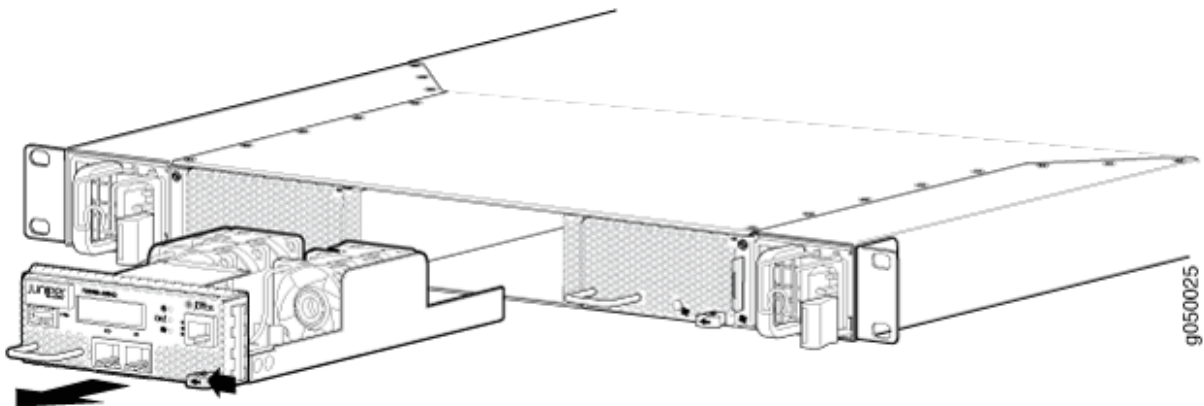
RELATED DOCUMENTATION

Management Board for a QFX3500 Device

Field-Replaceable Units in a QFX3500 Device

Front Panel of a QFX3500 Device

Connect a Device to a Network for Out-of-Band Management

Connecting a QFX Series Device to a Management Console

Installing a Management Board in a QFX3500 Device

CHAPTER 34

Replacing EX4300 Components

IN THIS CHAPTER

Installing and Removing EX4300 Switch Hardware Components

The EX4300 switch chassis is a rigid sheet-metal structure that houses the hardware components. The field-replaceable units (FRUs) in EX4300 switches are:

- Power supplies

- Fan modules

- Uplink modules

- Transceivers

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

NOTE: You must remove a fan module only for replacement.

See these topics for instructions for installing and removing components:

- "Installing an AC Power Supply in an EX4300 Switch" on page 486

- *Removing an AC Power Supply from an EX4300 Switch*

- ["Installing a DC Power Supply in an EX4300 Switch" on page 488](#)

- *Removing an AC Power Supply from an EX4300 Switch*

- ["Installing a Fan Module in an EX4300 Switch" on page 490](#)

- *Removing a Fan Module from an EX4300 Switch*

- ["Installing an Uplink Module in an EX4300 Switch" on page 492](#)

- *Removing an Uplink Module from an EX4300 Switch*

- ["Install a Transceiver" on page 494](#)

- ["Remove a Transceiver" on page 500](#)

- *Install a QSFP28 Transceiver*

- *Remove a QSFP28 Transceiver*

Installing an AC Power Supply in an EX4300 Switch

Before you install an AC power supply in the switch:

- Ensure you understand how to prevent electrostatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.

Ensure that you have the following parts and tools available to install the power supply:

- ESD grounding strap

- Phillips (+) screwdriver, number 2

The AC power supply in EX4300 switches is a hot-removable and hot-insertable field-replaceable unit (FRU) installed in the rear panel of the switch: You can remove and replace it without powering off the switch or disrupting switch functions.

> ⚠ **CAUTION**: Do not mix:
>
> - AC and DC power supplies in the same chassis

- Power supplies with different airflow labels (**AIR IN (AFI)** and **AIR OUT (AFO)**) in the same chassis.

- Fan modules with different airflow labels (**AIR IN (AFI)** and **AIR OUT (AFO)**) in the same chassis.

- Power supplies and fan modules with different airflow labels (**AIR IN (AFI)** and **AIR OUT (AFO)**) in the same chassis.

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

The power supply slots are at the right end of the rear panel on 24-port and 48-port switches, and at the left end on 32-port switches. shows how to install an AC power supply in 24-port or 48-port switches. The procedure is the same for 32-port switches.

To install an AC power supply in the switch:

1. Ensure that you have the correct power supply. The label **AIR IN (AFI)** or **AIR OUT (AFO)** on the power supply must match the label **AIR IN (AFI)** or **AIR OUT (AFO)** on the installed fan module.

2. Attach the 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, loosen the captive screws on the cover panel by using your fingers or the screwdriver. Hold the captive screw and gently pull it outward to remove the cover panel. 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 and the ejector lever fits into place.

Figure 190: Installing an AC Power Supply in an EX4300 Switch
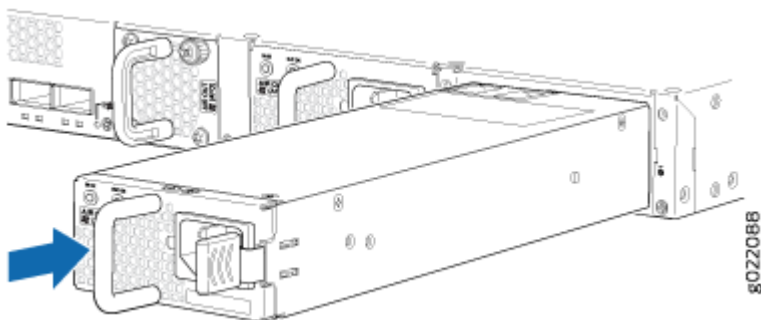
> **NOTE**: If you have a Juniper J-Care service contract, register any addition, change, or upgrade of hardware components at https://www.juniper.net/customers/support/tools/updateinstallbase/ . Failure to do so can result in significant delays if you need replacement parts. This note does not apply if you replace existing components with the same type of component.

RELATED DOCUMENTATION

Removing an AC Power Supply from an EX4300 Switch

Connecting AC Power to an EX4300 Switch

AC Power Supply in EX4300 Switches

AC Power Cord Specifications for an EX4300 Switch

EX4300 Switches Hardware Overview

Installing a DC Power Supply in an EX4300 Switch

Before you install a DC power supply in the switch:

- Ensure you understand how to prevent electrostatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.

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

- ESD grounding strap

- Phillips (+) screwdriver, number 2

The DC power supply in EX4300 switches is a hot-removable and hot-insertable field-replaceable unit (FRU) installed in the rear panel of the switch: You can remove and replace it without powering off the switch or disrupting switch functions.

> **CAUTION**: Do not mix:
>
> - AC and DC power supplies in the same chassis

- Power supplies with different airflow labels (**AIR IN (AFI)** and **AIR OUT (AFO)**) in the same chassis.

- Fan modules with different airflow labels (**AIR IN (AFI)** and **AIR OUT (AFO)**) in the same chassis.

- Power supplies and fan modules with different airflow labels (**AIR IN (AFI)** and **AIR OUT (AFO)**) in the same chassis.

NOTE: We recommend that you connect each power supply to a dedicated power source outlet. The power supply slots are at the right end of the rear panel on 24-port and 48-port switches, and at the left end on 32-port switches. Figure 191 on page 489 shows how to install a DC power supply in 24-port or 48-port switches. The procedure is the same for 32-port switches.

To install a DC power supply in the switch:

1. Ensure that you have the correct power supply. The label **AIR IN (AFI)** or **AIR OUT (AFO)** on the power supply must match the label **AIR IN (AFI)** or **AIR OUT (AFO)** on the installed fan module.

2. Attach the 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, loosen the captive screws on the cover panel by using your fingers or the screwdriver. Hold the captive screw and gently pull it outward to remove the cover panel. 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 and the ejector lever fits into place.

Figure 191: Installing a DC Power Supply in an EX4300 Switch
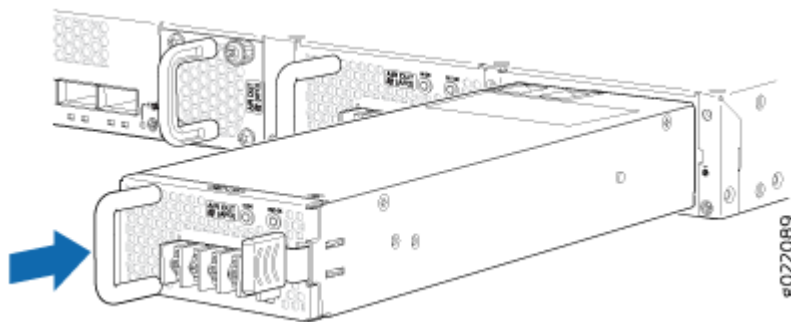
> **NOTE**: If you have a Juniper J-Care service contract, register any addition, change, or upgrade of hardware components at https://www.juniper.net/customers/support/tools/updateinstallbase/ . Failure to do so can result in significant delays if you need replacement parts. This note does not apply if you replace existing components with the same type of component.

RELATED DOCUMENTATION

Removing a DC Power Supply from an EX4300 Switch

Connecting DC Power to an EX4300 Switch

DC Power Supply in EX4300 Switches

EX4300 Switches Hardware Overview

Installing a Fan Module in an EX4300 Switch

Before you install a fan module in the switch:

- Ensure you understand how to prevent electrostatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.

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

- ESD grounding strap

- Phillips (+) screwdriver, number 2

Each fan module is a hot-removable and hot-insertable field-replaceable unit (FRU) installed in the rear panel of the switch: You can remove and replace it without powering off the switch or disrupting switch functions.

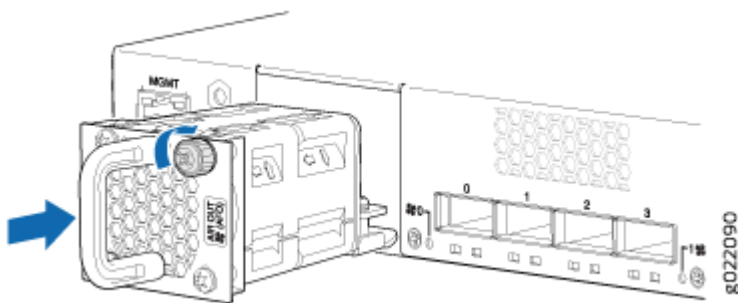> ⚠ **CAUTION**: Do not mix:
> - Fan modules with different airflow labels (**AIR IN (AFI)** and **AIR OUT (AFO)**) in the same chassis.
> - Power supplies with different airflow labels (**AIR IN (AFI)** and **AIR OUT (AFO)**) in the same chassis.

- Power supplies and fan modules with different airflow labels (**AIR IN (AFI)** and **AIR OUT (AFO)**) in the same chassis.

- AC and DC power supplies in the same chassis.

NOTE: The fan module slots are at the left end of the rear panel on 24-port and 48-port switches, and at the right end on 32-port switches. Figure 192 on page 491 shows how to install a fan module in 24- port or 48-port switches. The procedure is the same for 32-port switches.

1. Ensure that you have the correct fan module. The label **AIR IN (AFI)** or **AIR OUT (AFO)** on the fan module must match the label **AIR IN (AFI)** or **AIR OUT (AFO)** on the installed power supply.

2. Attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.

3. Remove the fan module from its bag.

4. Hold the handle of the fan module with one hand and support the weight of the module with the other hand. Place the fan module in the fan module slot on the rear panel of the switch and slide it in until it is fully seated.

5. Tighten the captive screws on the faceplate of the fan module by using your fingers. If you are unable to tighten the captive screws by using your fingers, use the screwdriver.

Figure 192: Installing a Fan Module in a 24-Port EX4300 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/support/tools/updateinstallbase/ . Failure to do so can result in significant delays if you need replacement parts. This note does not apply if you replace existing components with the same type of component.

Installing an Uplink Module in an EX4300 Switch

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*).

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

You can install an uplink module in the front panel of an EX4300 switch. The uplink module in EX4300 switches is a hot-removable and hot-insertable unit (FRU): You can remove and replace it without powering off the switch.

> **NOTE**: If you have set an uplink module port as a Virtual Chassis port (VCP), removing the uplink module breaks the setting. You must reset the port as a VCP after you replace the module. See Setting an Uplink Port on an EX Series or QFX Series Switch as a Virtual Chassis Port.

To install an uplink module in the switch (see Figure 193 on page 493, Figure 194 on page 493, and Figure 195 on page 494):

1. Wrap and fasten one end of an ESD wrist strap around your bare wrist, and connect the other end of the strap to the ESD point on the switch.

   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, loosen both captive screws on the faceplate of the uplink module by using your fingers. If you are unable to unscrew the captive screws by using your fingers, use the screwdriver. Hold both the captive screws and gently pull it outward to remove the cover panel, and save it for later use.

> **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.

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

> ⚠ **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.

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

5. Tighten both the captive screws by using your fingers or the screwdriver.

Figure 193: Installing a 4-Port 1-Gigabit Ethernet/10-Gigabit Ethernet SFP+ Uplink Module in a 24-Port or 48-Port EX4300 Switch Except EX4300-48MP and EX4300-48MP-S Switches
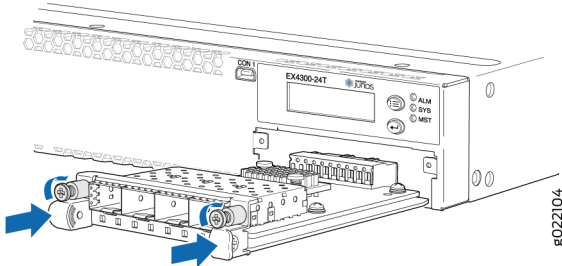
> **NOTE**: The procedure is the same for EX4300-48MP and EX4300-48MP-S switches.

Figure 194: Installing a 2-Port 40-Gigabit Ethernet QSFP+ Uplink Module in a 32-Port EX4300 Switch
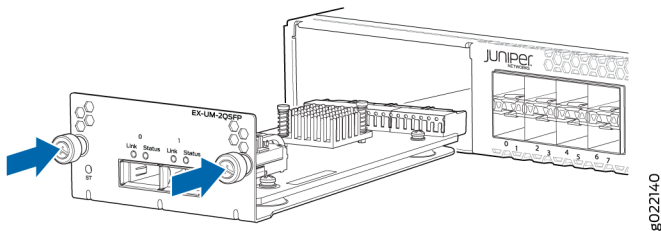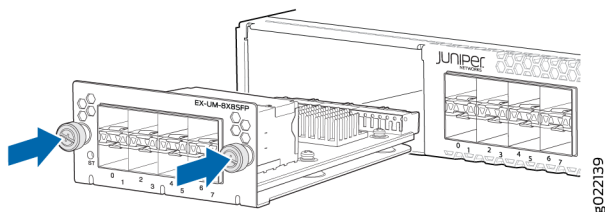
Figure 195: Installing an 8-Port 10-Gigabit Ethernet SFP+ Uplink Module in a 32-Port EX4300 Switch

> **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/support/tools/updateinstallbase/ . Failure to do so can result in significant delays if you need replacement parts. This note does not apply if you replace existing components with the same type of component.

RELATED DOCUMENTATION

Configuring Gigabit Ethernet Interfaces (CLI Procedure)

Install a Transceiver

Before you install a transceiver in a device, ensure that you have taken the necessary precautions for safe handling of lasers (see Laser and LED Safety Guidelines and Warnings).

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

The transceivers for Juniper Networks devices are hot-removable and hot-insertable field-replaceable units (FRUs). You can remove and replace the transceivers without powering off the device or disrupting the device 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**: The Juniper Networks Technical Assistance Center (JTAC) provides complete support for Juniper-supplied optical modules and cables. However, JTAC does not provide support for third-party optical modules and cables that are not qualified or supplied by Juniper Networks. If you face a problem running a Juniper device that uses third-party optical modules or cables, JTAC may help you diagnose host-related issues if the observed issue is not, in the opinion of JTAC, related to the use of the third-party optical modules or cables. Your JTAC engineer will likely request that you check the third-party optical module or cable and, if required, replace it with an equivalent Juniper-qualified component.
>
> Use of third-party optical modules with high-power consumption (for example, coherent ZR or ZR+) can potentially cause thermal damage to or reduce the lifespan of the host equipment. Any damage to the host equipment due to the use of third-party optical modules or cables is the users' responsibility. Juniper Networks will accept no liability for any damage caused due to such use.

shows how to install a QSFP+ transceiver. The procedure is the same for all types of transceivers except the QSFP28 and CFP transceivers.

To install a transceiver:

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

1. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to the ESD point on the switch.
2. Remove the transceiver from its bag.
3. 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.

> **LASER 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 protects your eyes from accidental exposure to laser light.

4. 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.
5. Using both hands, carefully place the transceiver in the empty port. The connectors must face the 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.

6. Slide the transceiver in gently until it is fully seated. If you are installing a CFP transceiver, use your fingers to tighten the captive screws on the transceiver.

7. Remove the rubber safety cap from the transceiver and the end of the cable, and insert the cable into the transceiver.

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

> ⚠ **CAUTION**: Do not leave a fiber-optic transceiver uncovered except when inserting or removing cable. The safety cap keeps the port clean and protects your eyes from accidental exposure to laser light.

8. If there is a cable management system, arrange the cable in the cable management system to prevent the cable from dislodging or developing stress points. Secure the cable so that it does not support its own weight as it hangs toward the floor. Place excess cable out of the way in a neatly coiled loop in the cable management system. Placing fasteners on the loop helps to maintain its shape.

> ⚠ **CAUTION**: Do not let fiber-optic cable hang free from the connector. Do not allow fastened loops of cable to dangle, which stresses the cable at the fastening point.

> ⚠ **CAUTION**: Avoid bending fiber-optic cable beyond its minimum bend radius. An arc smaller than a few inches in diameter can damage the cable and cause problems that are difficult to diagnose.

> **NOTE**: When you install SFP-DD transceivers, push it hard until you hear a click sound. Use a long nose plier to pull the SFP-DD transceiver connected on the top and bottom rows of the chassis where the pull tabs face each other.

> **NOTE**: Make sure to use a dust cap to cover ports that are unused.

> **NOTE**: While using Finisar AOC SFP+ optical module with the QFX5130-48C switch, you may need to pull the module upwards to pull out the module smoothly from the cage.

> **NOTE**: "

Figure 196: Install a Transceiver
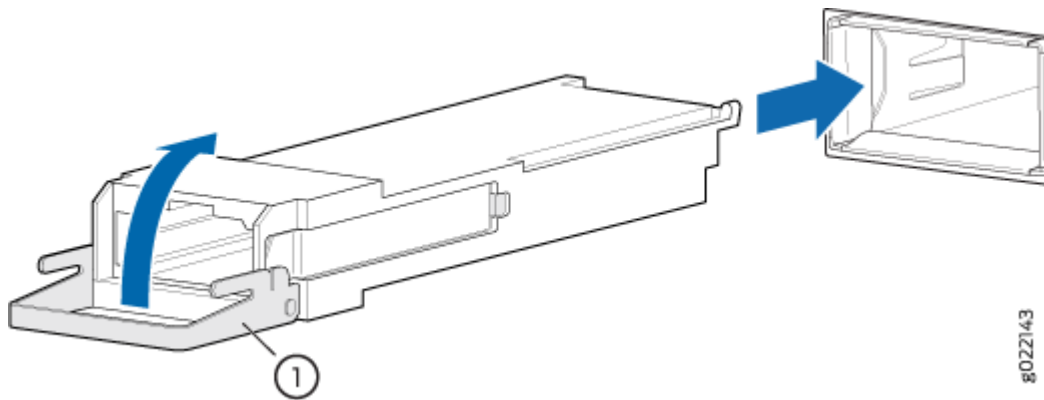
1– Ejector lever

CHAPTER 35

Replacing Transceivers and Fiber-Optic Cables

Removing a Transceiver from a QFX Series Device

Before you begin removing a transceiver from the QFX Series, ensure that you have taken the necessary precautions for safe handling of lasers (see *Laser and LED Safety Guidelines and Warnings for the QFX Series*).

Ensure that you have the following parts and tools available:

- Electrostatic bag or an antistatic mat

- Rubber safety caps to cover the transceiver and fiber-optic cable connector

- Dust cover to cover the port

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

To remove a transceiver from the QFX Series:

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.

> ⚠ **LASER 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.

> ⚠ **LASER 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. Bending the cables beyond their minimum bend radius 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 QFX Series Device*). 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. Using your fingers, pull the ejector lever away from 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.

5. Grasp the transceiver ejector lever and gently slide the transceiver approximately 0.5 in. (1.3 cm) straight out of the port.

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

6. Using your fingers, grasp the body of the transceiver and pull it straight out of the port.

7. Place the transceiver in the electrostatic 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 a QFX Series Device*

Remove a Transceiver

Before you remove a transceiver from a device, ensure that you have taken the necessary precautions for the safe handling of lasers (see *Laser and LED Safety Guidelines and Warnings*).

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 or a replacement transceiver

The transceivers for Juniper Networks devices are hot-removable and hot-insertable field-replaceable units (FRUs). You can remove and replace the transceivers without powering off the device or disrupting device 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.

Figure 197 on page 502 shows how to remove a QSFP+ transceiver. The procedure is the same for all types of transceivers except the QSFP28 and CFP transceivers.

To remove a transceiver from a device:

1. Place the antistatic bag or antistatic mat on a flat, stable surface.
2. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to the ESD point on the switch.
3. Label the cable connected to the transceiver so that you can reconnect it correctly.

> **LASER 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.

> **LASER 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 protects your eyes from 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.

4. Remove the cable connected to the transceiver (see *Disconnect a Fiber-Optic Cable*). Cover the transceiver and the end of each fiber-optic cable connector with a rubber safety cap immediately after disconnecting the fiber-optic cables.

5. If there is a cable management system, arrange the cable in the cable management system to prevent it from dislodging or developing stress points. Secure the cable so that it does not support its own weight as it hangs to the floor. Place excess cable out of the way in a neatly coiled loop in the cable management system. Placing fasteners on the loop helps to maintain its shape.

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

6. To remove an SFP56-DD, SFP, SFP+, XFP, a QSFP+, or QSFP56-DD transceiver:

   a. Using your fingers, pull open the ejector lever on the transceiver to unlock the transceiver.

      Note that QSFP-DD and SFP-DD transceivers don't have ejector levers, they have a pull tab instead which can be used to unlock and remove the transceiver.

   > ⚠️ **CAUTION**: Before removing the transceiver, make sure that you open the ejector lever completely until you hear it click. This precaution 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 ESD damage to the transceiver, do not touch the connector pins at the end of the transceiver.

Figure 197: Remove a QSFP+ Transceiver
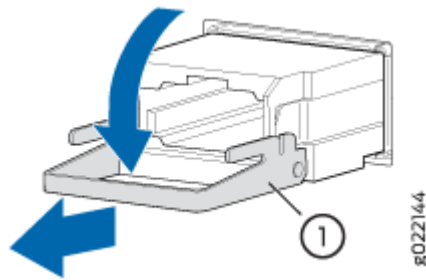
1–	Ejector lever

To remove a CFP transceiver:

a. Using your fingers, loosen the screws on the transceiver.

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 ESD damage to the transceiver, do not touch the connector pins at the end of the transceiver.

7. Using your fingers, grasp the body of the transceiver and pull it straight out of the port.

8. Place the transceiver in the antistatic bag or on the antistatic mat placed on a flat, stable surface.

9. Place the dust cover over the empty port, or install the replacement transceiver.

Installing a Transceiver in a QFX Series Device

Before you begin installing a transceiver in a QFX Series device, ensure that you have taken the necessary precautions for safe handling of lasers (see *Laser and LED Safety Guidelines and Warnings for the QFX Series*).

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

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

To install a transceiver in the QFX Series:

> **CAUTION**: To avoid 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 by a rubber safety cap. If it is not, cover the transceiver with a rubber safety cap.

> **LASER 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.
4. Using both hands, carefully place the transceiver in the empty port. The connectors must face the device 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. Note that on QFX5100-48T devices, the QSFP+ top and bottom ports have the same orientation for inserting and removing transceivers. On all other QFX Series devices, the ports are designed belly-to-belly, which requires you to turn the transceiver over on the bottom port row. See Figure 198 on page 504 through Figure 201 on page 505 for the correct orientation for your device.

5. Slide the transceiver in gently until it is fully seated. See Figure 198 on page 504 for an example of inserting an SFP transceiver. Figure 199 on page 504, Figure 200 on page 504, and Figure 201 on page 505 are examples of inserting QSFP+ transceivers into different QFX Series product SKU devices.
6. Remove the rubber safety cap when you are ready to connect the cable to the transceiver.

> **LASER 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.

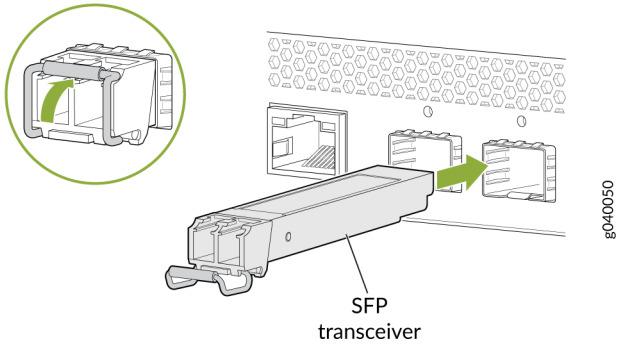**Figure 198: Installing an SFP Transceiver in the QFX Series**

Figure 199: Installing a QSFP+ Transceiver in the QFX Series—Vertical Orientation
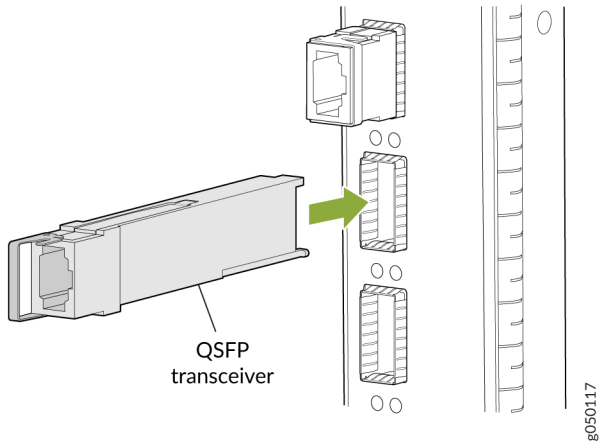

Figure 200: Installing a QSFP+ Transceiver in the QFX Series—Horizontal Orientation
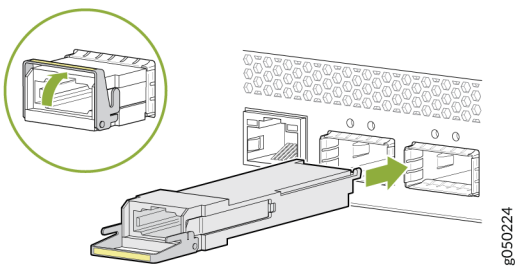
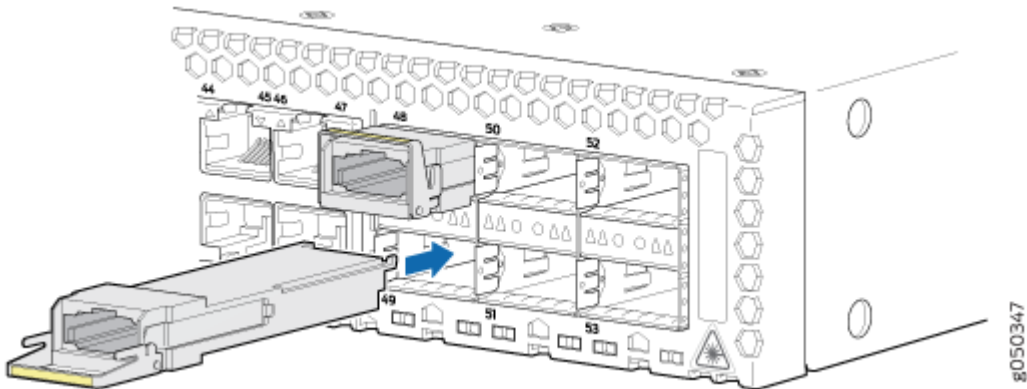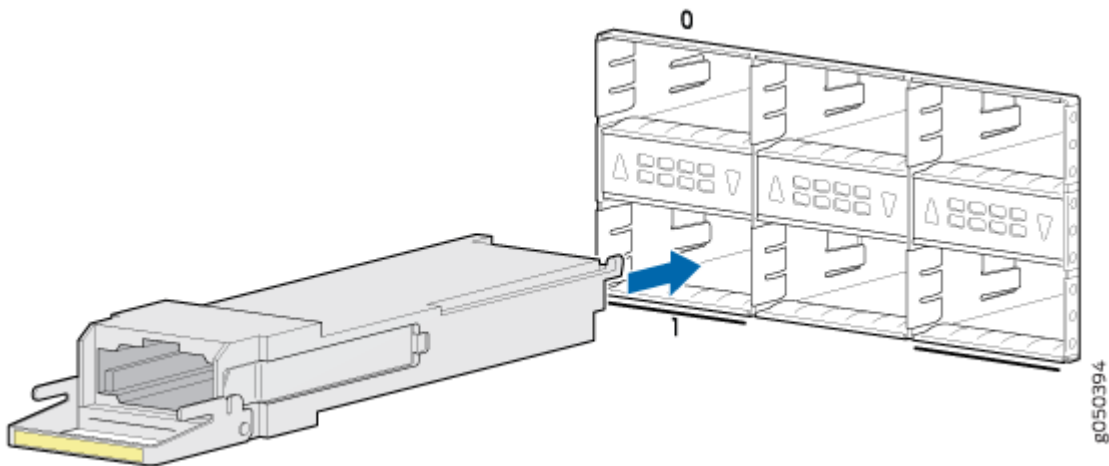**Figure 201: Installing a QSFP+ Transceiver in a QFX5100-48T**

Figure 202: Installing a QSFP28 Transceiver in a QFX10002

Removing a Transceiver from a QFX Series Device

Connecting a Fiber-Optic Cable to a QFX Series Device

Install a Transceiver

Before you install a transceiver in a device, ensure that you have taken the necessary precautions for safe handling of lasers (see Laser and LED Safety Guidelines and Warnings).

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

The transceivers for Juniper Networks devices are hot-removable and hot-insertable field-replaceable units (FRUs). You can remove and replace the transceivers without powering off the device or disrupting the device 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: The Juniper Networks Technical Assistance Center (JTAC) provides complete support for Juniper-supplied optical modules and cables. However, JTAC does not provide support for third-party optical modules and cables that are not qualified or supplied by Juniper Networks. If you face a problem running a Juniper device that uses third-party optical modules or cables, JTAC may help you diagnose host-related issues if the observed issue is not, in the opinion of JTAC, related to the use of the third-party optical modules or cables. Your JTAC engineer will likely request that you check the third-party optical module or cable and, if required, replace it with an equivalent Juniper-qualified component.

Use of third-party optical modules with high-power consumption (for example, coherent ZR or ZR+) can potentially cause thermal damage to or reduce the lifespan of the host equipment. Any damage to the host equipment due to the use of third-party optical modules or cables is the users' responsibility. Juniper Networks will accept no liability for any damage caused due to such use.

Figure 203 on page 508 shows how to install a QSFP+ transceiver. The procedure is the same for all types of transceivers except the QSFP28 and CFP transceivers.

To install a transceiver:

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

1. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to the ESD point on the switch.
2. Remove the transceiver from its bag.

3. 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.

> **LASER 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 protects your eyes from accidental exposure to laser light.

4. 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.

5. Using both hands, carefully place the transceiver in the empty port. The connectors must face the 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.

6. Slide the transceiver in gently until it is fully seated. If you are installing a CFP transceiver, use your fingers to tighten the captive screws on the transceiver.

7. Remove the rubber safety cap from the transceiver and the end of the cable, and insert the cable into the transceiver.

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

> **CAUTION**: Do not leave a fiber-optic transceiver uncovered except when inserting or removing cable. The safety cap keeps the port clean and protects your eyes from accidental exposure to laser light.

8. If there is a cable management system, arrange the cable in the cable management system to prevent the cable from dislodging or developing stress points. Secure the cable so that it does not support its own weight as it hangs toward the floor. Place excess cable out of the way in a neatly coiled loop in the cable management system. Placing fasteners on the loop helps to maintain its shape.

> ⚠️ **CAUTION**: Do not let fiber-optic cable hang free from the connector. Do not allow fastened loops of cable to dangle, which stresses the cable at the fastening point.

> ⚠️ **CAUTION**: Avoid bending fiber-optic cable beyond its minimum bend radius. An arc smaller than a few inches in diameter can damage the cable and cause problems that are difficult to diagnose.

> **NOTE**: When you install SFP-DD transceivers, push it hard until you hear a click sound. Use a long nose plier to pull the SFP-DD transceiver connected on the top and bottom rows of the chassis where the pull tabs face each other.

> **NOTE**: Make sure to use a dust cap to cover ports that are unused.

> **NOTE**: While using Finisar AOC SFP+ optical module with the QFX5130-48C switch, you may need to pull the module upwards to pull out the module smoothly from the cage.

> **NOTE**: "

Figure 203: Install a Transceiver

1– Ejector lever
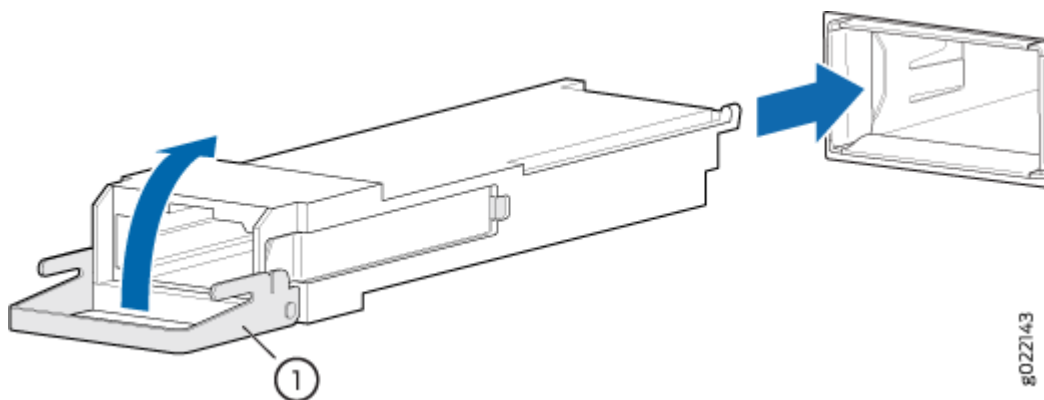
Disconnecting a Fiber-Optic Cable from a QFX Series Device

Before you disconnect a fiber-optic cable from an optical transceiver installed in the QFX Series, ensure that you have taken the necessary precautions for safe handling of lasers (see *Laser and LED Safety Guidelines and Warnings for the QFX Series*).

Ensure that you have the following parts and tools available:

- Rubber safety cap to cover the transceiver

- Rubber safety cap to cover the fiber-optic cable connector

The QFX Series has field-replaceable unit (FRU) optical transceivers to which you can connect fiber-optic cables.

To disconnect a fiber-optic cable from an optical transceiver installed in the QFX Series:

1. (Recommended) Disable the port in which the transceiver is installed by including the `disable` statement at the `[edit interfaces]` hierarchy level for the specific interface.

    LASER 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.

    LASER WARNING: Do not stare into the laser beam or view it directly with optical instruments even if the interface has been disabled.

2. Carefully unplug the fiber-optic cable connector from the transceiver.
3. Cover the transceiver with a rubber safety cap.

    LASER 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.

Connecting a Fiber-Optic Cable to a QFX Series Device

Maintaining Fiber-Optic Cables in a QFX Series Device

Disconnect a Fiber-Optic Cable

Before you disconnect a fiber-optic cable from an optical transceiver, ensure that you have taken the necessary precautions for safe handling of lasers. See *Laser and LED Safety Guidelines and Warnings*.

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

Juniper Networks devices have optical transceivers to which you can connect fiber-optic cables.

To disconnect a fiber-optic cable from an optical transceiver installed in the device:

1. Disable the port in which the transceiver is installed by issuing the following command:

```
[edit interfaces]
user@device# set interface-name disable
```

⚠ **LASER 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.

⚠ **LASER 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 protects your eyes from accidental exposure to laser light.

4. Cover the fiber-optic cable connector with the rubber safety cap.

Connecting a Fiber-Optic Cable to a QFX Series Device

Before you connect a fiber-optic cable to an optical transceiver installed in the QFX Series, ensure that you have taken the necessary precautions for safe handling of lasers (see *Laser and LED Safety Guidelines and Warnings for the QFX Series*).

The QFX Series has field-replaceable unit (FRU) optical transceivers to which you can connect fiber-optic cables. You can remove and replace the cables without powering off the device or disrupting the switching functions.

To connect a fiber-optic cable to an optical transceiver installed in the QFX Series:

> **LASER 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.

> **LASER WARNING**: Do not stare into the laser beam or view it directly with optical instruments even if the interface has been disabled.

1. If the fiber-optic cable connector is covered by a rubber safety cap, remove the cap. Save the cap.
2. If the optical transceiver is covered by a rubber safety cap, remove the cap. Save the cap.
3. Insert the cable connector into the optical transceiver.
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. Bending the cables beyond their minimum bend radius can damage the cables and cause problems that are difficult to diagnose.

> **CAUTION**: 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 QFX Series Device

Maintaining Fiber-Optic Cables in a QFX Series Device

Connect a Fiber-Optic Cable

Before you connect a fiber-optic cable to an optical transceiver installed in a device, ensure that you have taken the necessary precautions for safe handling of lasers (see *Laser and LED Safety Guidelines and Warnings*).

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

> **LASER 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 204 on page 512).

Figure 204: Connect a Fiber-Optic Cable to an Optical Transceiver Installed in a Device
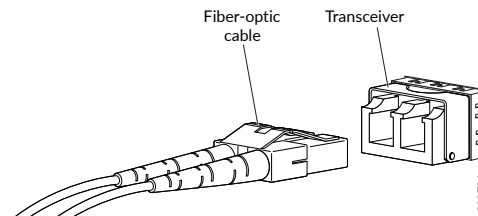
4. Secure the cables so that they do not support their own weight. Place excess cable out of the way in a neatly coiled loop. Placing fasteners on a loop helps cables maintain their shape.

> **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.

CHAPTER 36

Routine Maintenance

Maintaining Fiber-Optic Cables in a QFX Series Device

To maintain fiber-optic cables in the QFX Series:

- 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 cable to avoid 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.

- Do not bend fiber-optic cables beyond their minimum bend radius. Bending the cables beyond their minimum bend radius 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. Microdeposits 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 Cletop-S® Fiber Cleaner. Follow the directions in the cleaning kit you use.

Connecting a Fiber-Optic Cable to a QFX Series Device

Disconnecting a Fiber-Optic Cable from a QFX Series Device

How to Handle Fiber-Optic Cables

Fiber-optic cables connect to optical transceivers that are installed in Juniper Networks devices.

Follow these guidelines when handling 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 does not support 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. To prevent damage from overuse, attach a short fiber extension to the optical equipment. The short fiber extension absorbs wear and tear due to frequent plugging and unplugging, which is easier and less expensive to replace than the instruments.

- Keep fiber-optic cable connections clean. Microdeposits 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 instructions 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 instructions in the cleaning kit you use.

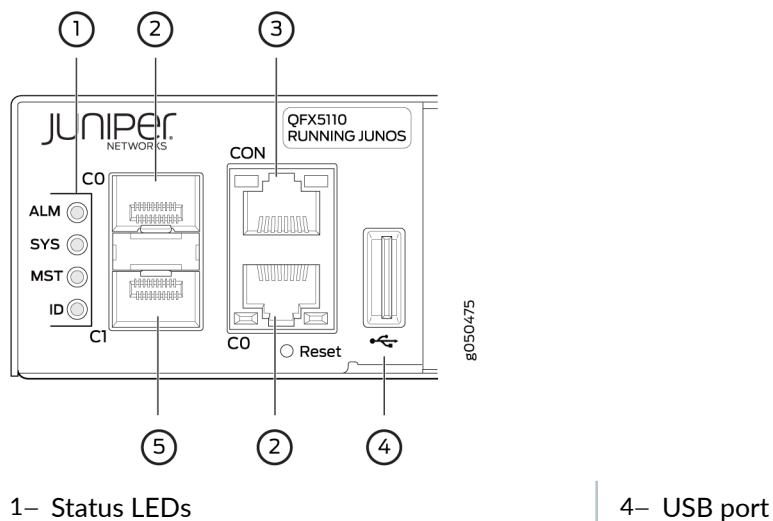CHAPTER 37

Viewing QFX5110 System Information

IN THIS CHAPTER

QFX5110 Chassis Status LEDs

The QFX5110 switch series has four status LEDs on the FRU side of the chassis, next to the management ports (see).

Figure 205: Chassis Status LEDs on a QFX5110 Switch

| 1— Status LEDs | 4— USB port |

2– em0–RJ-45 (10/100/1000 BASE-T) management Ethernet port (C0)	5– em1–SFP management Ethernet port (C1) cage (socket for either 10/100/1000 BASE-T RJ-45 SFP or 1-GbE fiber SFP)
3– RJ-45 console port (CON)	

Table 71 on page 516 describes the chassis status LEDs on a QFX5110, 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 lcd.

Table 71: Chassis Status LEDs on a QFX5110 Switch

Name	Color	State	Description
ALM–Alarm or beacon	Unlit	Off	The switch is halted or there is no alarm.
	Red	On steadily	A major hardware fault has occurred, such as a temperature alarm or power failure, and the switch has halted. Power off the QFX5110 by setting the AC power source outlet to the off (O) position, or unplugging the AC power cords. Correct any voltage or site temperature issues, and allow the switch to cool down. Power on the QFX5110 and monitor the power supply and fan LEDs to help determine where the error is occurring.
	Amber	On steadily	A minor, non-critical alarm has occurred, such as a software error. Power off the QFX5110 by setting the AC power source outlet to the off (O) position, or unplugging the AC power cords. Power on the QFX5110 and monitor the status LEDs to ensure that Junos OS boots properly.
SYS–System	Unlit	Off	The switch is powered off or halted.

Table 71: Chassis Status LEDs on a QFX5110 Switch *(Continued)*

Name	Color	State	Description
	Green	On steadily	Junos OS for QFX Series is loaded on the switch.
	Green	Blinking	The switch is participating as: • A member in a QFX Virtual Chassis • A leaf device in a Virtual Chassis Fabric (VCF) • A spine device in a VCF • A Routing Engine Primary in a VCF • A Routing Engine Backup in a VCF
MST–Primary in a QFX Virtual Chassis or Routing Engine Primary in a VCF	Unlit	Off	The switch is a line card member in a QFX Virtual Chassis.
	Green	On steadily	The switch is one of the following: • A standalone switch • In the primary role in a QFX Virtual Chassis • Is the routing engine primary in a VCF
	Green	Blinking	The switch is the backup primary in a QFX Virtual Chassis or the backup routing engine in a VCF.

Table 71: Chassis Status LEDs on a QFX5110 Switch *(Continued)*

Name	Color	State	Description
ID–Identification	Unlit	Off	The beacon feature is not enabled on the switch. This feature is enabled using the `request chassis beacon` command.
	Blue	Blinking	The beacon feature is enabled on the switch. This feature is enabled using the `request chassis beacon` command.

RELATED DOCUMENTATION

show chassis alarms

request chassis beacon

QFX5110 Management Port LEDs

The management ports (labeled **C0** for 10/100/1000BASE-T and **C1** for 10/100/1000BASE-T and SFP 1000BASE-X connections) on a QFX5110 switch have two LEDs that indicate link status and link activity (see). The left LED indicates status; the right LED indicates link/activity.

Figure 206: Management Port LEDs on a QFX5110

1– Status LEDs	4– USB port
2– em0–RJ-45 (10/100/1000BASE-T) management Ethernet port (C0)	5– em1–SFP management Ethernet port (C1) cage (socket for either 10/100/1000BASE-T RJ-45 SFP or 1-GbE fiber SFP)
3– RJ-45 console port (CON))	

describes the management port LEDs.
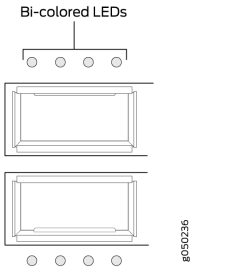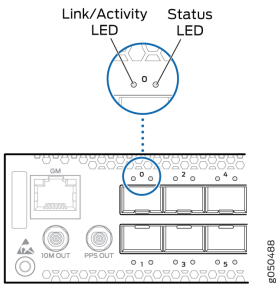
Table 72: Management Port LEDs on a QFX5110

LED	Color	State	Description
Link/Activity	Unlit	Off	No link is established, there is a fault, or the link is down.
	Green	On steadily	A link is established, but there is no link activity.
		Blinking or flickering	A link is established, and there is link activity.
Status	Unlit	Off	Either the port speed is 10 M or the link is down.
	Green	On steadily	The port speed is 1000 M.
	Amber	On steadily	The port speed is 100 M.

QFX5110 Network Port LEDs

The Link/Activity LED configuration for QFX5110-48S uses bi-colored LEDs. The link LED indicates link activity or a fault. See Table 73 on page 520.

Table 73: QFX5110-48S Access Port and Uplink LED Locations

Model	Port Type	Indicators	Location
QFX5110-48S	QSFP28	Link and Activity Status See Table 74 on page 520.	
	SFP+	Link and Activity Status See Table 75 on page 521,	

As shown in Table 73 on page 520 and Table 76 on page 522 there are four bi-color LEDs for each QSFP+ access port. The first LED indicates link presence and activity, while the remaining LEDs indicate status. Table 74 on page 520 describes how to interpret the Link/Activity QSFP28 port LEDs, counting from the left-most position.

Table 74: Network Port LEDs on QSFP28 Ports on a QFX5110

Position	Color	State	Description
1–4	Unlit	Off	The port is administratively disabled, there is no power, the link is down, or there is a fault.

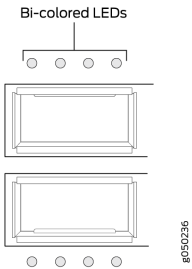**Table 74: Network Port LEDs on QSFP28 Ports on a QFX5110** *(Continued)*

Position	Color	State	Description
1	Green	On steadily	A link is established (either 100-Gigabit or 40-Gigabit, non-channelized) but there is no link activity. When this LED is on, the LEDs in positions 2 to 4 are off.
		Blinking	A link is established (either 100-Gigabit or 40-Gigabit, non-channelized) and there is link activity.
2-4	Green	On steadily	A 40-Gigabit link is established in channelized mode, but there is no link activity.
		Blinking	A 40-Gigabit link is established in channelized mode, and there is link activity.

describes how to interpret the Link/Activity LEDs on SFP+ ports.

Table 75: Network Port LEDs on SFP+ Ports on a QFX5110-48S Switch

LED	Color	State	Description
Link/Activity	Unlit	Off	The port is administratively disabled, there is no power, the link is down, or there is a fault.
	Green	On steadily	A link is established, but there is no link activity.
		Blinking	A link is established, and there is link activity.
Status	Unlit	Off	The link is down or there is a fault.
	Green	On steadily	A 10-Gigabit Ethernet transceiver is installed in the port and link is established.
	Green	Blinking	A 1-Gigabit Ethernet transceiver is installed in the port and the link is established.

Table 76: QFX5110-32Q Access Port and Uplink LED Locations

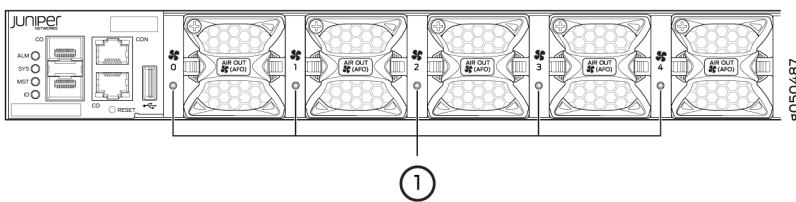| QFX5110-32Q	QSFP28 and QSFP+	Link and Activity Status	

RELATED DOCUMENTATION

QFX5110 Management Panel

Install a Transceiver

Connect a Fiber-Optic Cable

QFX5110 Fan Module LED

shows the location of the LED next to the fan module.

Figure 207: Fan Module LED in a QFX5110 Switch

1— Fan LED

describes the function of the fan tray LED.

**Table 77: Fan Tray LED in a QFX5110 Switch**

Name	Color	State	Description
Fan	Green	On steadily	The fan module is operating normally. The system has verified that the module is engaged, that the airflow is in the correct direction, and that the fan is operating correctly.
	Amber	Blinking	An error has been detected in the fan module. Replace the fan module as soon as possible. Either the fan has failed or it is seated incorrectly. To maintain proper airflow through the chassis, leave the fan module installed in the chassis until you are ready to replace it.

Under normal operating conditions, the fan modules operate at a moderate speed. Temperature sensors in the chassis monitor the temperature within the chassis.

The system raises an alarm if a fan module 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.

QFX5110 AC Power Supply LEDs

Figure 208 on page 523 shows the location of the LEDs on the power supply.

Figure 208: AC Power Supply LEDs on a QFX5110 Switch
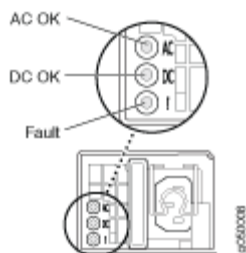
Table 78 on page 524 describes the LEDs on the AC power supplies.

Table 78: AC Power Supply LEDs on a QFX5110 Switch

LED	Color	State	Description
AC OK	Unlit	Off	The power supply is disconnected from power, or power is not coming into the power supply.
	Green	On steadily	Power is coming into the power supply.
DC OK	Unlit	Off	The power supply is disconnected from power, or the power supply is not sending out power correctly.
	Green	On steadily	The power supply is sending out power correctly.
Fault	Amber	On steadily	An error has been detected in the power supply. Replace the power supply as soon as possible. To maintain proper airflow through the chassis, leave the power supply installed in the chassis until you are ready to replace it.

NOTE: If the **AC OK** LED and the **DC OK** LED are unlit, either the AC power cord is not installed properly or the power supply fuse has failed. If the **AC OK** LED is lit and the **DC OK** LED is unlit, the AC power supply is installed properly, but the power supply has an internal failure.

QFX5110 DC Power Supply LEDs

shows the location of the LEDs on the DC power supply.

Figure 209: DC Power Supply Faceplate on a QFX5110 Switch
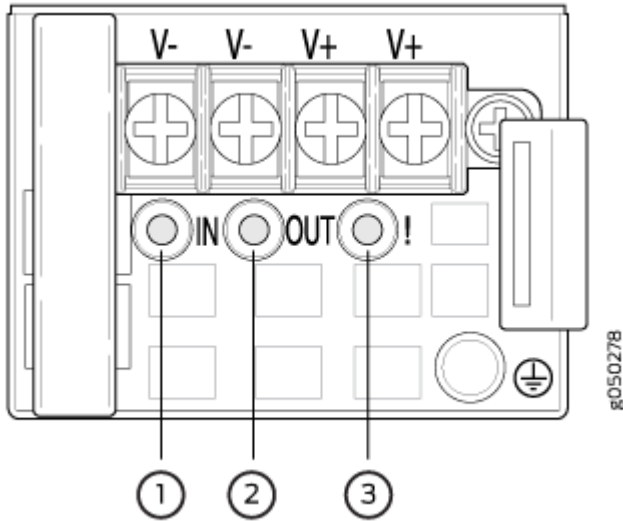
1– Input LED	3– Fault LED
2– Output LED	

> **CAUTION**: The V+ terminals are shunted internally together, as are the V- terminals. The same polarity terminal can be wired together from the same source to provide an additional current path in a higher power chassis. Do not connect the terminals to different sources.

Table 79 on page 525 describes the LEDs on the DC power supplies.

Table 79: DC Power Supply LEDs on a QFX5110 Switch

Name	Color	State	Description
Input	Unlit	Off	The power supply is disconnected from power, or power is not coming into the power supply.
	Green	On steadily	Power is coming into the power supply.
Output	Unlit	Off	The power supply is disconnected from power, or the power supply is not sending out power correctly.

Table 79: DC Power Supply LEDs on a QFX5110 Switch *(Continued)*

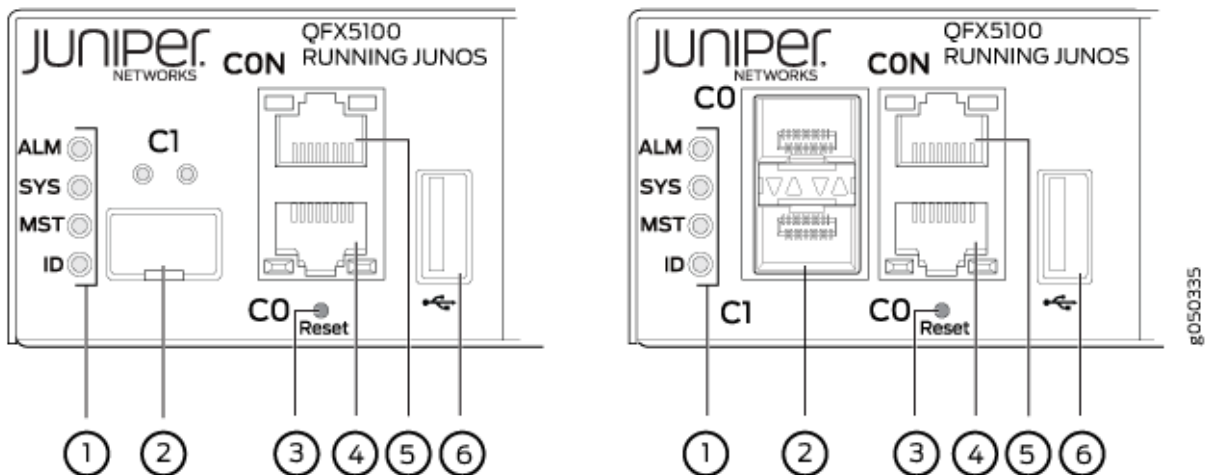| Name	Color	State	Description
	Green	On steadily	The power supply is sending out power correctly.
Fault	Amber	On steadily	An error has been detected in the power supply. Replace the power supply as soon as possible. To maintain proper airflow through the chassis, leave the power supply installed in the chassis until you are ready to replace it.

CHAPTER 38

Viewing QFX5100 System Information

IN THIS CHAPTER

Chassis Status LEDs on a QFX5100 Device

The QFX5100 switch series has four status LEDs on the FRU side of the chassis, next to the management ports (see).

Figure 210: Chassis Status LEDs on a QFX5100 Switch

1– Status LEDs	4– em0–RJ-45 (10/100/1000 Base-T) management Ethernet port (C0)
2– em1–SFP management Ethernet port (C1) Cage (socket for either 10/100/1000 Base-T RJ45 SFP or 1GbE fiber SFP)	5– RJ-45 console port (CON)
3– **Reset** button, see caution statement below	6– USB port

> ⚠️ **CAUTION**: Do not use the **Reset** button to restart the power sequence unless under the direction of Juniper Networks Technical Assistance Center (JTAC).

describes the chassis status LEDs on a QFX5100 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 80: Chassis Status LEDs on a QFX5100 Switch

Name	Color	State	Description
ALM–Alarm or beacon	Unlit	Off	The switch is halted or there is no alarm.
	Red	On steadily	A major hardware fault has occurred, such as a temperature alarm or power failure, and the switch has halted. Power off the QFX5100 switch by setting the AC power source outlet to the OFF (O) position, or unplugging the AC power cords. Correct any voltage or site temperature issues, and allow the switch to cool down. Power on the QFX5100 switch and monitor the power supply and fan LEDs to help determine where the error is occurring.

Table 80: Chassis Status LEDs on a QFX5100 Switch *(Continued)*

Name	Color	State	Description
	Amber	On steadily	A minor alarm has occurred, such as a software error. Power off the QFX5100 switch by setting the AC power source outlet to the OFF (O) position, or unplugging the AC power cords. Power on the QFX5100 switch and monitor the status LEDs to ensure that Junos OS boots properly.
SYS–System	Unlit	Off	The switch is powered off or halted.
	Green	On steadily	Junos OS for QFX Series is loaded on the switch.
	Green	Blinking	The switch is participating as: • A member in a QFX Virtual Chassis • A leaf device in a Virtual Chassis Fabric (VCF) • A spine device in a VCF • A Routing Engine Primary in a VCF • A Routing Engine Backup in a VCF
MST–Primary in a QFX Virtual Chassis or Routing Engine Primary in a VCF	Unlit	Off	The switch is a linecard member in a QFX Virtual Chassis.

Table 80: Chassis Status LEDs on a QFX5100 Switch *(Continued)*

Name	Color	State	Description
	Green	On steadily	The switch is one of the following: • A standalone switch • In the primary role in a QFX Virtual Chassis • Is the routing engine primary in a VCF
	Green	Blinking	The switch is the backup primary in a QFX Virtual Chassis or the backup routing engine in a VCF.
ID–Identification	Unlit	Off	The beacon feature is not enabled on the switch. This feature is enabled using the `request chassis beacon` command.
	Blue	Blinking	The beacon feature is enabled on the switch. This feature is enabled using the `request chassis beacon` command.

RELATED DOCUMENTATION
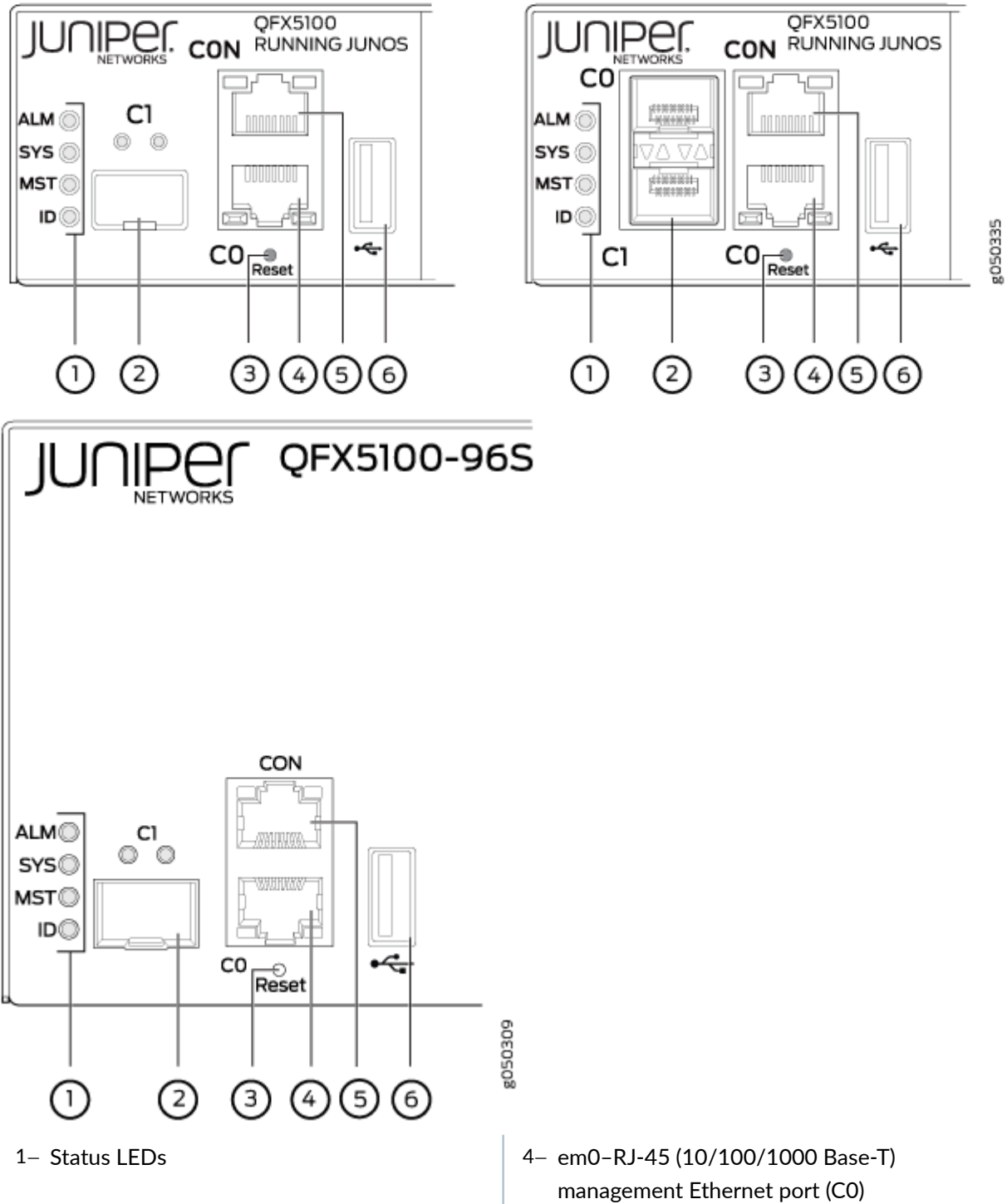
show chassis alarms

request chassis beacon

Management Port LEDs on a QFX5100 Device

The management ports (labeled **C0** for 10/100/1000 Base-T and **C1** for 10/100/1000 Base-T and SFP 1000 Base-X connections) on a QFX5100 switch have two LEDs that indicate link status and link

activity (see Figure 211 on page 531). The left LED indicates status; the right LED indicates link/activity.

Figure 211: Management Port LEDs on a QFX5100 Switch

| 1– | Status LEDs | 4– | em0–RJ-45 (10/100/1000 Base-T) management Ethernet port (C0) |

2– em1–SFP management Ethernet port (C1) Cage (socket for either 10/100/1000 Base-T RJ45 SFP or 1GbE fiber SFP)	5– RJ-45 console port (CON)
3– **Reset** button, see caution statement below	6– USB port

> ⚠ **CAUTION**: Do not use the **Reset** button to restart the power sequence unless under the direction of Juniper Networks Technical Assistance Center (JTAC).

Table 81 on page 532 describes the management port LEDs.

Table 81: Management Port LEDs on a QFX5100 Switch

LED	Color	State	Description
Link/Activity	Unlit	Off	No link is established, there is a fault, or the link is down.
	Green	On steadily	A link is established, but there is no link activity.
		Blinking or flickering	A link is established, and there is link activity.
Status	Unlit	Off	Either the port speed is 10 M or the link is down.
	Green	On steadily	The port speed is 1000 M.
	Amber	On steadily	The port speed is 100 M.

Access Port and Uplink Port LEDs on a QFX5100 Device

The Link/Activity and Status LED configuration for QFX5100 switches use bi-colored LEDs. The link LED indicates link activity or a fault. The status LED indicates transceiver presence. See Table 82 on page 533 to locate the position and type of LED for your QFX5100 model.
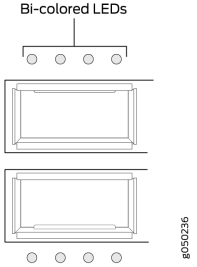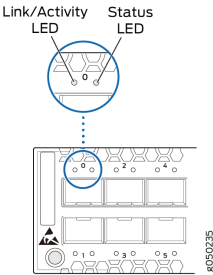
Table 82: QFX5100 Access Port and Uplink LED Locations

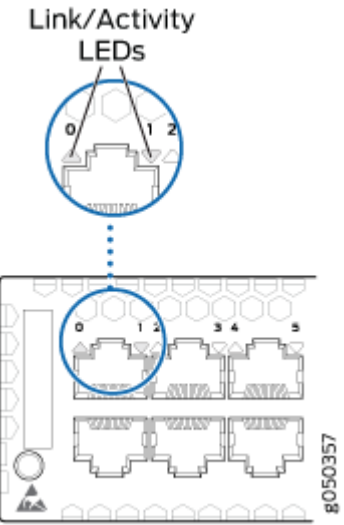| Model	Port Type	Indicators	Location
QFX5100-24Q	QSFP+	Link Status	
QFX5100-48S and QFX5100-48SH	SFP+	Link Status	
QFX5100-48T and QFX5100-48TH	10GBASE-T	Link	

Table 82: QFX5100 Access Port and Uplink LED Locations *(Continued)*

Model	Port Type	Indicators	Location
QFX5100-96S	SFP+	Link Status	

Table 83 on page 534 describes how to interpret the SFP+ port LEDs.

Table 83: Network Port LEDs on SFP+ Ports on a QFX5100 Switch

LED	Color	State	Description
Link/Activity	Unlit	Off	The port is administratively disabled, there is no power, the link is down, or there is a fault.
	Green	On steadily	A link is established, but there is no link activity.
		Blinking	A link is established, and there is link activity.
	Amber	Blinking	The beacon is enabled on the port. On QFX5100-48T, it indicates a fault.

Table 83: Network Port LEDs on SFP+ Ports on a QFX5100 Switch *(Continued)*

LED	Color	State	Description
Status **NOTE**: Not applicable for QFX5100-48T or QFX5100-48TH.	Unlit	Off	The link is down.
	Amber	Blinking	The beacon function is enabled on the port.
	Green	Blinking	A 1-Gigabit Ethernet transceiver is installed in the port and the link is established.
	Green	On steadily	A 10-Gigabit Ethernet transceiver is installed in the port and link is established.

As shown in Table 82 on page 533, there are four bi-color LEDs for each QSFP+ port. The first LED is used and the remaining LEDs are not used when the interface is configured for 40-Gigabit Ethernet and connected to a QSFP+ transceiver. All four LEDs are used when the interface is configured for 10-Gigabit Ethernet and the port is connected using an optical split cable or a copper DACBO cable. Table 84 on page 535 describes how to interpret the QSFP+ LEDs.

Table 84: Network Port LEDs on QSFP+ Ports on a QFX5100 Switch

Color	State	Description
Unlit	Off	The port is administratively disabled, there is no power, the link is down, or there is a fault. **NOTE**: When configured for 10-Gigabit Ethernet, the LED remains unlit only if all four of the 10-Gigabit Ethernet SFP+ breakout links are down.
Green	On steadily	A link is established, but there is no link activity. **NOTE**: When configured for 10-Gigabit Ethernet, the LED is lit green when at least one of the four 10-Gigabit Ethernet SFP+ breakout links is established.

536

Table 84: Network Port LEDs on QSFP+ Ports on a QFX5100 Switch *(Continued)*

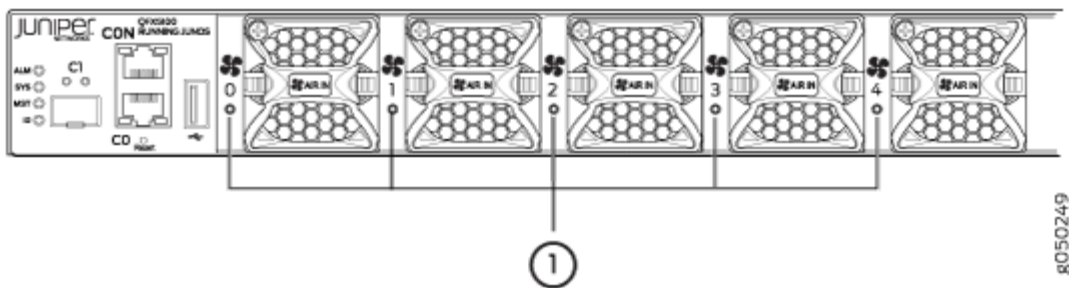| Color	State	Description
	Blinking	A link is established, and there is link activity. **NOTE**: When configured for 10-Gigabit Ethernet, the LED is lit green when at least one of the four 10-Gigabit Ethernet SFP+ breakout links is established.
Amber	Blinking	All four LEDs blink to indicate the beacon function was enabled on the port.

RELATED DOCUMENTATION

Management Panel of a QFX5100 Device

Install and Remove Transceivers and Fiber Optic Cables on QFX5100 Devices

Fan Module LED on a QFX5100 Device

Figure 212 on page 536 shows the location of the LED next to the fan module.

Figure 212: Fan Module LED in a QFX5100 Switch

1— Fan LED

Table 85 on page 537 describes the function of the fan tray LED.

Table 85: Fan Tray LED in a QFX5100 Switch

Name	Color	State	Description
Fan	Green	On steadily	The fan module is operating normally. The system has verified that the module is engaged, that the airflow is in the correct direction, and that the fan is operating correctly.
	Amber	Blinking	An error has been detected in the fan module. Replace the fan module as soon as possible. Either the fan has failed or it is seated incorrectly. To maintain proper airflow through the chassis, leave the fan module installed in the chassis until you are ready to replace it.

AC Power Supply LEDs on a QFX5100 Device

Figure 213 on page 537 shows the location of the LEDs on the power supply.

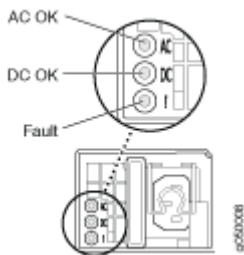**Figure 213: AC Power Supply LEDs on a QFX5100 Switch**

Table 86 on page 538 describes the LEDs on the AC power supplies.

**Table 86: AC Power Supply LEDs on a QFX5100 Switch**

LED	Color	State	Description
AC OK	Unlit	Off	The power supply is disconnected from power, or power is not coming into the power supply.
	Green	On steadily	Power is coming into the power supply.
DC OK	Unlit	Off	The power supply is disconnected from power, or the power supply is not sending out power correctly.
	Green	On steadily	The power supply is sending out power correctly.
Fault	Amber	On steadily	An error has been detected in the power supply. Replace the power supply as soon as possible. To maintain proper airflow through the chassis, leave the power supply installed in the chassis until you are ready to replace it.

NOTE: If the **AC OK** LED and the **DC OK** LED are unlit, either the AC power cord is not installed properly or the power supply fuse has failed. If the **AC OK** LED is lit and the **DC OK** LED is unlit, the AC power supply is installed properly, but the power supply has an internal failure.

DC Power Supply LEDs on a QFX5100 Device

shows the location of the LEDs on the DC power supply.

Figure 214: DC Power Supply Faceplate on a QFX5100 Switch
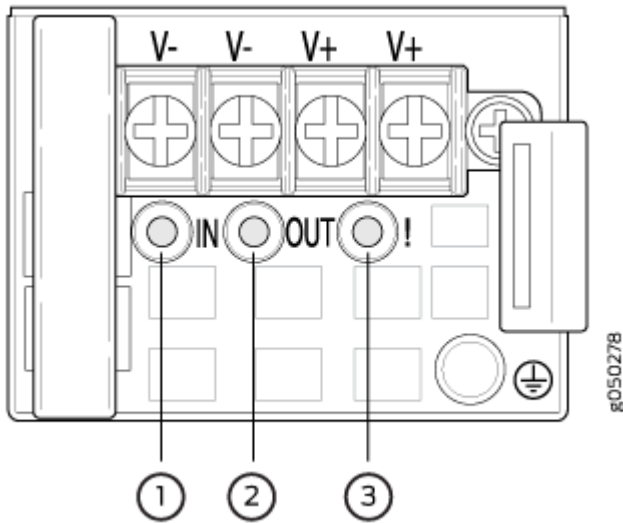
1– Input LED	3– Fault LED
2– Output LED	

CAUTION: The V+ terminals are shunted internally together, as are the V- terminals. The same polarity terminal can be wired together from the same source to provide an additional current path in a higher power chassis. Do not connect the terminals to different sources.

Table 87 on page 539 describes the LEDs on the DC power supplies.

Table 87: DC Power Supply LEDs on a QFX5100 Switch

Name	Color	State	Description
Input	Unlit	Off	The power supply is disconnected from power, or power is not coming into the power supply.
	Green	On steadily	Power is coming into the power supply.
Output	Unlit	Off	The power supply is disconnected from power, or the power supply is not sending out power correctly.

Table 87: DC Power Supply LEDs on a QFX5100 Switch *(Continued)*

Name	Color	State	Description
	Green	On steadily	The power supply is sending out power correctly.
Fault	Amber	On steadily	An error has been detected in the power supply. Replace the power supply as soon as possible. To maintain proper airflow through the chassis, leave the power supply installed in the chassis until you are ready to replace it.

CHAPTER 39

Viewing QFX3600 System Information

IN THIS CHAPTER

Chassis Status LEDs in the QFX3600 and QFX3600-I Device

The front panel of the QFX3600 and QFX3600-I device has three LEDs on the right side of the management board, next to the LCD panel (see).

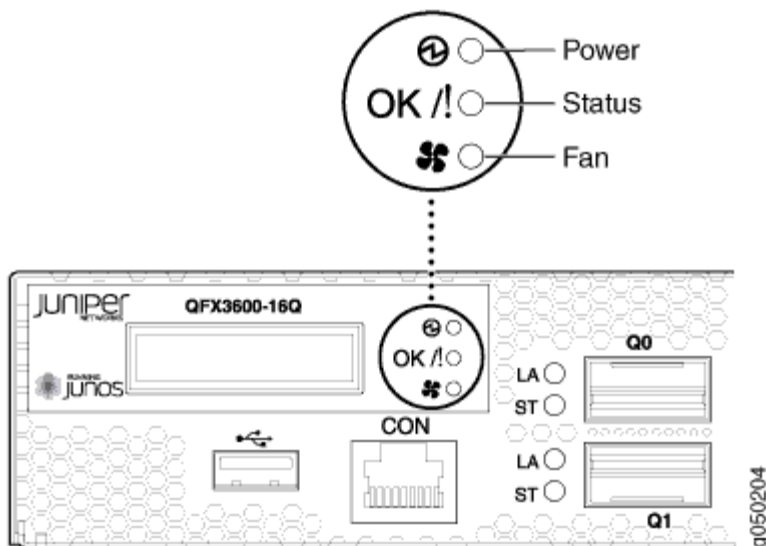**Figure 215: Chassis Status LEDs in the QFX3600 and QFX3600-I Device**

Table 88 on page 542 describes the chassis status LEDs in a QFX3600 and QFX3600-I device, 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 lcd`.

Table 88: Chassis Status LEDs in the QFX3600 and QFX3600-I Device

Name	Color	State	Description
Power	Green	On steadily	The device is powered on.
	Amber	Blinking	A temperature or voltage error has been detected, and the device has shut down. Power off the QFX3600 or QFX3600-I device following the instructions in "Powering Off a QFX3600 Device" on page 433. Correct any site temperature issues, and allow the device to cool down. Power on the QFX3600 or QFX3600-I device and monitor the power supply and fan LEDs to help determine where the error is occurring. If the amber Power LED begins blinking again, power off the QFX3600 or QFX3600-I device and contact customer support. See *Contacting Customer Support to Obtain a Return Materials Authorization for a QFX Series Device or Component*.
Status	Green	On steadily	Junos OS has been loaded on the device.
		Intermittent blinking	The beacon feature has been enabled on the device using the `request chassis beacon` command.
	Amber	Blinking	A software error has occurred. Power off the QFX3600 or QFX3600-I device by following the instructions in "Powering Off a QFX3600 Device" on page 433. Power on the QFX3600 or QFX3600-I device and monitor the management board LEDs to ensure that Junos OS boots properly.
Fan	Green	On steadily	The fan trays are operating normally.
	Amber	Blinking	An error has been detected in a fan tray installed on the rear panel of the device. Replace the fan tray as soon as possible. To maintain proper airflow through the chassis leave the fan tray installed in the chassis, until you are ready to replace it.

Management Port LEDs in the QFX3600 and QFX3600-I Device

The RJ-45 management ports labeled **C0** and **C1** and SFP management ports labeled **C0S** and **C1S** in a QFX3600 or QFX3600-I device have two LEDs that indicate link speed and activity.

> **NOTE**: On the SFP management ports, **LA** denotes activity, and **ST** denotes speed.

Figure 216: LEDs on the Management Ports on a QFX3600 or QFX3600-I Device
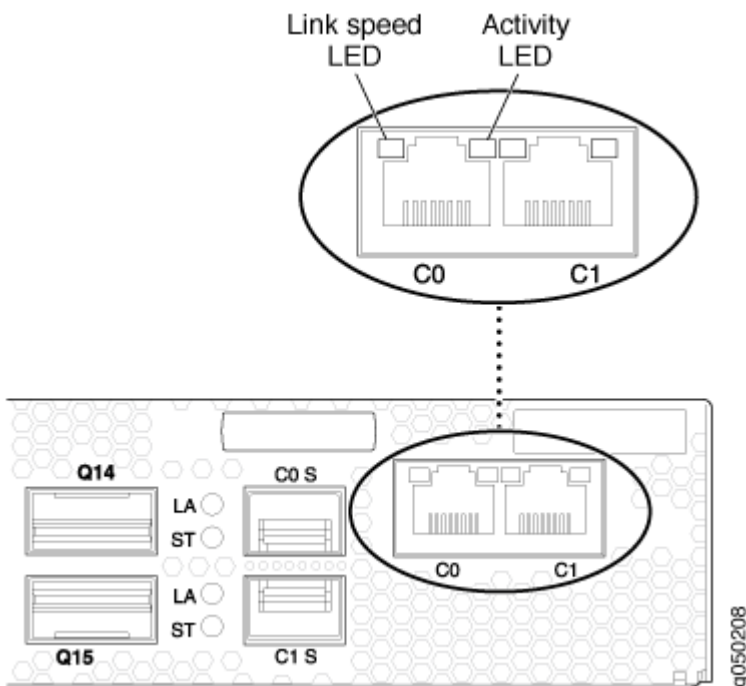
Table 89 on page 544 describes the management port LEDs.

Table 89: Management Port LEDs in a QFX3600 or QFX3600-I Device

LED	Color	State	Description
Link speed	Unlit	Off	The port is not active.
	Green	On steadily	1-Gbps link is established.
	Amber	On steadily	10/100-Mbps link is established. **NOTE**: The SFP management ports (**C0S** and **C1S**) do not support 10-Mbps or 100-Mbps speeds.
Activity	Unlit	Off	There is no activity on the link.
	Green	Flickering	There is activity on the link.

RELATED DOCUMENTATION

Front Panel of a QFX3600 Device

Front Panel of a QFX3600-I Interconnect Device

Connecting a QFX3600 Device to a Network for Out-of-Band Management

Access Port and Uplink Port LEDs on a QFX3600 or QFX3600-I Device

Each access port and uplink port in a QFX3600 device has two LEDs (see Figure 217 on page 545).

Figure 217: LEDs on the QSFP+ Access and Uplink Ports

The LEDs labeled Link/Activity LED in indicate link activity or faults. The LEDs labeled Status LED in indicate link status.

describes the QSFP+ access port LEDs.

Table 90: Access Port LEDs on QSFP+ Ports on a QFX3600 Device

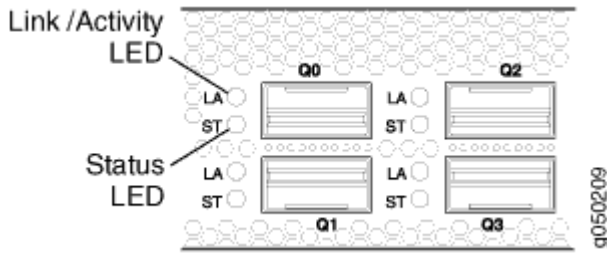| LED	Color	State	Description
Link/Activity	Unlit	Off	No link is established, there is a fault, or the link is down. **NOTE**: The LED remains unlit only if all four of the 10-Gigabit Ethernet SFP+ breakout links are down.
	Green	On steadily	A link is established, but there is no link activity. **NOTE**: The LED is lit green when at least one of the four 10-Gigabit Ethernet SFP+ breakout links is established.
		Blinking	A link is established, and there is link activity. **NOTE**: The LED is lit green when at least one of the four 10-Gigabit Ethernet SFP+ breakout links is established.
Status	Unlit	Off	No transceiver is installed in the port, or the transceiver is not supported.
	Green	On steadily	A transceiver is installed in the port.

describes the QSFP+ uplink port LEDs.

Table 91: Uplink Port LEDs on a QFX3600 or QFX3600-I Device

LED	Color	State	Description
Link/Activity	Unlit	Off	No link is established, there is a fault, or the link is down.
	Green	On steadily	A link is established, but there is no link activity.
		Blinking	A link is established, and there is link activity.
Status	Unlit	Off	No transceiver is installed in the port, or the transceiver is not supported.
	Green	On steadily	A transceiver is installed in the port.

RELATED DOCUMENTATION

Front Panel of a QFX3600 Device

Front Panel of a QFX3600-I Interconnect Device

Installing a Transceiver in a QFX Series Device

Connecting a Fiber-Optic Cable to a QFX Series Device

Fan Tray LED on a QFX3600 or QFX3600-I Device

Figure 218 on page 547 shows the location of the LED on the fan tray.

Figure 218: Fan Tray

1– Handle	2– LED
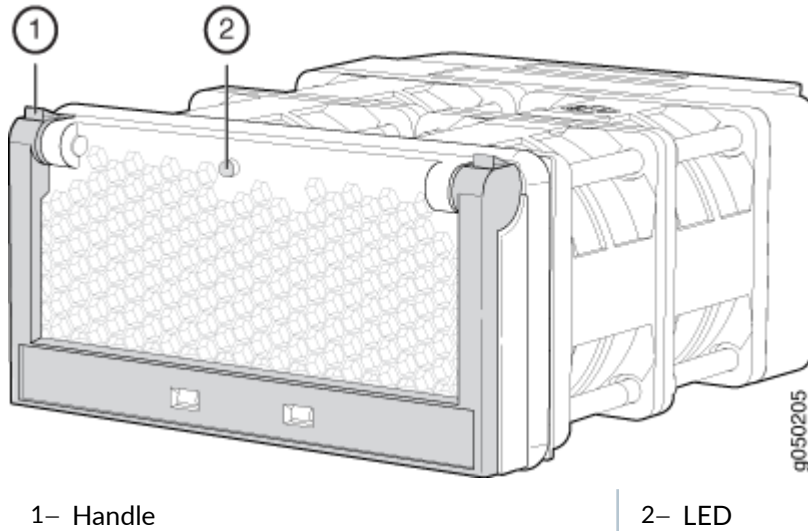
Table 92 on page 547 describes the function of the fan tray LED.

Table 92: Fan Tray LED

Name	Color	State	Description
Fan	Green	On steadily	The fan tray is operating normally.
	Amber	Blinking	An error has been detected in the fan tray. Replace the fan tray as soon as possible. To maintain proper airflow through the chassis, leave the fan tray installed in the chassis until you are ready to replace it.

RELATED DOCUMENTATION

Cooling System and Airflow for QFX3600 and QFX3600-I Devices

Installing a Fan Tray in a QFX3600 or QFX3600-I Device

Removing a Fan Tray from a QFX3600 or QFX3600-I Device

AC Power Supply LEDs on a QFX3500, QFX3600, or QFX3600-I Device

Figure 219 on page 548 shows the location of the LEDs on the power supply.

Figure 219: AC Power Supply LEDs on a QFX3500, QFX3600, or QFX3600-I Device
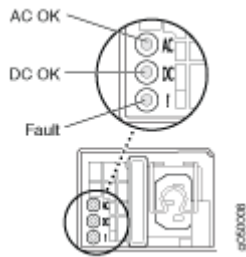
describes the LEDs on the AC power supplies.

Table 93: AC Power Supply LEDs on a QFX3500, QFX3600, or QFX3600-I Device

LED	Color	State	Description
AC OK	Unlit	Off	The power supply is disconnected from power, or power is not coming into the power supply.
	Green	On steadily	Power is coming into the power supply.
DC OK	Unlit	Off	The power supply is disconnected from power, or the power supply is not sending out power correctly.
	Green	On steadily	The power supply is sending out power correctly.
Fault	Amber	On steadily	An error has been detected in the power supply. Replace the power supply as soon as possible. To maintain proper airflow through the chassis, leave the power supply installed in the chassis until you are ready to replace it.

NOTE: If the **AC OK** LED and the **DC OK** LED are unlit, either the AC power cord is not installed properly or the power supply fuse has failed. If the **AC OK** LED is lit and the **DC OK** LED is unlit, the AC power supply is installed properly, but the power supply has an internal failure.

RELATED DOCUMENTATION

AC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

DC Power Supply LEDs on a QFX3500, QFX3600, or QFX3600-I Device

Figure 220 on page 549 shows the location of the LEDs on the DC power supply.

**Figure 220: DC Power Supply Faceplate on a QFX3500, QFX3600, or QFX3600-I Device**

1– Shunt positive input terminals		5– ESD grounding point	
2– Shunt negative input terminals		6– Fault LED	
3– Terminal block		7– Output LED	
4– Ejector lever		8– Input LED	

![caution] **CAUTION**: The V+ terminals are shunted internally together, as are the V- terminals. The same polarity terminal can be wired together from the same source to provide an

additional current path in a higher power chassis. Do not connect the terminals to different sources.

describes the LEDs on the DC power supplies.

Table 94: DC Power Supply LEDs on a QFX3500, QFX3600, or QFX3600-I Device

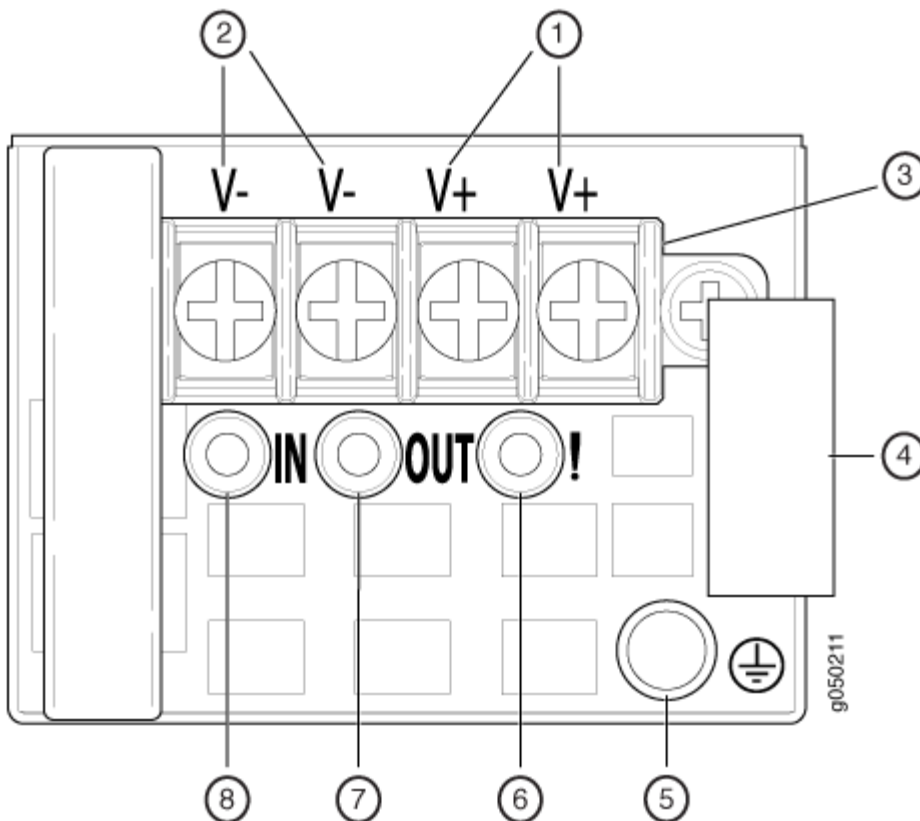| Name	Color	State	Description
Input	Unlit	Off	The power supply is disconnected from power, or power is not coming into the power supply.
	Green	On steadily	Power is coming into the power supply.
Output	Unlit	Off	The power supply is disconnected from power, or the power supply is not sending out power correctly.
	Green	On steadily	The power supply is sending out power correctly.
Fault	Amber	On steadily	An error has been detected in the power supply. Replace the power supply as soon as possible. To maintain proper airflow through the chassis, leave the power supply installed in the chassis until you are ready to replace it.

RELATED DOCUMENTATION

DC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

Connecting DC Power to a QFX3500, QFX3600, or QFX3600-I Device

CHAPTER 40

Viewing QFX3500 System Information

IN THIS CHAPTER

Chassis Status LEDs on a QFX3500 Device

The front panel of the QFX3500 device has three LEDs on the right side of the management board, next to the LCD panel (see).

Figure 221: Chassis Status LEDs on a QFX3500 Device
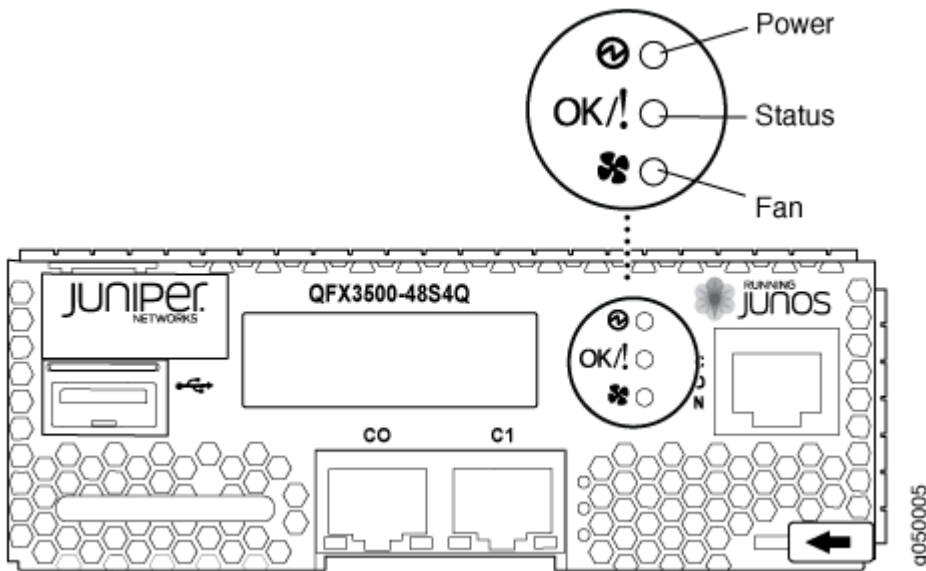
describes the chassis status LEDs on a QFX3500 device, their colors and states, and the status they indicate. You can view the colors of the three LEDs remotely through the CLI by issuing the operational mode command `show chassis lcd`.

Table 95: Chassis Status LEDs on a QFX3500 Device

Name	Color	State	Description
Power	Green	On steadily	The device is powered on.
	Amber	Blinking	A temperature or voltage error has been detected, and the device has shut down. Power off the QFX3500 device by setting the AC power source outlet to the OFF (O) position, or unplugging the AC power cords. Correct any site temperature issues, and allow the device to cool down. Power on the QFX3500 device and monitor the power supply and fan LEDs to help determine where the error is occurring. If the amber Power LED begins blinking again, power off the QFX3500 device and contact customer support. See *Contacting Customer Support to Obtain a Return Materials Authorization for a QFX Series Device or Component*.
Status	Green	On steadily	Junos OS has been loaded on the device.

Table 95: Chassis Status LEDs on a QFX3500 Device *(Continued)*

Name	Color	State	Description
		Intermittent blinking	The beacon feature has been enabled on the device using the `request chassis beacon` command.
	Amber	Blinking	A software error has occurred. Power off the QFX3500 device by setting the AC power source outlet to the OFF (O) position, or unplugging the AC power cords. Power on the QFX3500 device and monitor the management board LEDs to ensure that Junos OS boots properly.
Fan	Green	On steadily	The fan modules on the management board are operating normally.
	Amber	Blinking	An error has been detected in the fan modules installed on the management board. Replace the management board as soon as possible. You must power off the QFX3500 device before replacing the management board. See *Removing a Management Board from a QFX3500 Device*.

RELATED DOCUMENTATION

Front Panel of a QFX3500 Device

Chassis Alarm Messages on a QFX3500 Device

Management Port LEDs on a QFX3500 Device

The management ports (labeled **C0** and **C1**) on a QFX3500 device have two LEDs that indicate link speed and activity (see).

> **NOTE**: depicts the 1000BASE-T management ports. The LEDs on the SFP management ports are identical.

Figure 222: Management Port LEDs on a QFX3500 Device
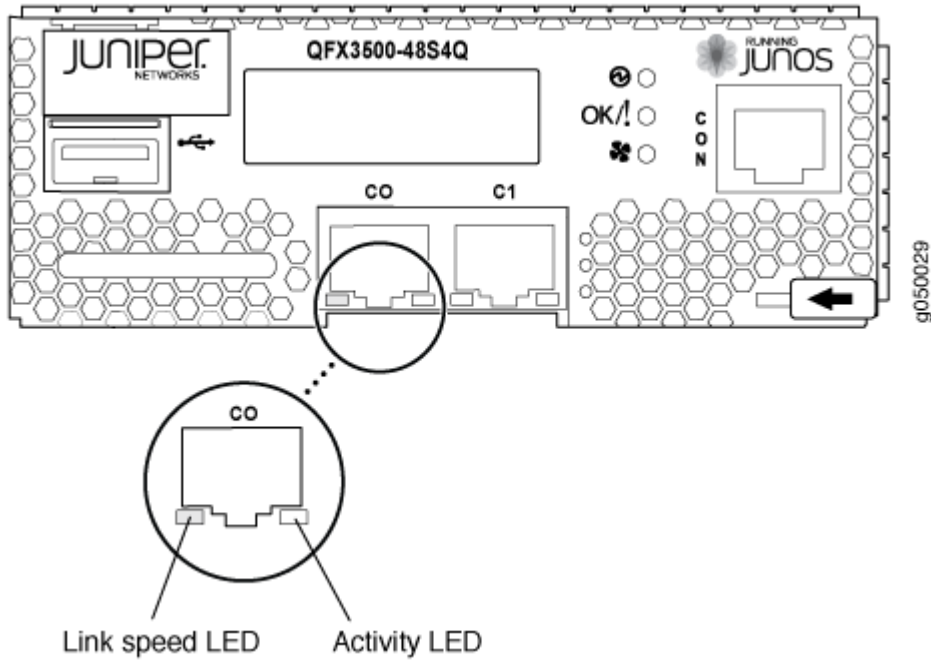
describes the management port LEDs.

Table 96: Management Port LEDs on a QFX3500 Device

LED	Color	State	Description
Link speed	Unlit	Off	The port is not active.
	Green	On steadily	1-Gbps link is established.
	Amber	On steadily	10/100-Mbps link is established.
Activity	Unlit	Off	There is no activity on the link.
	Green	Flickering	There is activity on the link.

Front Panel of a QFX3500 Device

Connect a Device to a Network for Out-of-Band Management

Access Port and Uplink Port LEDs on a QFX3500 Device

Each access port and uplink port on a QFX3500 device has two LEDs. The two figures in this topic show the location of those LEDs:

- shows the location of the LEDs on the SFP+ access ports.

- shows the location of the LEDs on the QSFP+ uplink ports.

Figure 223: LEDs on the SFP+ Access Ports
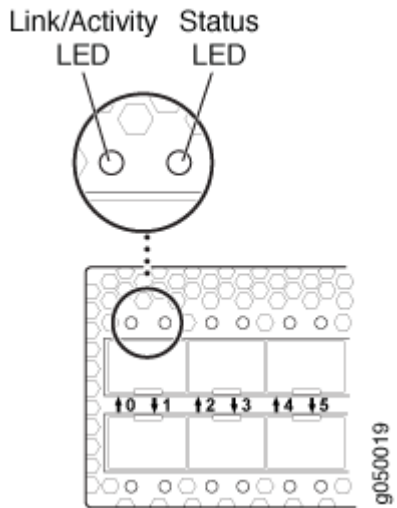
Figure 224: LEDs on the QSFP+ Uplink Ports
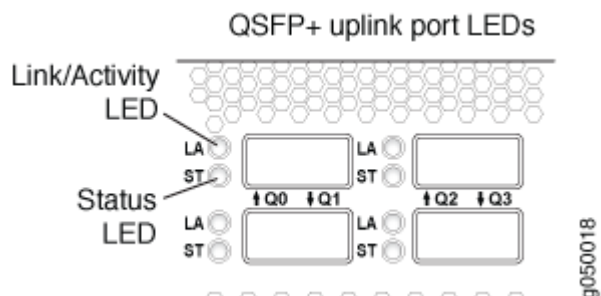
The LEDs labeled Link/Activity LED in Figure 223 on page 555 and Figure 224 on page 555 indicate link activity or faults. The LEDs labeled Status LED in Figure 223 on page 555 and Figure 224 on page 555 indicate link status.

> **TIP**: By default, all access ports are configured as Ethernet interfaces. If you insert a Fibre Channel transceiver, the LEDs do not light until you configure the port as a Fibre Channel interface in Junos OS. Likewise, the LEDs do not light if you insert an Ethernet transceiver in a port configured as a Fibre Channel interface.

Table 97 on page 556 describes the SFP+ access port LEDs.

Table 97: Network Port LEDs on SFP+ Access Ports on a QFX3500 Device

LED	Color	State	Description
Link/Activity	Unlit	Off	No link is established, there is a fault, or the link is down.
	Green	On steadily	A link is established, but there is no link activity.
		Blinking	A link is established, and there is link activity.
Status	Unlit	Off	No transceiver is installed in the port, the port is configured for a different interface, or the transceiver is not supported.
	Green	On steadily	An Ethernet transceiver is installed in the port.
	Amber	On steadily	A Fibre Channel transceiver is installed in the port.

Table 98 on page 556 describes the QSFP+ uplink port LEDs.

Table 98: Uplink Port LEDs on QSFP+ Uplink Ports on a QFX3500 Device

LED	Color	State	Description
Link/Activity	Unlit	Off	No link is established, there is a fault, or the link is down. **NOTE**: The LED remains unlit only if all four of the 10-Gigabit Ethernet SFP+ breakout links are down.

Table 98: Uplink Port LEDs on QSFP+ Uplink Ports on a QFX3500 Device *(Continued)*

LED	Color	State	Description
	Green	On steadily	A link is established, but there is no link activity. **NOTE**: The LED is lit green when at least one of the four 10-Gigabit Ethernet SFP+ breakout links is established.
		Blinking	A link is established, and there is link activity. **NOTE**: The LED is lit green when at least one of the four 10-Gigabit Ethernet SFP+ breakout links is established.
Status	Unlit	Off	No transceiver is installed in the port, or the transceiver is not supported.
	Green	On steadily	A transceiver is installed in the port.

RELATED DOCUMENTATION

Rear Panel of a QFX3500 Device

Installing a Transceiver in a QFX Series Device

Connecting a Fiber-Optic Cable to a QFX Series Device

Fan Tray LED on a QFX3500 Device

Figure 225 on page 558 shows the location of the LED on the fan tray.

Figure 225: Fan Tray LED in a QFX3500 Device
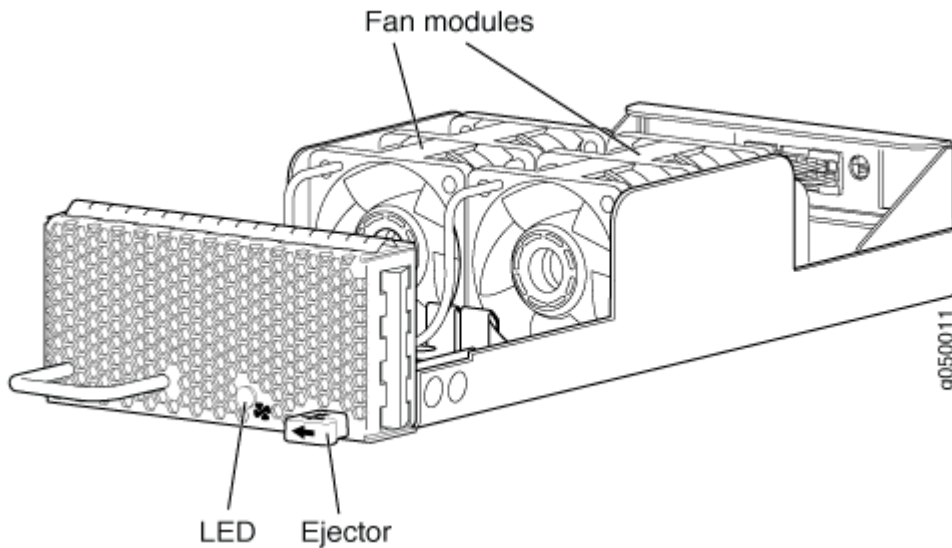
describes the function of the fan tray LED.

Table 99: Fan Tray LED in a QFX3500 Device

Name	Color	State	Description
Fan	Green	On steadily	The fan tray is operating normally.
	Amber	Blinking	An error has been detected in the fan tray. Replace the fan tray as soon as possible. To maintain proper airflow through the chassis, leave the fan tray installed in the chassis until you are ready to replace it.

RELATED DOCUMENTATION

Cooling System and Airflow for a QFX3500 Device

Installing a Fan Tray in a QFX3500 Device

Removing a Fan Tray from a QFX3500 Device

AC Power Supply LEDs on a QFX3500, QFX3600, or QFX3600-I Device

shows the location of the LEDs on the power supply.

Figure 226: AC Power Supply LEDs on a QFX3500, QFX3600, or QFX3600-I Device
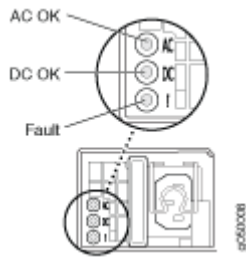
describes the LEDs on the AC power supplies.

Table 100: AC Power Supply LEDs on a QFX3500, QFX3600, or QFX3600-I Device

LED	Color	State	Description
AC OK	Unlit	Off	The power supply is disconnected from power, or power is not coming into the power supply.
	Green	On steadily	Power is coming into the power supply.
DC OK	Unlit	Off	The power supply is disconnected from power, or the power supply is not sending out power correctly.
	Green	On steadily	The power supply is sending out power correctly.
Fault	Amber	On steadily	An error has been detected in the power supply. Replace the power supply as soon as possible. To maintain proper airflow through the chassis, leave the power supply installed in the chassis until you are ready to replace it.

NOTE: If the **AC OK** LED and the **DC OK** LED are unlit, either the AC power cord is not installed properly or the power supply fuse has failed. If the **AC OK** LED is lit and the **DC OK** LED is unlit, the AC power supply is installed properly, but the power supply has an internal failure.

RELATED DOCUMENTATION

AC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

DC Power Supply LEDs on a QFX3500, QFX3600, or QFX3600-I Device

shows the location of the LEDs on the DC power supply.

Figure 227: DC Power Supply Faceplate on a QFX3500, QFX3600, or QFX3600-I Device

1–	Shunt positive input terminals	5–	ESD grounding point
2–	Shunt negative input terminals	6–	Fault LED
3–	Terminal block	7–	Output LED
4–	Ejector lever	8–	Input LED

⚠ **CAUTION**: The V+ terminals are shunted internally together, as are the V- terminals. The same polarity terminal can be wired together from the same source to provide an

additional current path in a higher power chassis. Do not connect the terminals to different sources.

describes the LEDs on the DC power supplies.

Table 101: DC Power Supply LEDs on a QFX3500, QFX3600, or QFX3600-I Device

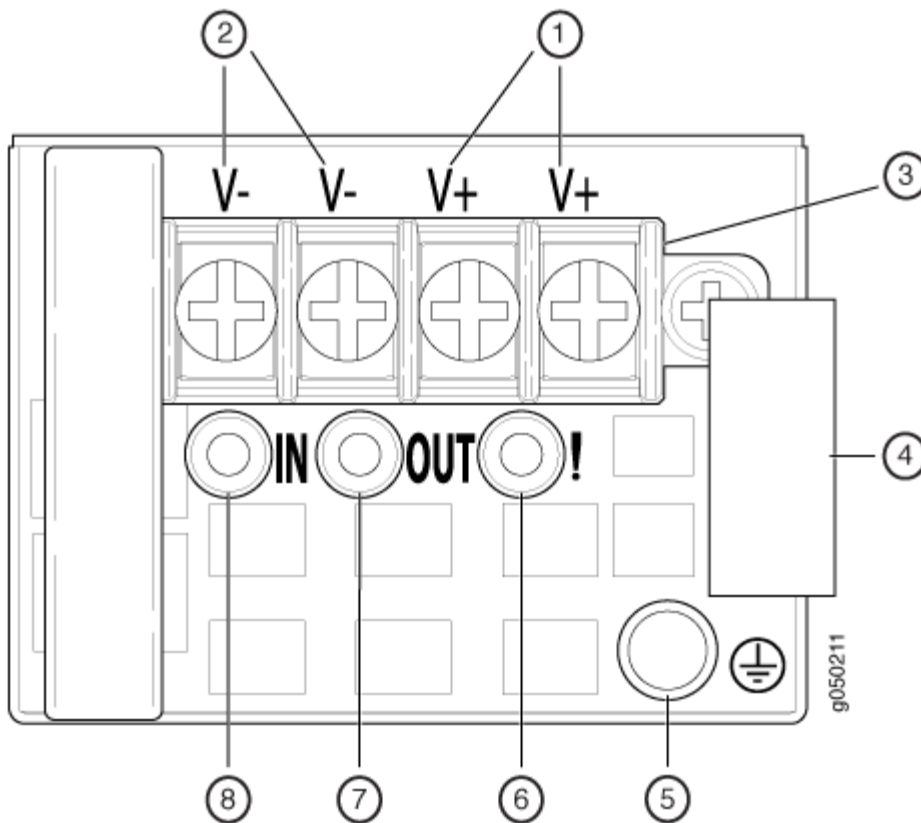| Name	Color	State	Description
Input	Unlit	Off	The power supply is disconnected from power, or power is not coming into the power supply.
	Green	On steadily	Power is coming into the power supply.
Output	Unlit	Off	The power supply is disconnected from power, or the power supply is not sending out power correctly.
	Green	On steadily	The power supply is sending out power correctly.
Fault	Amber	On steadily	An error has been detected in the power supply. Replace the power supply as soon as possible. To maintain proper airflow through the chassis, leave the power supply installed in the chassis until you are ready to replace it.

RELATED DOCUMENTATION

DC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

Connecting DC Power to a QFX3500, QFX3600, or QFX3600-I Device

Viewing EX4300 System Information

IN THIS CHAPTER

Dashboard for EX Series Switches

IN THIS SECTION

NOTE: This topic applies only to the J-Web Application package.

When you log in to the J-Web user interface, the dashboard for the Juniper Networks EX Series Ethernet Switches appears. Use the dashboard to view system information.

The Update Available window appears if there is a latest update of the J-Web Application package available on the Juniper Networks server. This window is enabled by the auto update feature of J-Web.

> **NOTE**:
>
> - The Update Available window will *not* appear when you log in, if you have not selected the **Check for updates automatically on every login** in the *Update Preference* section in the **Maintain > Update J-Web** side pane. By default, the *Check for update automatically on every login* is selected.
>
> - If you choose *Update Later*, you can update to the latest J-Web Application package by clicking the orange icon next to *Update Available* on the top pane of the J-Web interface or through **Maintain > Update J-Web**.
>
> - Starting in Junos OS Release 22.3R1 which aligns with the J-Web Application package release 22.3A1, J-Web supports EX4400 switches.
>
> - Starting in Junos OS Release 22.4R1 which aligns with the J-Web Application package release 22.4A1, J-Web supports EX4100 and EX4100-F switches.
>
> - Starting in Junos OS Release 23.1R1 which aligns with the J-Web Application package release 23.1A1, J-Web supports EX4400-24X switches.
>
> - Starting in Junos OS Release 23.2R1 which aligns with the J-Web Application package release 23.2A1, J-Web supports EX4400-EM-1C uplink module for EX4400 and EX4400-24X switches.

The dashboard comprises a graphical chassis viewer and four panels.

Graphical Chassis Viewer

The Dashboard panel displays a graphical view of the chassis of a switch. In a Virtual Chassis, it displays a graphical view of each member switch.

In a Virtual Chassis, the default values are shown on the Dashboard panel when no chassis image is clicked. The panel displays the value for a switch if you click its image.

> **NOTE**:

- If the member switch is not present, inactive, or not provisioned, you cannot expand the member switch image.

- Starting in J-Web Application Package Release 19.2A1, J-Web supports EX4650 switches.

  NOTE: For EX4650 switches, chassis viewer supports only the standalone view and does not support the Virtual Chassis configuration.

- Starting in Junos OS Release 22.3R1 which aligns with the J-Web Application package release 22.3A1, J-Web supports EX4400 switches. For EX4400 switches, chassis viewer supports both the standalone view and Virtual Chassis configuration.

- Starting in Junos OS Release 22.4R1 which aligns with the J-Web Application package release 22.4A1, J-Web supports EX4100 and EX4100-F switches. For EX4100 and EX4100-F switches, chassis viewer supports both the standalone view and Virtual Chassis configuration.

- Starting in Junos OS Release 23.1R1 which aligns with the J-Web Application package release 23.1A1, J-Web supports EX4400-24X switches. For EX4400-24X switches, chassis viewer supports both the standalone view and Virtual Chassis configuration.

- Starting in Junos OS Release 23.2R1 which aligns with the J-Web Application package release 23.2A1, J-Web supports EX4400-EM-1C uplink module for EX4400 and EX4400-24X switches.

lists the details that are displayed on each member switch.

Table 102: Details of a Virtual Chassis Member Switch

Details	Example
Model number of the member switch	**EX3300**
Assigned ID that applies to the entire Virtual Chassis configuration	**ID 2** **NOTE**: If the member switch is not provisioned, the serial number of the switch is displayed instead of its ID.
Role of the member switch	**Master** Possible roles are: **Master**, **Backup**, or **Linecard**

Table 102: Details of a Virtual Chassis Member Switch *(Continued)*

Details	Example
Status of the member switch	**Prsnt** Possible statuses are: **Prsnt**, **NotPrsnt**, **Inactive**, or **Unprvsnd**

The status of the member switch is displayed on the image of the switch. If the member switch appears dimmed, it means the switch is not present, is inactive, or is not provisioned in the Virtual Chassis. If the member switch does not appear dimmed, it means the switch is present and is active.

describes the possible status of a member switch.

Table 103: Status of a Member Switch in a Virtual Chassis

If the member switch is	It appears as	It means the member switch
Present	**Prsnt**	Has established physical and logical connections with Virtual Chassis member switches.
Not present	dimmed and **NotPrsnt**	Has been disconnected from the existing Virtual Chassis.
Inactive	dimmed and **Inactive**	Has established physical connections, but is unable to establish logical connections.
Not provisioned	dimmed and **Unprvsnd**	Cannot synchronize with the existing preprovisioned Virtual Chassis.

Click **Rear View** for a graphical view of the rear panel of the switch.

Click **Preferences** to choose which panels must be displayed and set the refresh interval for chassis viewer information. Click **OK** to save your changes and return to the dashboard or click **Cancel** to return to the dashboard without saving changes.

NOTE: You can drag the various panels to different locations in the J-Web window.

System Information Panel

Table 104: System Information

Field	Description
System name	Indicates the local name of the EX Series switch. The local name of the EX Series switches changes when an individual image is clicked. For EX4650, EX4400, EX4100, and EX4100-F switches: • Indicates the switch's host name. • Displays the switch's specific host name when you click on the individual line card.
Device model	Indicates the model of the EX Series switch. In a Virtual Chassis configuration, to indicate the model of a switch, click the image of that switch. **NOTE**: In a Virtual Chassis setup for an EX6210, EX8208, or EX8216 switch, the Device model field displays details of the primary Routing Engine. To view details of a member, select it. By default, the EX4650, EX4400, EX4100, and EX4100-F switches show the model of the primary switch. When you click on the image, the model of the switch is displayed.

Table 104: System Information *(Continued)*

Field	Description
Inventory details	Indicates the following: • For EX3200, EX2200, EX2200-C, EX3300, EX4200, EX4300-48MP, EX4500, and EX4550 switches that are not configured as Virtual Chassis, the value displayed in Inventory details field is always 1 FPC. FPC is a legacy term for a slot in a large Juniper Networks chassis; which simply refers to the standalone switch. • For EX2200 and EX2200-C switches configured as a Virtual Chassis, the value displayed in the Inventory details field is 1–4 FPC, with the number corresponding to the number of member switches. • For EX3300 switches configured as a Virtual Chassis, the value displayed in the Inventory details field is 1–6 FPC, with the number corresponding to the number of member switches. NOTE: For Junos OS Release 14.1X53-D10 and later, EX3300 switches configured as a Virtual Chassis display the value 1–10 FPC in the Inventory details field. • For EX4200, EX4500, and EX4550 switches configured as a Virtual Chassis, the value displayed in the Inventory details field is 1–10 FPC, with the number corresponding to the number of member switches. • For EX4650, EX4400, EX4100, and EX4100-F switches, the value displayed in Inventory details field is equal to the number of FPCs. • For EX6210 switches, the values displayed in the Inventory details field are 1–2 CB and 1–9 FPC. CB, or Control Board, refers to the SRE module. FPC refers to line cards and the FPC within the CB.

Table 104: System Information *(Continued)*

Field	Description
	- For an EX8208 switch, the values displayed in Inventory details field are 1–3 CB and 0–8 FPC. CB, or Control Board, refers to SRE and SF modules. FPC refers to line cards. - For EX8216 switches, the values displayed in Inventory details field are 1–2 CB and 0–16 FPC. CB, or Control Board, refers to RE modules and FPC refers to line cards. - For an XRE200 External Routing Engine in an EX8200 Virtual Chassis, the value displayed in Inventory details is 1 XRE. XRE refers to RE modules. For XRE200 External Routing Engines configured as a Virtual Chassis, the values displayed in Inventory details are 1–2 XRE and 0–4 LCC, where LCC refers to the EX8200 line card chassis.
Junos image	Indicates the version of the Junos OS image. In a Virtual Chassis configuration, the Junos OS image of the primary switch is displayed by default. To display the Junos OS image of a specific switch, click the image of that switch. **NOTE**: For EX4650, EX4400, EX4100, and EX4100-F switches, the Junos OS image of the primary switch is displayed by default. To display the Junos OS image of a specific switch, click the image of that switch.
Boot image	Indicates the version of the boot image that is used. In a Virtual Chassis configuration, the boot image of the primary switch is displayed by default. To display the boot image of a specific switch, click the image of that switch. **NOTE**: For EX4650, EX4400, EX4100, and EX4100-F switches, the boot image of the primary switch is displayed by default. To display the boot image of a specific switch, click the image of that switch.

Table 104: System Information *(Continued)*

Field	Description
Device uptime	Indicates the time since the last reboot. In a Virtual Chassis configuration, to display the uptime of the specific switch, click the image of that switch. **NOTE**: For EX4650, EX4400, EX4100, and EX4100-F switches, click the image of the switch to display the uptime.
Last configured time	Indicates the time when the switch was last configured. For EX4400, EX4100, and EX4100-F switches in Virtual Chassis configuration, indicates the last configured time of the primary by default. To display the last configured time of a specific switch, click the image of that switch.

Health Status Panel

Table 105: Health Status

Field	Description
EX2200, EX2200-C, EX3200, EX3300, EX4200, and EX4300-48MP Switches	
Memory util.	Indicates the memory used in the Routing Engine. In a Virtual Chassis configuration, the memory utilization value of the primary Routing Engine is displayed. **NOTE**: In EX4300-48MP switches, you can use only the built-in QSFP+ ports as VCPs to connect the switch in a Virtual Chassis. You cannot connect the ports on the uplink module in EX4300-48MP switches to Virtual Chassis ports (VCPs).
Flash	Indicates the usage and capacity of internal flash memory and any external USB flash drive.

Table 105: Health Status *(Continued)*

Field	Description
Temp.	Indicates the chassis temperature status. Temperatures are listed in Celsius and the corresponding Fahrenheit values. **NOTE**: The **Temp** field is unavailable for a standalone EX2200-C switch. The **Temp** field is dynamically available for an EX2200 Virtual Chassis switch based on the model of the member clicked.
CPU load	Indicates the average CPU usage over 15 minutes. In a Virtual Chassis configuration, on loading the primary or backup switch, the CPU load for that switch's Routing Engine is displayed by default. To display the CPU load for a specific switch's Routing Engine, click the image of that switch.
Fan status	Indicates the status of the fans in the fan tray. The possible values are **OK**, **Failed**, and **Absent**. In a Virtual Chassis configuration, the fan status of the primary switch is displayed by default. To display the fan status for any switch , click the image of that switch. **NOTE**: The **Fan status** field is unavailable for a standalone EX2200-C switch. The **Fan status** field is dynamically available for an EX2200 Virtual Chassis switch based on the model of the member clicked.

EX4500 and EX4550 Switches

Field	Description
Memory util.	Indicates the memory used in the Routing Engine. In a Virtual Chassis configuration, the memory utilization value of the primary Routing Engine is displayed.
Flash	Indicates the usage and capacity of internal flash memory and any external USB flash drive.
Temp.	Indicates the chassis temperature status. Temperatures in the dashboard are listed in Celsius and the corresponding Fahrenheit values. **NOTE**: The **Temp** field is unavailable for an EX4500 switch.
CPU load	Indicates the average CPU usage over 15 minutes.
Fan status	Indicates the status of the fans in the fan tray. The possible values are **OK**, **Failed**, and **Absent**. This field also indicates the direction of airflow of the fan tray. The possible values are **Front to back** and **Back to front**.

Table 105: Health Status *(Continued)*

Field	Description
EX4650, EX4400, EX4100, and EX4100-F Switches	
Fan status	Indicates the status of the fans in the fan tray. The possible values are **OK**, **Failed**, and **Absent**.
	NOTE: The fans are located on the side panel of the chassis.
	For EX4400, EX4100, and EX4100-F switches in Virtual Chassis, displays the primary member's fan status.
	NOTE: EX4100-F-12T and EX4100-F-12P are fanless switches that have natural convection cooling.
Temp.	Indicates temperature of the sensor near to Routing Engine.
	In EX4400, EX4100, and EX4100-F Virtual Chassis, the primary FPCs Routing Engine temperature is displayed by default. To display the temperature of the FPC Routing Engine of the specific switch, click the image of that switch.
Memory util.	Indicates the memory used in the Routing Engine.
	To display the Routing Engine memory utilization of the EX4400, EX4100, and EX4100-F switches, click primary or line card for primary or click backup for backup.
CPU load	Indicates the average CPU usage over 15 minutes.
	In EX4400, EX4100, and EX4100-F Virtual Chassis, the primary Routing Engine CPU load is displayed by default. To display the chassis Routing Engine CPU load of the specific switch, click the image of that switch.
EX6210 Switches	
Memory util.	Indicates the memory used in the primary Routing Engine. Click the **backup Routing Engine** to view the memory used in the backup Routing Engine.
CPU load	Indicates the average CPU usage over 15 minutes.
Flash	Indicates the usage and capacity of internal flash memory and any external USB flash drive.

Table 105: Health Status *(Continued)*

Field	Description
Fan status	Indicates the status of the fans in the fan tray. The possible values are **OK**, **Failed**, and **Absent**.

EX8208 Switches

Memory util.	Indicates the memory used in the external Routing Engine. In an EX8200 Virtual Chassis, the memory utilization value of the XRE200 External Routing Engine in the primary role is displayed. Click the **XRE200 External Routing Engine** in the backup role to view the memory used in the backup external Routing Engine.
CPU load	Indicates the average CPU usage over 15 minutes.
Flash	Indicates the usage and capacity of internal flash memory and any external USB flash drive.

EX8216 Switches

Memory util.	Indicates the memory used in the external Routing Engine. In an EX8200 Virtual Chassis, the memory utilization value of the XRE200 External Routing Engine in the primary role is displayed. Click the XRE200 External Routing Engine in the backup role to view the memory used in the backup external Routing Engine.
CPU load	Indicates the average CPU usage over 15 minutes.
Flash	Indicates the usage and capacity of internal flash memory and any external USB flash drive.

XRE200 External Routing Engines

Memory util.	Indicates the memory used in the external Routing Engine. In an EX8200 Virtual Chassis, the memory utilization value of the XRE200 External Routing Engine in the primary role is displayed. Click the backup XRE200 External Routing Engine to view the memory used in backup external Routing Engine.
CPU load	Indicates the average CPU usage over 15 minutes.
Flash	Indicates the usage and capacity of internal flash memory and any external USB flash drive.

Table 105: Health Status *(Continued)*

Field	Description
Fan Status	Indicates the status of the fans in the fan tray. The possible values are **OK**, **Failed**, and **Absent**.

Capacity Utilization Panel

Table 106: Capacity Utilization

Field	Description
Number of active ports	Indicates the number of active ports in the switch. Configured Virtual Chassis ports (VCPs) are considered as active ports.
Total number of ports	Indicates the number of ports in the switch. In EX3300 Virtual Chassis, the total number of ports of all of the switches is displayed. For EX4650 switches, on loading the switch, the consolidated values for all the FPCs are displayed by default. For EX4400, EX4100, and EX4100-F switches, on loading the switch, the consolidated values for all the FPCs are displayed by default and dedicated VCP ports are not considered.
Used-up MAC-Table entries	Indicates the number of MAC table entries.
Supported MAC-Table entries	Indicates the maximum number of MAC table entries permitted. For EX4650 switches, the supported maximum number of MAC table entries are 288000. For EX4400, EX4100, and EX4100-F switches, the supported maximum number of MAC table entries are 64000.

Table 106: Capacity Utilization *(Continued)*

Field	Description
Number of VLANs configured	Indicates the number of VLANs configured. **NOTE**: Only tagged VLANs are counted.
Number of VLANs supported	Indicates the maximum number of VLANs supported. For EX switches, the supported maximum number of VLANs are 4094.

Alarms Panel

Displays information about the last five alarms raised in the system. For example, if there are 5 major alarms, then details of all 5 major alarms are displayed. If there are 4 major alarms and 3 minor alarms, then details of the 4 major alarms and 1 minor alarm are displayed. Major alarms are displayed in red and minor alarms are displayed in yellow.

In an EX8200 Virtual Chassis, the top 5 alarms for the primary external Routing Engine are displayed by default. If you select an EX8200 member switch of the Virtual Chassis, the top 5 alarms for that member switch are displayed.

File System Usage

To display the file system storage details of a switch in the backup or line card role, click the image of that switch.

For EX4650, EX4400, EX4100, and EX4100-F switches, the directory, space used, and the file type details are displayed. By default, primary switch file system storage details are displayed. When you click the image, line card switch file system storage details are displayed.

Chassis Viewer

Click the **Rear View** button to see the back of the chassis image. Click the **Front View** button to see the front of the chassis image. In a Virtual Chassis configuration, the **Rear View** button is disabled if the switch is not selected.

> **NOTE**: For EX4650 switches, chassis viewer supports only the standalone view and does not support Virtual Chassis configuration.
>
> Starting in Junos OS Release 22.3R1 which aligns with the J-Web Application package release 22.3A1, J-Web supports EX4400 switches.
>
> Starting in Junos OS Release 22.4R1 which aligns with the J-Web Application package release 22.4A1, J-Web supports EX4100 and EX4100-F switches.
>
> Starting in Junos OS Release 23.1R1 which aligns with the J-Web Application package release 23.1A1, J-Web supports EX4400-24X switches.
>
> Starting in Junos OS Release 23.2R1 which aligns with the J-Web Application package release 23.2A1, J-Web supports EX4400-EM-1C uplink module for EX4400 and EX4400-24X switches.

Table 107: Chassis Viewer for EX2200 Switches

Field	Description
Front View	

Table 107: Chassis Viewer for EX2200 Switches *(Continued)*

Field	Description
Interface status	In the image, the following colors denote the interface status: • Green—Interface is up and operational. • Yellow—Interface is up but is nonoperational. • Gray—Interface is down and nonoperational. Mouse over the interface (port) to view more information.
Rear View	
Management (**me0**) port	The management port is used to connect the switch to a management device for out-of-band management.
Console port	The console port is used to connect the switch to a management console or to a console server. (You might do this for initial switch configuration.)
USB port	Indicates the USB port for the switch. **NOTE**: We recommend that you use USB flash drives purchased from Juniper Networks for your EX Series switch.
Fan tray	Mouse over the fan tray icon to display name, status, and description information.
Power supply	Mouse over the power outlet icon to display name, status, and description information.

Table 108: Chassis Viewer for EX2200-C Switches

Field	Description
Front View	

Table 108: Chassis Viewer for EX2200-C Switches *(Continued)*

Field	Description
Interface status	In the image, the following colors denote the interface status: • Green—Interface is up and operational. • Yellow—Interface is up but is nonoperational. • Gray—Interface is down and nonoperational. Mouse over the interface (port) to view more information.
Management (**me0**) port	The management port is used to connect the switch to a management device for out-of-band management.
Console port	The console port is used to connect the switch to a management console or to a console server. (You might do this for initial switch configuration.)
USB port	Indicates the USB port for the switch. **NOTE**: We recommend that you use USB flash drives purchased from Juniper Networks for your EX Series switch.
Rear View	
Power supply	Mouse over the power outlet icon to display name, status, and description information.

Table 109: Chassis Viewer for EX3200, EX3300, and EX4200 Switches

Field	Description
Front View	

Table 109: Chassis Viewer for EX3200, EX3300, and EX4200 Switches *(Continued)*

Field	Description
Interface status	In the image, the following colors denote the interface status: • Green—Interface is up and operational. • Yellow—Interface is up but is nonoperational. • Gray—Interface is down and nonoperational. Mouse over the interface (port) to view more information. For a Virtual Chassis configuration, select the switch to view the interface status. If an SFP+ uplink module is installed in the switch, mouse over the port icon to display whether the module is configured to operate in 1-gigabit mode or in 10-gigabit mode. If the module is configured to operate in 1-gigabit mode, the tool tip information is displayed for all 4 ports. If the module is configured to operate in 10-gigabit mode, the tool tip information is displayed only for 2 ports. On an EX3300 switch with the 4x GE/XE SFP+ module, mouse over the port icon to display whether the module is configured to operate in 1-gigabit mode or 10-gigabit mode. For SFP, SFP+, and XFP ports, the interfaces appear dimmed if no transceiver is inserted. The chassis viewer displays `Transceiver not plugged-in` when you mouse over the port icon.
LCD panel	LCD panel configured for the LEDs on the ports. Mouse over the icon to view the current character display.
Rear View of the EX3200 Switch	
Management (**me0**) port	The management port is used to connect the switch to a management device for out-of-band management.
Console port	The console port is used to connect the switch to a management console or to a console server. (You might do this for initial switch configuration.)

Table 109: Chassis Viewer for EX3200, EX3300, and EX4200 Switches *(Continued)*

Field	Description
USB port	Indicates the USB port for the switch. **NOTE**: We recommend that you use USB flash drives purchased from Juniper Networks for your EX Series switch.
Fan tray	Mouse over the fan tray icon to display name, status, and description information.
Power supply	Mouse over the power supply icon to display name, status, and description information.

Rear View of the EX3300 and EX4200 Switch

Fan tray	Mouse over the fan tray icon to display name, status, and description information. For a Virtual Chassis, the status of the fans of the selected member switch is displayed.
Virtual Chassis port	Displayed only when EX4200 switches are configured as a Virtual Chassis. The following colors denote the Virtual Chassis port (VCP) status: • Green—VCP is up and operational. • Yellow—VCP is up but is nonoperational. • Gray—VCP is down and nonoperational.
USB port	Indicates the USB port for the switch. **NOTE**: We recommend that you use USB flash drives purchased from Juniper Networks for your EX Series switch.
Management (**me0**) port	The management port is used to connect the switch to a management device for out-of-band management.
Console port	The console port is used to connect the switch to a management console or to a console server. (You might do this for initial switch configuration.)
Power supplies	Mouse over the power supply icons to display name, status, and description information.

Table 110: Chassis Viewer for EX4100 and EX4100-F Switches

Field	Description
Front View	
RJ-45 ports	Mouse over the interface (port) to view more information.
	EX4100 Switches:
	• EX4100-24P switch supports 24 RJ-45 ports (10/100/1000BASE-T) that support PoE+.
	• EX4100-24T switch supports 24 RJ-45 ports (10/100/1000BASE-T).
	• EX4100-48P switch supports 48 RJ-45 ports (10/100/1000BASE-T) that support PoE+.
	• EX4100-48T switch supports 48 RJ-45 ports (10/100/1000BASE-T).
	EX4100-F Switches:
	• EX4100-F-12T switch supports 12 RJ-45 ports (10/100/1000BASE-T).
	• EX4100-F-12P switch supports 12 RJ-45 ports (10/100/1000BASE-T) that support support PoE+.
	• EX4100-F-24P switch supports 24 RJ-45 ports (10/100/1000BASE-T) that support PoE+.
	• EX4100-F-24T switch supports 24 RJ-45 ports (10/100/1000BASE-T).
	• EX4100-F-48P switch supports 48 RJ-45 ports (10/100/1000BASE-T) that support PoE+.
	• EX4100-F-48T switch supports 48 RJ-45 ports (10/100/1000BASE-T).
SFP ports	Mouse over the interface (10 GE SFP+ Uplink ports) to view more information.

Table 110: Chassis Viewer for EX4100 and EX4100-F Switches *(Continued)*

Field	Description
USB port	Displays USB Type C console port.
Chassis status LEDs	Displays status LEDs labeled **SYS**, **ALM**, **MST**, and **CLD**.
Port mode LEDs	Displays port mode LEDs labeled **SPD**, **DX**, **EN**, and **PoE**.
Factory Reset/Mode button	Displays the Factory Reset/Mode button, which is used to reset the switches to the factory-default configuration.
Virtual Chassis ports	EX4100 and EX4100-F switches have dedicated Virtual Chassis ports (VCPs) that you can use to interconnect member switches of a Virtual Chassis. You can interconnect a maximum of 10 switches to form a Virtual Chassis.
Rear View	
Management port	The management port (MGMT) is used to connect the switch to a management device for out-of-band management.
Console port	The Console port (RJ-45) labeled as **CON** is used to connect the switch to a management console or to a console server.
USB port	Indicates the USB port for the switch. **NOTE**: We recommend that you use USB flash drives purchased from Juniper Networks for your EX Series switch.

Table 110: Chassis Viewer for EX4100 and EX4100-F Switches *(Continued)*

Field	Description
Power supply	Mouse over the power supply icon to display name, status, and description information. **NOTE**: EX4100-F-12T and EX4100-F-12P switches use external power adapters.
Fan tray	Mouse over the fan tray icon to display fan's status information. **NOTE**: EX4100-F-12T and EX4100-F-12P are fanless switches that have natural convection cooling.

Table 111: Chassis Viewer for EX4400 Switches

Field	Description
Front View	

Table 111: Chassis Viewer for EX4400 Switches *(Continued)*

Field	Description
RJ-45 ports	Mouse over the interface (port) to view more information. • EX4400-24T switch supports 24 RJ-45 ports (10/100/1000BASE-T). • EX4400-24P switch supports 24 RJ-45 ports (10/100/1000BASE-T) that support PoE-bt. • EX4400-24MP switch supports 24 RJ-45 ports (100-Mbps/1-Gbps/2.5-Gbps/5-Gbps/10- Gbps) that support PoE-bt. • EX4400-48T switch supports 48 RJ-45 ports (10/100/1000BASE-T). • EX4400-48P switch supports 48 RJ-45 ports (10/100/1000BASE-T) that support PoE-bt. • EX4400-48MP switch supports 36 RJ-45 ports (100-Mbps/1-Gbps/2.5-Gbps) and 12 RJ-45 ports (100-Mbps/1-Gbps/2.5-Gbps/5-Gbps/10- Gbps) that support PoE-bt.
SFP ports	Mouse over the interface (port) to view more information. EX4400-48F switch supports 36 small form-factor pluggable (SFP) ports and 12 small form-factor pluggable plus (SFP+) ports. EX4400-24X switch supports 24 1GbE/10GbE SFP/SFP+ ports and two 100GbE QSFP28 ports.
USB port	Displays USB Type C console port.
Chassis status LEDs	Displays status LEDs labeled **SYS**, **ALM**, **MST**, and **CLD**.
Port mode LEDs	Displays port mode LEDs labeled **SPD**, **DX**, and **EN**.

Table 111: Chassis Viewer for EX4400 Switches *(Continued)*

Field	Description
Factory Reset/Mode button	Displays the Factory Reset/Mode button, which is used to reset the switches to the factory-default configuration.
Extension module slot	Displays a slot for installing an optional extension module. Extension modules are hot-insertable and hot-removable field replaceable units (FRUs). The 1x100GbE QSFP28 extension module (EX4400-EM-1C) supports Media Access Control Security (MACsec) with AES-256 encryption. You can install one 40GbE QSFP+ transceiver or one 100GbE QSFP28 transceiver in the extension module.
Rear View	
Management port	The management port (me0) is used to connect the switch to a management device for out-of-band management. **NOTE**: For EX4400-24X, the MGMT port is available on the front panel.
Virtual Chassis ports	The QSFP28 ports are configured as Virtual Chassis ports (VCPs) by default. You can configure them as network ports and operate them as 100 GbE network ports by using QSFP28 transceivers.
Console port	The Console port (RJ-45) labeled as **CON** is used to connect the switch to a management console or to a console server. **NOTE**: For EX4400-24X, the CON port is available on the front panel.

Table 111: Chassis Viewer for EX4400 Switches *(Continued)*

Field	Description
USB port	Indicates the USB port for the switch. **NOTE**: • We recommend that you use USB flash drives purchased from Juniper Networks for your EX Series switch. • For EX4400-24X, the USB port is available only on the front panel.
Mini USB port	Indicates the mini USB port for the switch. **NOTE**: Mini USB port is not available for EX4400-24X.
Power supply	Mouse over the power supply icon to display name, status, and description information.
Fan tray	Mouse over the fan tray icon to display status of the fans and airflow direction information.

Table 112: Chassis Viewer for EX4500 Switches

Field	Description

Front View

Table 112: Chassis Viewer for EX4500 Switches *(Continued)*

Field	Description
Interface status	In the image, the colors listed below denote the interface status: • Green—Interface is up and operational. • Yellow—Interface is up but is nonoperational. • Gray—Interface is down and nonoperational. Mouse over the interface (port) to view more information. For a Virtual Chassis configuration, select the switch to view the interface status. If an SFP+ uplink module is installed in the switch, mouse over the interface (ports) on the module for more information. For SFP and SFP+ ports, the interfaces appear dimmed if no transceiver is inserted. The chassis viewer displays `Transceiver not plugged-in` when you mouse over the port icon.
LCD panel	LCD panel configured for the LEDs on the ports. Mouse over the icon to view the current character display.
Console port	The console port is used to connect the switch to a management console or to a console server.
Management (**me0**) port	The management port is used to connect the switch to a management device for out-of-band management. Use this port for initial switch configuration.
USB port	Indicates the USB port for the switch. **NOTE**: We recommend that you use USB flash drives purchased from Juniper Networks for your EX Series switch.

Rear View of the EX4500 Switch

Fan tray	Mouse over the fan tray icon to display status of the fans and airflow direction information. For a Virtual Chassis, the status of the fans of the selected member switch is displayed.

Table 112: Chassis Viewer for EX4500 Switches *(Continued)*

Field	Description
Virtual Chassis port	Displayed only when switches are configured as a Virtual Chassis. The colors listed below denote the Virtual Chassis port (VCP) status: • Green—VCP is up and operational. • Yellow—VCP is up but is nonoperational. • Gray—VCP is down and nonoperational.
Power supplies	Mouse over the power supply icons to display name, status, and description information.
Intraconnect module	Mouse over the module to display details of the intraconnect module. The intraconnect module helps the switch achieve line rate on all its ports.
Virtual Chassis module	Mouse over to display details of the switches in the Virtual Chassis configuration.

Table 113: Chassis Viewer for EX4550 Switches

Field	Description
Front View	

Table 113: Chassis Viewer for EX4550 Switches *(Continued)*

Field	Description
Interface status	In the image, the colors listed below denote the interface status: • Green—Interface is up and operational. • Yellow—Interface is up but is nonoperational. • Gray—Interface is down and nonoperational. Mouse over the interface (port) to view more information. For a Virtual Chassis configuration, select the switch to view the interface status. If an expansion module or a Virtual Chassis module is installed in the switch, mouse over the interface (ports) on the module for more information. On an EX4550-32F switch, for SFP and SFP+ ports, the interfaces appear dimmed if no transceiver is inserted. The chassis viewer displays `Transceiver (1G/10G) not plugged in` when you mouse over the port icon.
LCD panel	LCD panel configured for the LEDs on the ports. Mouse over the icon to view the current character display.
Console port	The console port is used to connect the switch to a management console or to a console server.
Mini Console port	The mini console port is used to connect the switch to the management console.
Management (**me0**) port	The management port is used to connect the switch to a management device for out-of-band management. Use this port for initial switch configuration.
PIC1 slot	You can insert an uplink module or a Virtual Chassis module in the PIC1 slot. Mouse over to display the details of the module inserted (uplink or Virtual Chassis).
USB port	Indicates the USB port for the switch. **NOTE**: We recommend that you use USB flash drives purchased from Juniper Networks for your EX Series switch.

Rear View of the EX4550 Switch

Table 113: Chassis Viewer for EX4550 Switches *(Continued)*

Field	Description
Fan tray	Mouse over the fan tray icon to display the status of the fans and airflow direction information. For a Virtual Chassis, the status of the fans of the selected member switch is displayed.
Virtual Chassis port	Displayed only when switches are configured as a Virtual Chassis. In the image, the colors listed below denote the Virtual Chassis port (VCP) status: • Green—VCP is up and operational. • Yellow—VCP is up but is nonoperational. • Gray—VCP is down and nonoperational.
Power supplies	Mouse over the power supply icons to display name, status, and description information.
PIC2 slot	You can insert an uplink module or a Virtual Chassis module into the PIC2 slot. Mouse over to display the details of the module inserted (uplink or Virtual Chassis).

Table 114: Chassis Viewer for EX4650 Switches

Field	Description
Front View	
SFP28 and QSFP28 Ports	Displays 48 small form-factor pluggable (SFP28) ports and eight 100-Gbps quad small form-factor pluggable (QSFP28) ports. Mouse over the interface (port) to view more information.
Rear View	
Management port	The management port (em0) is used to connect the switch to a management device for out-of-band management.
Virtual Chassis ports	Not supported.

Table 114: Chassis Viewer for EX4650 Switches *(Continued)*

Field	Description
Console port	The Console port (RJ-45) is used to connect the switch to a management console or to a console server.
USB port	Indicates the USB port for the switch. **NOTE**: We recommend that you use USB flash drives purchased from Juniper Networks for your EX Series switch.
Fan Tray	Mouse over the fan tray icons to display name, status, and description information.
Power supply	Mouse over the power supply icon to display name, status, and description information.

Table 115: Chassis Viewer for EX6210 Switches

Field	Description
Front View	
Temperature	Mouse over the temperature icon to display the temperature of the CB or line card.

Table 115: Chassis Viewer for EX6210 Switches *(Continued)*

Field	Description
Interface status	Select the CB or line card.
	In the image, the colors listed below denote the interface status:
	• Green—Interface is up and operational.
	• Yellow—Interface is up but is nonoperational.
	• Gray—Interface is down and nonoperational.
	Mouse over the interface (port) to view more information.
	You can view status for the following ports on the SRE module:
	• USB port—Indicates the USB port for the switch.
	NOTE: We recommend that you use USB flash drives purchased from Juniper Networks for your EX Series switch.
	• Management (**me0**) port—The management port is used to connect the switch to a management device for out-of-band management. There are 2 management ports: fiber and copper. The same status is displayed for both the **me0** ports.
	• Console port—The console port is used to connect the switch to a management console or to a console server. (You might do this for initial switch configuration.)
	CBs support 4 SFP+ uplink ports. Mouse over the interface on the CB for more information.
	For SFP and SFP+ ports, the interfaces appear dimmed if no transceiver is inserted. The chassis viewer displays `Transceiver not plugged-in` when you mouse over the port icon.
Power supplies	Mouse over the power supply icons to display name, status, and description information.
LCD panel	LCD panel configured for the LEDs on the ports. Mouse over the icon to view the current character display of the primary Routing Engine. The EX6210 switch has 2 LCD panels, one for each Routing Engine. The backup Routing Engine LCD displays **Backup**.
Rear View of the EX6210 Switch	
Fan tray	Mouse over the fan tray icon to display information regarding the cooling fans.

Table 116: Chassis Viewer for EX8208 Switches

Field	Description
Front View	
Interface status	In the image, click any line card, SRE module, or SF module to view the front view of the selected component. In the image, the colors listed below denote the interface status: • Green—Interface is up and operational. • Yellow—Interface is up but is nonoperational. • Gray—Interface is down and nonoperational. Mouse over the interface (port) to view more information. You can view status for the following ports on the SRE module: • USB port—Indicates the USB port for the switch. NOTE: We recommend that you use USB flash drives purchased from Juniper Networks for your EX Series switch. • Auxiliary port—This port is unavailable. • Management (**me0**) port—The management port is used to connect the switch to a management device for out-of-band management. • Console port—The console port is used to connect the switch to a management console or to a console server. (You might do this for initial switch configuration.) Because the SF module has no ports, no status information is displayed.
Slot numbers	Slots on the switch are labeled, from the top of the switch down: • 0–3 (line cards) • SRE0, SF, SRE1 (SRE and SF modules) • 4–7 (line cards)
Temperature	The active slots contain a gray temperature icon. Mouse over the icon to display temperature information for the slot.

Table 116: Chassis Viewer for EX8208 Switches *(Continued)*

Field	Description
Fan status	Mouse over the fan tray icon to display name, status, and description information.
Power supplies	Mouse over the power supply icons to display name, status, and description information.
LCD panel	LCD panel configured for the LEDs on the ports. Mouse over the icon to view the current character display.
Rear View	The EX8208 switch does not have any components on the rear of the chassis.

Table 117: Chassis Viewer for EX8216 Switches

Field	Description
Front View	

Table 117: Chassis Viewer for EX8216 Switches *(Continued)*

Field	Description
Interface status	In the image, click any line card or RE module to display the front view of the selected component. In the image, the colors listed below denote the interface status: • Green—Interface is up and operational. • Yellow—Interface is up but is nonoperational. • Gray—Interface is down and nonoperational. Mouse over the interface (port) to view more information. You can view status for the following ports on the RE module: • USB port—Indicates the USB port for the switch. NOTE: We recommend that you use USB flash drives purchased from Juniper Networks for your EX Series switch. • Auxiliary port—This port is unavailable. • Management (**me0**) port—The management port is used to connect the switch to a management device for out-of-band management. • Console port—The console port is used to connect the switch to a management console or to a console server. (You might do this for initial switch configuration.)
Slot numbers	Slots on the switch are labeled, from the top of the switch down: • RE0 (RE module) • RE1 (RE module) • 0–15 (line cards)
Temperature	The active slots contain a gray temperature icon. Mouse over the icon to display temperature information for the slot.
Fan status	Mouse over the fan tray icon to display consolidated information about the fans.
Power supplies	Mouse over the power supply icons to display name, status, and description information.

Table 117: Chassis Viewer for EX8216 Switches *(Continued)*

Field	Description
LCD panel	LCD panel configured for the LEDs on the ports. Mouse over the icon to view the current character display.

Rear View

SF modules	Mouse over the SF module icons in their respective slots to display information. Slots are numbered SF7–SF0, from left to right.

Table 118: Chassis Viewer for XRE200 External Routing Engines

Field	Description
Front View	
Interface status	In the image, the colors listed below denote the interface status: • Green—Interface is up and operational. • Yellow—Interface is up but is nonoperational. • Gray—Interface is down and nonoperational. Mouse over the interface (port) to view more information. For a Virtual Chassis configuration, select the switch to view the interface status.
Console port	The console port is used to connect the switch to a management console or to a console server.
Management (**me0**) port	The management port is used to connect the switch to a management device for out-of-band management. Use this port for initial switch configuration.

Table 118: Chassis Viewer for XRE200 External Routing Engines *(Continued)*

Field	Description
Virtual Chassis port	In the image, the colors listed below denote the Virtual Chassis port (VCP) status: • Green—VCP is up and operational. • Yellow—VCP is up but is nonoperational. • Gray—VCP is down and nonoperational. Mouse over the interface (port) to view more information.
LCD panel	LCD panel configured for the LEDs on the ports. Mouse over the icon to view the current character display.
Temperature	The active slots contain a gray temperature icon. Mouse over the icon to display temperature information for the slot.
USB port	Indicates the USB port for the switch. **NOTE**: We recommend that you use USB flash drives purchased from Juniper Networks for your EX Series switch.
PIC1 slot	You can install a Virtual Chassis module in the PIC1 slot. Mouse over the Virtual Chassis ports to display the port status details.
PIC2 slot	You can install a Virtual Chassis module in the PIC2 slot. Mouse over the Virtual Chassis ports to display the port status details.
Rear View of the XRE200 External Routing Engine	
Fan modules	Mouse over the fan modules to display status of the fans and airflow direction information. For a Virtual Chassis, the status of the fans of the selected member switch is displayed.
Power supplies	Mouse over the power supply icons to display name, status, and description information.

Change History Table

Feature support is determined by the platform and release you are using. Use Feature Explorer to determine if a feature is supported on your platform.

Release	Description
22.4A1	Starting in Junos OS Release 22.4R1 which aligns with the J-Web Application package release 22.4A1, J-Web supports EX4100 and EX4100-F switches.

RELATED DOCUMENTATION

J-Web User Interface for EX Series Switches Overview

EX2200 Switches Hardware Overview

EX2300 Switches Hardware Overview

EX3200 Switches Hardware Overview

EX3300 Switches Hardware Overview

EX4200 Switches Hardware Overview

EX4500 Switches Hardware Overview

EX6210 Switch Hardware Overview

EX8208 Switch Hardware Overview

EX8216 Switch Hardware Overview

Check Active Alarms with the J-Web Interface

XRE200 External Routing Engine Hardware Guide

Chassis Status LEDs on EX4300 Switches

EX4300 switches except EX4300-48MP and EX4300-48MP-S switches have three chassis status LEDs (labeled **ALM**, **SYS**, and **MST**) on the right of the LCD panel, next to the Menu and Enter buttons (see Figure 228 on page 598). EX4300-48MP and EX4300-48MP-S switches have three chassis status LEDs (labeled **ALM**, **SYS**, and **MST**) on the right of the front panel (see Figure 229 on page 598).

Figure 228: Chassis Status LEDs in EX4300 Switches Except EX4300-48MP and EX4300-48MP-S Switches

1– LCD panel	3– LCD panel Menu button
2– LCD panel Enter button	4– Chassis status LEDs
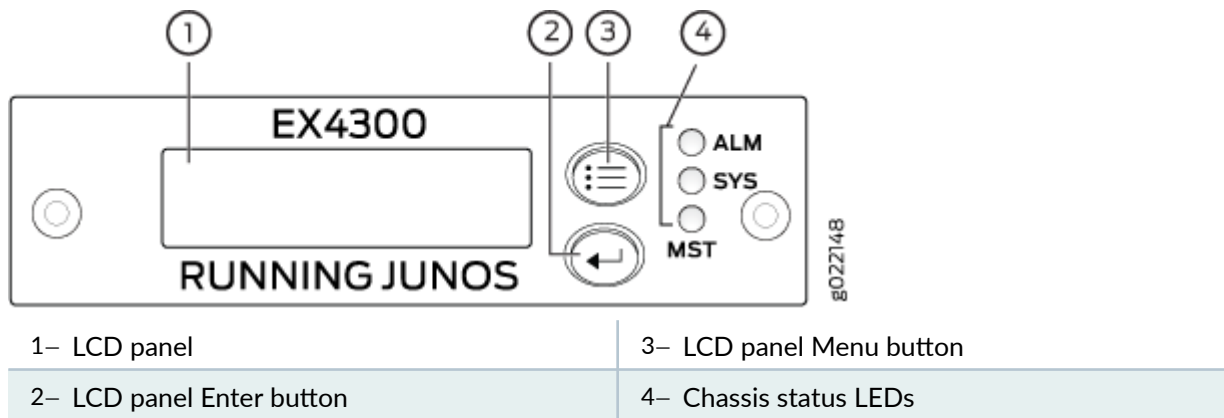
Figure 229: Chassis Status LEDs in EX4300-48MP and EX4300-48MP-S Switches
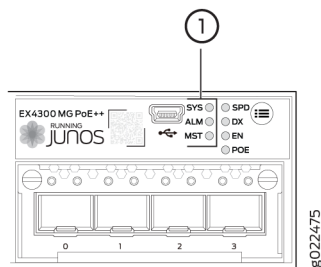
1– Chassis status LEDs	

Table 119 on page 598 describes the chassis status LEDs on an EX4300 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 119: Chassis Status LEDs on an EX4300 Switch

LED Label	Color	State and Description
ALM (Alarm)	Unlit	There is no alarm or the switch is halted.

Table 119: Chassis Status LEDs on an EX4300 Switch *(Continued)*

LED Label	Color	State and Description
	Red	There is a major alarm. A major alarm indicates a critical error condition that requires immediate attention. **NOTE**: When you connect power to the switch, the Alarm (**ALM**) LED glows red. This behavior is normal. Plugging an active Ethernet cable into the management (**MGMT**) port on the switch completes the network link and turns off the **ALM** LED. (See *Connect a Device to a Network for Out-of-Band Management*.) Connecting the switch to a dedicated management console instead of a network does not affect the **ALM** LED. The LED remains red until the switch is connected to a network.
	Yellow (on EX4300 switches except EX4300-48MP and EX4300-48MP-S switches) or amber (on EX4300-48MP and EX4300-48MP-S switches)	There is a minor alarm. A minor alarm indicates a noncritical condition that requires monitoring or maintenance. A minor alarm that is left unchecked might cause interruption in service or performance degradation. **NOTE**: The Alarm (**ALM**) LED glows yellow on EX4300 switches except EX4300-48MP and EX4300-48MP-S switches or amber on EX4300-48MP and EX4300-48MP-S switches if you commit a configuration to make it active on the switch and do not also create a rescue configuration to back it up. To save the most recently committed configuration as the rescue configuration, enter the operational mode command `request system configuration rescue save`.
SYS (System)	Green	• On steadily—Junos OS for EX Series switches has been loaded on the switch. • Blinking (not applicable for EX4300-48MP and EX4300-48MP-S switches)—The switch is booting.
	Unlit	• EX4300 switches except EX4300-48MP and EX4300-48MP-S switches—The switch is powered off or is halted. • EX4300-48MP and EX4300-48MP-S switches—The switch is booting or the switch is powered off or is halted.

Table 119: Chassis Status LEDs on an EX4300 Switch *(Continued)*

LED Label	Color	State and Description
MST (Primary)	Green	In a standalone EX4300 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 primary in the Virtual Chassis configuration. • Blinking—The switch is the backup in the Virtual Chassis configuration. • Off—The switch is a line card 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 (yellow or 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

show chassis lcd

Chassis Component Alarm Conditions on EX4300 Switches

Check Active Alarms with the J-Web Interface

Understand Alarm Types and Severity Levels on EX Series Switches

Network Port, Built-In QSFP+ Port, Uplink Port, and Uplink Module Port LEDs on EX4300 Switches

Each 10/100/1000BASE-T network port, SFP network port, SFP+ uplink port, SFP+ uplink module port, built-in QSFP+ port, and QSFP+ uplink module port on an EX4300 switch has two LEDs that show the link activity and status of the port.

The following figures in this topic shows the location of those LEDs:

Figure 230: LEDs on 10/100/1000BASE-T Network Ports and 100/1000/2500/5000/10000BASE-T Ethernet Network Ports
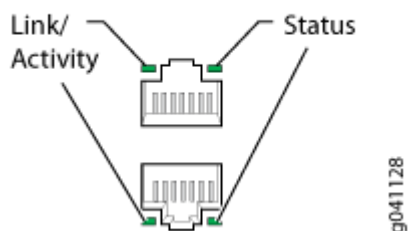
Figure 231: LEDs on the SFP Network Ports on EX4300-32F Switches
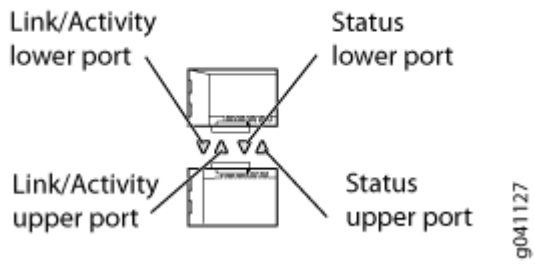
Figure 232: LEDs on the Built-In QSFP+ Ports
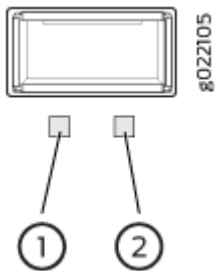
1– Link activity LED	2– Status LED

Figure 233: LEDs on the SFP+ Uplink Ports and on the 4-Port 1-Gigabit Ethernet/10-Gigabit Ethernet SFP+ Uplink Module for EX4300 Switches Except EX4300-48MP and EX4300-48MP-S Switches
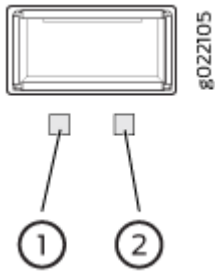
1– Link activity LED	2– Status LED

Figure 234: LEDs on the on the Ports on the 2-Port 40-Gigabit Ethernet QSFP+ Uplink Module for EX4300-32F Switches
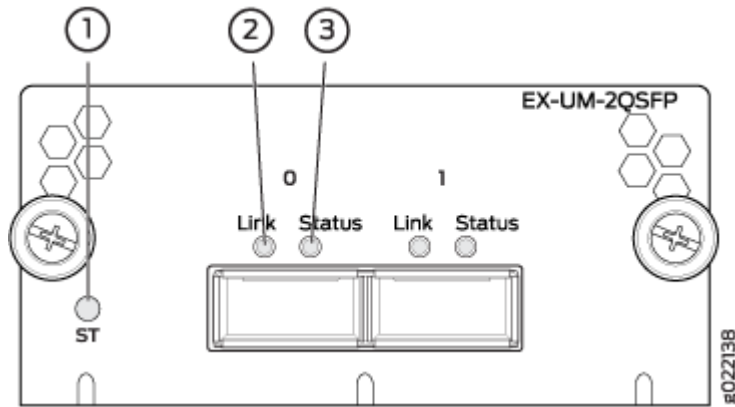
1– Status LED of the uplink module	3– Status LED of the uplink module port
2– Link activity LED of the uplink module port	

Figure 235: LEDs on the 8-Port 10-Gigabit Ethernet SFP+ Uplink Module for EX4300-32F Switches
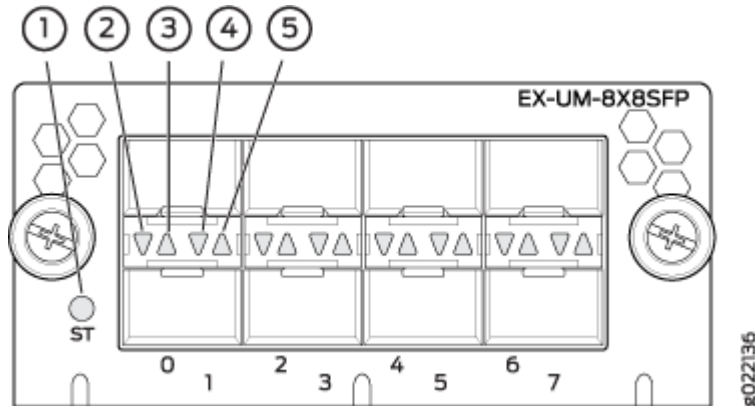
1– Status LED of the uplink module	4– Status LED the lower port
2– Link activity LED of the lower port	5– Status LED the upper port
3– Link activity LED of the upper port	

Figure 236: LEDs on the Ports on the 2-Port 40-Gigabit Ethernet QSFP+/100-Gigabit Ethernet QSFP28 Uplink Module for EX4300-48MP and EX4300-48MP-S Switches
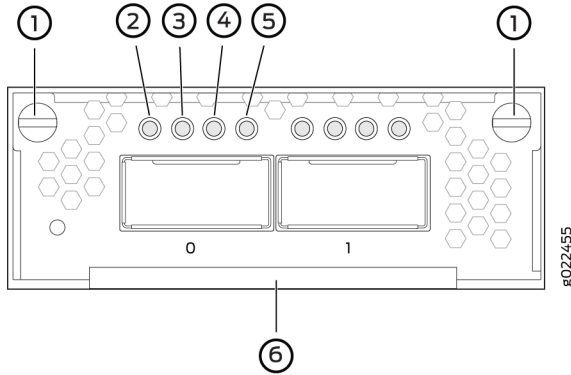
1–	Captive screws of the uplink module	4–	Link activity LED of the uplink module port
2–	Link activity LED of the uplink module port	5–	Link activity LED of the uplink module port
3–	Link activity LED of the uplink module port	6–	Handle of the uplink module

There are four LEDs for each port (labeled 2, 3, 4, and 5 in Figure 236 on page 604). If a port is configured to operate at 10-Gbps speed by using breakout cables, four 10-Gbps interfaces are created and the four LEDs for that port becomes operational. Each of these LEDs indicates the link activity on the corresponding interface. If a port is configured to operate at 40-Gbps or 100-Gbps speed, the LED labeled 2 for that port in Figure 236 on page 604 becomes operational and indicates the link activity on the corresponding port.

Figure 237: LEDs on the Ports on the 4-Port 1-Gigabit Ethernet SFP/10-Gigabit Ethernet SFP+ Uplink Module for EX4300-48MP and EX4300-48MP-S Switches
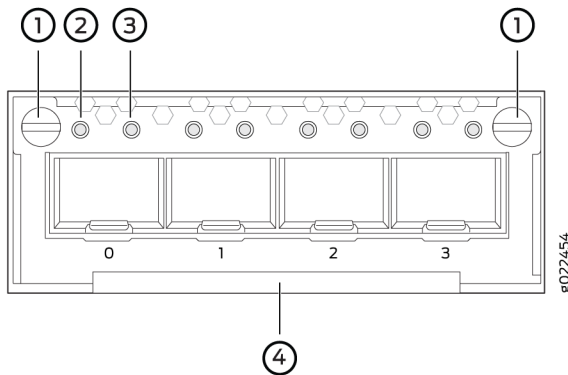
1–	Captive screws of the uplink module	3–	Status LED of the uplink module port
2–	Link activity LED of the uplink module port	4–	Handle of the uplink module

The describes the link activity LED on 10/100/1000BASE-T network ports, SFP network ports, SFP+ uplink ports, SFP+ uplink module ports, built-in QSFP+ ports, QSFP+ uplink module ports, and QSFP+/QSFP28 uplink module ports.

Table 120: Link/Activity LED

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.

On EX4300 switches except EX4300-48MP and EX4300-48MP-S switches, from the Idle menu of the LCD panel, use the Enter button on the LCD panel to toggle between the ADM, DPX, SPD, and PoE+ indicators.

describes the Status LED on 10/100/1000BASE-T Ethernet network ports and SFP network ports on EX4300 switches except EX4300-48MP and EX4300-48MP-S switches.

Table 121: Status LED on 10/100/1000BASE-T Ethernet Network Ports and SFP Network Ports on EX4300 Switches Except EX4300-48MP and EX4300-48MP-S Switches

LED	LCD Indicator/ Status Mode LED	State and Description
Status	LED: ADM/EN	Indicates the administrative status (enabled or disabled). The status indicators are: • Green—Port is administratively enabled. • Unlit—Port is administratively disabled.
	LED: DPX/DX	Indicates the duplex mode. The status indicators are: • Green—Port is set to full-duplex mode. • Unlit—Port is set to half-duplex mode. **NOTE**: In EX4300 switches, the ports operate in full-duplex mode only.

Table 121: Status LED on 10/100/1000BASE-T Ethernet Network Ports and SFP Network Ports on EX4300 Switches Except EX4300-48MP and EX4300-48MP-S Switches *(Continued)*

LED	LCD Indicator/ Status Mode LED	State and Description
	LED: SPD	Indicates the speed. The speed indicators are: • Unlit—10 Mbps • Blinking green—100 Mbps • Steadily green—1000 Mbps **NOTE**: In 32-port EX4300 switches, when an EX-SFP-1GE-T transceiver is installed in the port, the LED is unlit when the speed is 100 Mbps.
	LED: PoE/POE	Indicates the PoE mode. The status indicators are: • Steadily green—PoE is enabled on the port and a device is drawing power. • Blinking green—PoE is enabled on the port, but no power is drawn from the port. • Unlit—PoE is not enabled on the port.

Table 122: Status LED on SFP+ Uplink Ports and SFP+ Uplink Module Ports Except on EX4300-48MP and EX4300-48MP-S switches

LED	LCD Indicator	State and Description
Status	Green	Indicates the speed. The speed indicators are: • Blinking green—1000 Mbps • Steadily green—10 Gbps

describes the Status LED on QSFP+ ports and QSFP+ uplink module ports in EX4300 switches.

Table 123: Status LED on QSFP+ Ports and QSFP+ Uplink Module Ports

LED	LCD Indicator	State and Description
Status	Green	Indicates the status. The status indicators are: • Unlit—40-Gigabit port is down. • Steadily green—40-Gigabit port is up.

describes the Status LED on 100/1000/2500/5000/10000BASE-T Ethernet network ports on EX4300-48MP and EX4300-48MP-S switches. Use the Factory Reset/Mode button on the far right side of the front panel to toggle the Status LED to show the different port parameters for the network ports. You can tell which port parameter is indicated by the Status LED by looking at which port status mode LED (SPD, DX, EN, and PoE) is lit.

Table 124: Status LED on 100/1000/2500/5000/10000BASE-T Ethernet Network Ports on EX4300-48MP and EX4300-48MP-S Switches

LED	Status Mode LED	State and Description
Status	EN	Indicates the administrative status (enabled or disabled). The status indicators are: • Green—Port is administratively enabled. • Unlit—Port is administratively disabled.
	DX	Indicates the duplex mode. The status indicators are: • Green—Port is set to full-duplex mode. • Unlit—Port is set to half-duplex mode. **NOTE**: In EX4300 switches, the ports operate in full-duplex mode only.

Table 124: Status LED on 100/1000/2500/5000/10000BASE-T Ethernet Network Ports on EX4300-48MP and EX4300-48MP-S Switches *(Continued)*

LED	Status Mode LED	State and Description
	SPD	Indicates the speed. The speed indicators are: • Unlit—10 Mbps • Blinking green—100 Mbps • Steadily green—1000 Mbps • Blinking amber—5000 Mbps • Steadily blue—10000 Mbps
	POE	Indicates the PoE mode. The status indicators are: • Steadily green—PoE is enabled on the port and a device is drawing power. • Blinking green—PoE is enabled on the port, but no power is drawn from the port. • Unlit—PoE is not enabled on the port.

Starting in Junos OS Release 20.1R1, you can use the `request chassis beacon` command on EX4300-48MP switches to identify the switch or a port on the switch. When you execute the command, the status LEDs on the RJ-45 network ports blink two times per second irrespective of the mode the ports are operating in (see How to Locate a Device or Port Using the Chassis Beacon).

Table 125 on page 608 describes the Status LED on the ports on the 4-port 1-Gigabit Ethernet SFP/10-Gigabit Ethernet SFP+ uplink module for EX4300-48MP and EX4300-48MP-S switches.

Table 125: Status LED on the Ports on the 4-Port 1-Gigabit Ethernet SFP/10-Gigabit Ethernet SFP+ Uplink Module for EX4300-48MP and EX4300-48MP-S Switches

LED	LCD Indicator	State and Description
Status	Green	Indicates the speed. The speed indicator is: • Steadily green—1 or 10 Gbps

Management Port LEDs on EX4300 Switches

The management port, labeled **MGMT**, on the rear panel of an EX4300 switch, has two LEDs that indicate link activity and status of the management port. Figure 238 on page 609 shows the location of Management port on a 24-port EX4300 switch. The location of the LEDs and their behavior are similar for all EX4300 switches except EX4300-48MP and EX4300-48MP-S switches. Figure 239 on page 609 shows the location of Management port on EX4300-48MP and EX4300-48MP-S Switches.

Figure 238: LEDs on the Management Port on a 24-Port EX4300 Switch
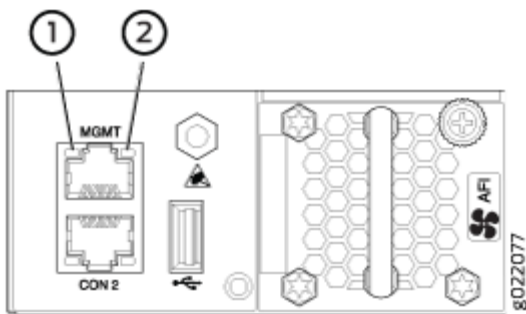
1– Link/Activity LED	2– Status LED

Figure 239: LEDs on the Management Port on EX4300-48MP and EX4300-48MP-S Switches
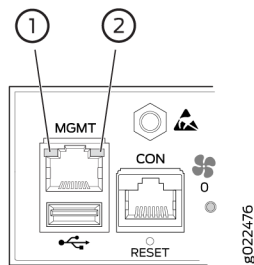
1– Link/Activity LED	2– Status LED

Table 126 on page 610 describes the Link/Activity LED.

Table 126: Link/Activity LED on the Management Port on an EX4300 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.

describes the Status LED.

Table 127: Status LED on the Management Port on an EX4300 Switch

LED	Color	State and Description

Status	Green	Indicates the speed. The speed indicators are:
		
		• EX4300 switches except EX4300-48MP and EX4300-48MP-S switches:
		
		  • Off—Link speed is 10 Mbps.
		
		  • Blinking—Link speed is 100 Mbps.
		
		  • On steadily—Link speed is 1000 Mbps.
		
		• EX4300-48MP and EX4300-48MP-S switches:
		
		  • Off—Link speed is 10 Mbps or 1000 Mbps.
		
		  • On steadily—Link speed is 100 Mbps.

RELATED DOCUMENTATION

Connect a Device to a Network for Out-of-Band Management

AC Power Supply LEDs in EX4300 Switches

shows the location of the LEDs on an AC power supply for EX4300 switches except EX4300-48MP and EX4300-48MP-S switches.

Figure 240: LEDs on AC Power Supply for EX4300 Switches
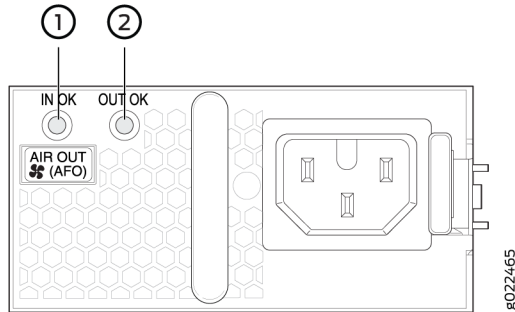
1– IN OK LED	2– OUT OK LED

describes the AC power supply LEDs.

Table 128: AC Power Supply LEDs in EX4300 Switches

LED	Color	Description
IN OK	Unlit	Indicates one of the following: • AC power input voltage is not within normal operating range. • No AC power input.
	Green	Power supply is receiving proper input power and is functioning normally.
OUT OK	Unlit	Indicates one of the following: • **IN OK** LED is unlit. • The power supply is not delivering power correctly.

Table 128: AC Power Supply LEDs in EX4300 Switches *(Continued)*

LED	Color	Description
	Green	The power supply is delivering power and is functioning correctly.
	Red	The power supply has failed and must be replaced.

> **NOTE**: If the **IN OK** LED and the **OUT OK** LED are not lit green, either the AC power cord is not installed properly or the power input voltage is not within normal operating range.
>
> If the **IN OK** LED is lit green and the **OUT OK** LED is unlit or lit red, the AC power supply is installed properly, but the power supply has an internal failure.

DC Power Supply LEDs in EX4300 Switches

shows the location of the LEDs on a DC power supply for an EX4300 switch.

Figure 241: DC Power Supply Faceplate on an EX4300 Switch
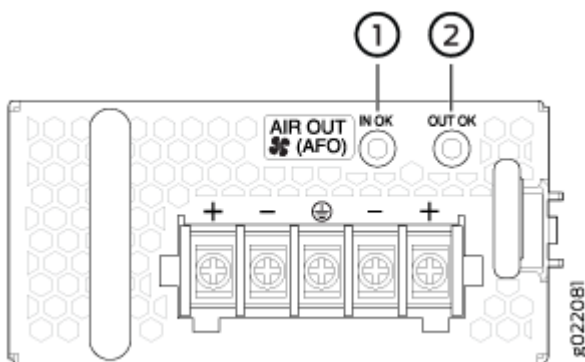
1– IN OK LED 2– OUT OK LED

describes the LEDs on the DC power supplies.

Table 129: DC Power Supply LEDs on an EX4300 Switch

Name	Color	Description
IN 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. • No DC power input.
	Green	The power supply is receiving power.
OUT OK	Unlit	Indicates one of the following: • **IN OK** LED is unlit. • The power supply is not delivering power correctly.
	Green	The power supply is functioning correctly.
	Red	The power supply has failed and must be replaced.

6
PART

Troubleshooting

CHAPTER 42

Restoring Junos OS

IN THIS CHAPTER

Creating an Emergency Boot Device for QFX Series Switches

Before you begin, you need to download the installation media image for your device and Junos OS release from https://www.juniper.net/customers/support/ .

If Junos OS on the device is damaged in some way that prevents the software from loading properly, you can use an emergency boot device to repartition the primary disk and load a fresh installation of Junos OS. Use the following procedure to create an emergency boot device.

> **NOTE**: You can create the emergency boot device on another Juniper Networks device, or any laptop or desktop PC that supports Linux. The steps you take to create the emergency boot device vary, depending on the device.

To create an emergency boot device:

1. Use FTP to copy the installation media image into the **/var/tmp** directory on the device.
2. Insert a USB storage device into the USB port.
3. From the CLI, start the shell:

```
user@device> start shell
%
```

4. Use the gunzip command to unzip the image file.

5. Switch to the root account using the su command:

```
% su
Password: password
```

> **NOTE**: The password is the root password for the device. If you logged in to the device as the root user, you do not need to perform this step.

6. Enter the following command on the device:

```
root@device% dd if=/var/tmp/filename of=/dev/da0 bs=1m
```

The device writes the installation media image to the USB storage device:

```
root@device% dd if=install-media-qfx-5e-15.1X53-D30.5-domestic.img of=/dev/da0 bs=1m
1399+0 records in
1399+0 records out
1466957824 bytes transferred in 394.081902 secs (3722469 bytes/sec)
```

7. Log out of the shell:

```
root@device% exit
% exit
user@device>
```

Performing a Recovery Installation

If Junos OS on your device is damaged in some way that prevents the software from loading correctly, you may need to perform a recovery installation using an emergency boot device (for example, a USB flash drive) to restore the default factory installation. Once you have recovered the software, you need to restore the device configuration. You can either create a new configuration as you did when the device was shipped from the factory, or if you saved the previous configuration, you can simply restore that file to the device.

Starting in Junos OS Release 14.1, you can also use a system snapshot as a bootup option when your Junos OS or configuration is damaged. The system snapshot feature takes a "snapshot" of the files

currently used to run the device—the complete contents of the **/config** directories, which include the running Juniper Networks Junos OS, the active configuration, and the rescue configuration, as well as the host OS—and copies all of these files into an external USB flash drive. See Understanding How to Back Up an Installation on Switches.

> **NOTE**: System snapshot is not supported on QFX10002 switches.

If at all possible, you should try to perform the following steps before you perform the recovery installation:

1. Ensure that you have an emergency boot device to use during the installation. See *Creating an Emergency Boot Device for QFX Series Switches* for information on how to create an emergency boot device.

2. Copy the existing configuration in the file **/config/juniper.conf.gz** from the device to a remote system, such as a server, or to an emergency boot device. For extra safety, you can also copy the backup configurations (the files named **/config/juniper.conf.*n*,** where *n* is a number from 0 through 9) to a remote system or to an emergency boot device.

> ⚡ **WARNING**: The recovery installation process completely overwrites the entire contents of the internal flash storage.

3. Copy any other stored files to a remote system as desired.

To reinstall Junos OS:

1. Insert the emergency boot device into the QFX Series device.

2. Reboot the QFX Series device.

> **NOTE**: Do not power off the device if it is already on.

```
[edit system]
user@device> request system reboot
```

If you do not have access to the CLI, power cycle the QFX Series device.

The emergency boot device (external USB install media) is detected. At this time, you can load the Junos OS from the emergency boot device onto the internal flash storage.

3. The software prompts you with the following options:

```
External USB install media detected.
You can load Junos from this media onto an internal drive.
Press 'y' to proceed, 'f' to format and install, or 'n' to abort.
Do you wish to continue ([y]/f/n)? f
```

4. Type **f** to format the internal flash storage and install the Junos OS on the emergency boot device onto the internal flash storage.

   If you do no want to format the internal flash storage, type **y**.

   The following messages are displayed:

```
Installing packages from external USB drive da1
Packages will be installed to da0, media size: 8G

Processing format options
Fri September  4 01:18:44 UTC 2012

-- IMPORTANT INFORMATION --
Installer has detected settings to format system boot media.
This operation will erase all data from your system.

Formatting installation disk .. this will take a while, please wait
Disabling platform watchdog - threshold 12 mins

Determining installation slice
Fri September  4 01:27:07 UTC 2012
```

5. The device copies the software from the emergency boot device, occasionally displaying status messages. Copying the software can take up to 12 minutes.

   When the device is finished copying the software, you are presented with the following prompt:

```
*** Fri September  4 01:19:00 UTC 2012***
Installation successful..
Please select one of the following options:
Reboot to installed Junos after removing install media (default) ... 1
Reboot to installed Junos by disabling install media .............. 2
Exit to installer debug shell .................................... 3
```

```
Install Junos to alternate slice ................................... 4
Your choice: 4
NOTE: System installer will now install Junos to alternate slice
Do not power off or remove the external installer media or
interrupt the installation mechanism.
```

6. Select **4** to install Junos OS to the alternate slice of the partition, and then press Enter.

7. Remove the emergency boot device when prompted and then press Enter. The device then reboots from the internal flash storage on which the software was just installed. When the reboot is complete, the device displays the login prompt.

8. Create a new configuration as you did when the device was shipped from the factory, or restore the previously saved configuration file to the device.

Change History Table

Feature support is determined by the platform and release you are using. Use Feature Explorer to determine if a feature is supported on your platform.

Release	Description
14.1	Starting in Junos OS Release 14.1, you can also use a system snapshot as a bootup option when your Junos OS or configuration is damaged.

RELATED DOCUMENTATION

Creating an Emergency Boot Device for QFX Series Switches

Recovering the Installation Using an Emergency Boot Device on QFX Series Switches

If Junos OS on your device is damaged in some way that prevents the software from loading correctly, you may need to perform a recovery installation using an emergency boot device (for example, a USB flash drive) to restore the default factory installation. Once you have recovered the software, you need to restore the device configuration. You can either create a new configuration as you did when the device was shipped from the factory, or if you saved the previous configuration, you can simply restore that file to the device.

If at all possible, you should try to perform the following steps before you perform the recovery installation:

1. Ensure that you have an emergency boot device to use during the installation. See *Creating an Emergency Boot Device for QFX Series Switches* for information on how to create an emergency boot device.

2. Copy the existing configuration in the file **/config/juniper.conf.gz** from the device to a remote system, such as a server, or to an emergency boot device. For extra safety, you can also copy the backup configurations (the files named **/config/juniper.conf.***n*, where *n* is a number from 0 through 9) to a remote system or to an emergency boot device.

   You can use the system snapshot feature to complete this step. The system snapshot feature takes a "snapshot" of the files currently used to run the QFX Series switch—the complete contents of the **/config** and **/var** directories, which include the running Junos OS, the active configuration, and the rescue configuration—and copies all of these files into a memory source. See *Creating a Snapshot and Using It to Boot a QFX Series Switch*.

   > **NOTE**: System snapshot is not supported on QFX10000 and QFX5200 switches.

   > ⚠️ **CAUTION**: The recovery installation process completely overwrites the entire contents of the internal flash storage.

3. Copy any other stored files to a remote system as desired.

To reinstall Junos OS:

1. Connect to the device's console port (either directly or through a console server).

2. Insert the emergency boot device into the QFX Series switch.

3. Reboot or power cycle the device.

4. As soon as the device reboots, keep pressing **Esc** until the boot options menu opens.

```
Press Esc for boot options
...
Intel(R) Xeon(R) CPU  @ 2.50GHz                                    2.50 GHz
V0018.8                                                        16384 MB RAM
 Continue
 Boot Manager
 Device Manager
 Boot From File
 Setup Utility
```

> **NOTE**: You might have to reboot or power cycle the device more than once if you miss hitting **Esc** to open the boot options menu.

5. In the boot options menu, select **Boot Manager**.

6. In the Boot Manager menu, select the emergency boot device. In this example, the emergency boot device is the USB device.

> **NOTE**: In later releases, the Boot Manager menu might display two different entries for the same USB recovery device. Select the **EFI USB Device** entry.

```
                                Boot Manager

Boot Option Menu

 SSD0 : ATP M.2 2242
 IBA GE Slot 0101 v1350
 IBA GE Slot 0102 v1350
 USB : General Udisk
 SSD1 : ATP M.2 2242
 IBA GE Slot 0103 v1350
 EFI HDD Device (ATP M.2 2242)
 Internal EFI Shell
```

The Juniper Linux Installer or GNU GRUB menu opens. The menu and options may differ slightly depending on the platform and release.

7. If you have Junos OS software from the factory installed on the emergency boot device, the software prompts you with the following options:

```
Juniper Linux Installer - (c) Juniper Networks 2014
        Reboot
        Install Juniper Linux Platform
        Boot to host shell [debug]
```

Select **Install Juniper Linux Platform** to install the Junos OS software from the emergency boot device.

> **NOTE**: Depending on the platform and release, you may see different entries such as **Install Juniper Linux**, **Install Juniper Linux Platform**, or **Install Juniper Linux with secure boot support**.

8. The device copies the software from the emergency boot device, occasionally displaying status messages. Copying the software can take up to 12 minutes.

9. After the software is copied to the device, the device reboots from the internal flash storage on which the software was just installed.

> **NOTE**: If the Boot Manager menu includes both SSD drive and EFI HDD Device entries, manually select the **EFI HDD Device** option.

When the reboot is complete, the device displays the Junos OS login prompt:

```
root@switch#
```

10. Create a new configuration as you did when the device was shipped from the factory, or restore the previously saved configuration file to the device.

11. Remove the emergency boot device.

CHAPTER 43

Returning Hardware

IN THIS CHAPTER

Locating the Serial Number on a QFX5110 Device or Component

IN THIS SECTION

If you are returning a switch or 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 a Return Materials Authorization (RMA). See *Contact Customer Support to Obtain Return Material Authorization*.

If the switch is operational and you can access the command-line interface (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 switch or component.

> **NOTE**: If you want to find the serial number ID label on a component, you need to remove the component from the switch chassis, for which you must have the required parts and tools available.

Listing the Chassis and Component Details Using the CLI

To list the QFX5110 switch and components and their serial numbers, use the `show chassis hardware` CLI operational mode command.

```
user@device> show chassis hardware

user@device> show chassis hardware
Hardware inventory:
Item              Version  Part number  Serial number    Description
Chassis                                 WS3115130011     QFX5110-48S-4Q
Pseudo CB 0
Routing Engine 0           BUILTIN      BUILTIN          RE-QFX5110-48S-4Q
FPC 0             REV 03   650-061152   WS3115290015
  CPU                      BUILTIN      BUILTIN          FPC CPU
  PIC 0                    BUILTIN      BUILTIN          48x10G-4x100G
    Xcvr 34       REV 01   740-030658   AD1148A0AXP      SFP+-10G-USR
    Xcvr 35       REV 01   740-030658   AD1148A0APE      SFP+-10G-USR
    Xcvr 48       REV01    740-061001   LEO150600KQ      QSFP28-100G-CU3M
    Xcvr 49       REV01    740-061001   LEO150600KQ      QSFP28-100G-CU3M
    Xcvr 50       REV 01   740-038624   MOC13346240015   QSFP+-40G-CU3M
```

```
Power Supply 0   REV 03   740-041741   1GA24141198       JPSU-650W-AC-AFO
Power Supply 1   REV 03   740-041741   1GA24141173       JPSU-650W-AC-AFO
Fan Tray 0                                               fan-ctrl-2 0, Front to Back Airflow -
AFO
Fan Tray 1                                               fan-ctrl-2 1, Front to Back Airflow -
AFO
Fan Tray 2                                               fan-ctrl-2 2, Front to Back Airflow -
AFO
Fan Tray 3                                               fan-ctrl-2 3, Front to Back Airflow -
AFO
Fan Tray 4                                               fan-ctrl-2 4, Front to Back Airflow -
AFO


{master:0}
root>
```

NOTE: You must remove the fan module to read the fan serial number from the serial number ID label. The fan module serial number cannot be viewed through the CLI. **Fan Tray 2** refers to the third module from the left, counting from 0.

Locating the Chassis Serial Number ID Label on a QFX5110

The chassis serial number ID label is located on the right side of the QFX5110 port panel. On legacy switches, or switches with an LCD, the port panel is referred to as the front panel. See Figure 242 on page 625 for an example of where to find the serial number ID.

Figure 242: Location of the Serial Number ID Label on a QFX5110
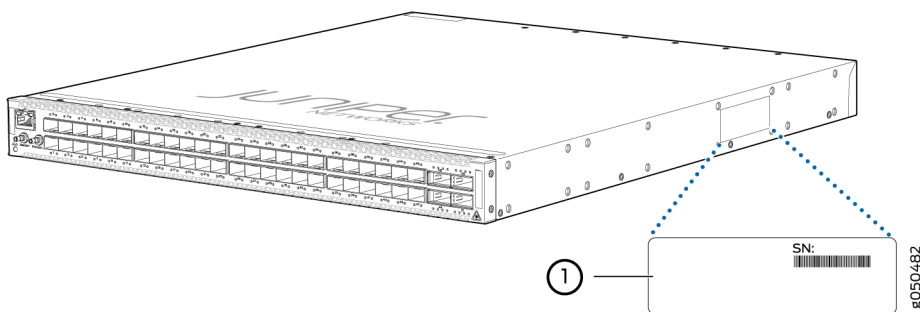
Locating the Serial Number ID Labels on FRU Components

The power supplies and fan modules installed in a QFX5110 are field-replaceable units (FRUs). For each FRU, you must remove the FRU from the switch chassis to see the FRU serial number ID label.

- AC power supply—The serial number ID label is on the top of the AC power supply. See Figure 243 on page 626 for an example of where to find the serial number ID.

Figure 243: Location of the AC Power Supply Serial Number ID Label on a QFX5110
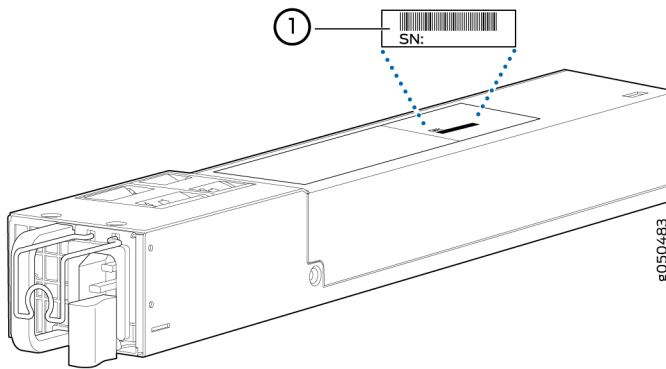
1— AC power supply serial number

- Fan module—The serial number ID label is on the bottom of the fan bezel. See Figure 244 on page 626 for an example of where to find the serial number ID.

Figure 244: Location of the Fan Module Serial Number ID Label on a QFX5110-48S
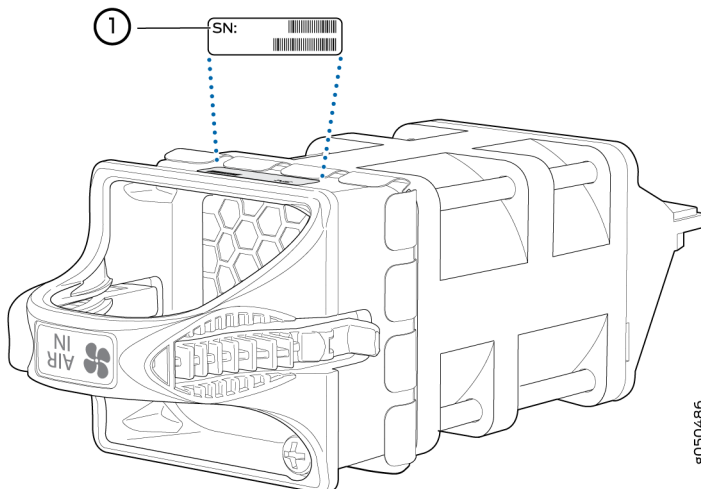
1— Fan module serial number

Locating the Serial Number on a QFX5100 Device or Component

If you are returning a switch or 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 a Return Materials Authorization (RMA). See *Contacting Customer Support to Obtain a Return Materials Authorization for a QFX Series Device or Component*.

If the switch is operational and you can access the command-line interface (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 switch or component.

NOTE: If you want to find the serial number ID label on a component, you need to remove the component from the switch chassis, for which you must have the required parts and tools available.

Listing the Chassis and Component Details Using the CLI

To list the QFX5100 switch and components and their serial numbers, use the `show chassis hardware` CLI operational mode command. If you are using the QFX5100 switch as a Node device in a QFabric system, you must first log in to the switch using the `request component login` CLI operational mode command.

```
user@device> show chassis hardware

Hardware inventory:
Item             Version  Part number  Serial number    Description
Chassis                                EL9270           QFX5100-24Q-2P
Pseudo CB 0
Routing Engine 0          BUILTIN      BUILTIN          QFX Routing Engine
FPC 0            REV 17   750-036931   P5331-C          QFX5100-24Q-2P
```

```
  CPU                       BUILTIN     BUILTIN        FPC CPU
  PIC 0                     BUILTIN     BUILTIN        24x 40G-QSFP
Power Supply 0   Rev 04   740-032091   VB02420        QFX3500-48S4Q
Power Supply 1
Fan Tray 1                                            QFX5100 Fan Tray 1, Bac
k to Front Airflow - AFI
Fan Tray 2                                            QFX5100 Fan Tray 2, Bac
k to Front Airflow - AFI
Fan Tray 3                                            QFX5100 Fan Tray 3, Bac
k to Front Airflow - AFI
Fan Tray 4                                            QFX5100 Fan Tray 4, Bac
k to Front Airflow - AFI
Fan Tray 5                                            QFX5100 Fan Tray 5, Bac
k to Front Airflow - AFI
```

NOTE: You must remove the fan module to read the fan serial number from the serial number ID label. The fan module serial number cannot be viewed through the CLI. **Fan Tray 2** refers to the third module from the left, counting from 0.

Locating the Chassis Serial Number ID Label on a QFX5100 Switch

The location for the chassis serial number ID label is product SKU-dependent. On the QFX5100-96S, QFX5100-48S, QFX5100-48SH, QFX5100-48T, and QFX5100-48TH product SKUs, the serial number ID label is located on the left side of the port panel. On legacy switches, or switches with an LCD, the port panel is referred to as the front panel. See through for examples of where to find the serial number ID. On the QFX5100-24Q, the serial number ID label is located next to the left expansion port on the port panel. See .

Figure 245: Location of the Serial Number ID Label on a QFX5100-96S Switch
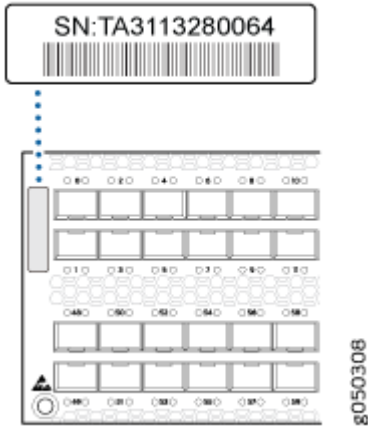
Figure 246: Location of the Serial Number ID Label on QFX5100-48S and QFX5100-48SH Switches
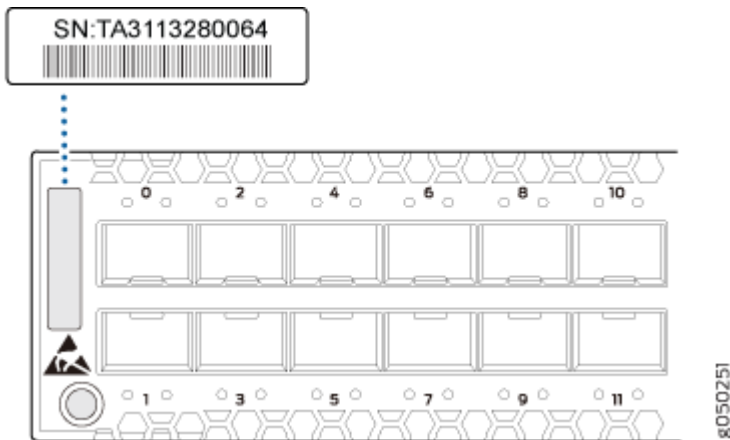
Figure 247: Location of the Serial Number ID Label on QFX5100-48T and QFX5100-48TH Switches
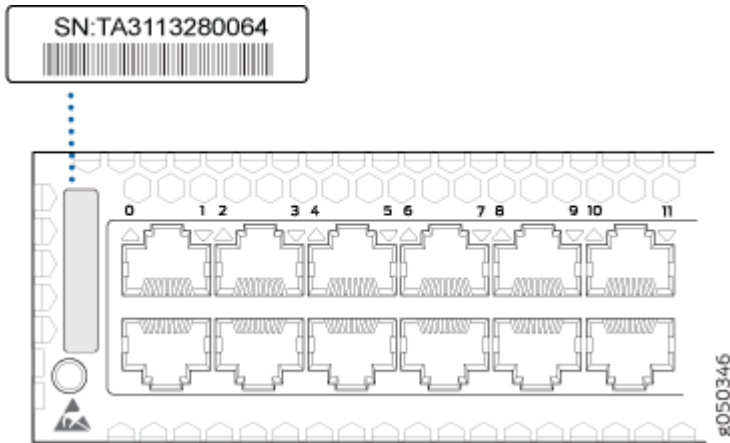
Figure 248: Location of the Serial Number ID Label on a QFX5100-24Q Switch
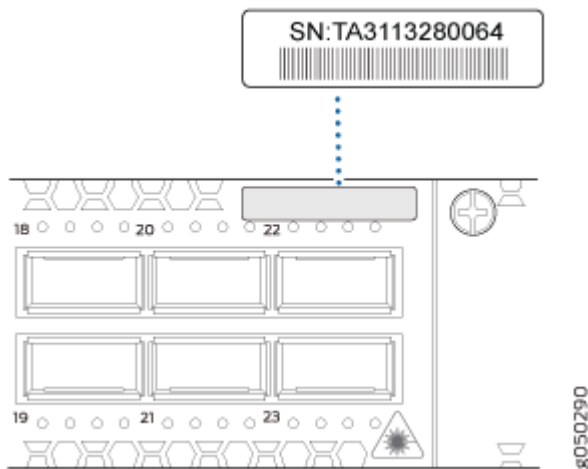
Locating the Serial Number ID Labels on FRU Components

The power supplies, fan module, and expansion modules installed in QFX5100 switches are field-replaceable units (FRUs). For each FRU, you must remove the FRU from the switch chassis to see the FRU serial number ID label.

- AC power supply—The serial number ID label is on the top of the AC power supply.

- Fan module—The serial number ID label is on the top of the fan module.

- Expansion module–The serial number ID label is in the middle of the printed circuit board (PCB).

Returning a QFX5100 Device or Component for Repair or Replacement

Locating the Serial Number on a QFX3600 or QFX3600-I Device or Component

IN THIS SECTION

If you are returning a switch or 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 a Return Materials Authorization (RMA). See *Contacting Customer Support to Obtain a Return Materials Authorization for a QFX Series Device or Component*.

If the switch is operational and you can access the command-line interface (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 device or component.

> **NOTE**: If you want to find the serial number ID label on a component, you will need to remove the component from the switch chassis, for which you must have the required parts and tools available.

Listing the Chassis and Component Details Using the CLI

To list the QFX3600 or QFX3600-I device and components and their serial numbers, use the `show chassis hardware` CLI operational mode command. For the QFX3600-I Interconnect device, or if you are using the QFX3600 device as a Node device in a QFabric system, you must first log in to the device using the

request component login CLI operational mode command, or connect directly to the device through the console **CON** port on the front panel.

```
user@device> show chassis hardware
Hardware inventory:
Item               Version  Part number  Serial number    Description
Chassis                                  JN00000000       QFX3600
Routing Engine 0            BUILTIN      BUILTIN          QFX Routing Engine
FPC 0              REV 05   750-036931   EE0823           QFX 16x40G Switch
  CPU                       BUILTIN      BUILTIN          FPC CPU
  PIC 0                     BUILTIN      BUILTIN          16x 40G-QSFP+
Power Supply 0     Rev 04   740-032091   UI00690          QFX PS 650W AC
Power Supply 1     Rev 04   740-032091   UI00679          QFX PS 650W AC
Fan Tray 0                                                QFX Fan Tray
Fan Tray 1                                                QFX Fan Tray
Fan Tray 2                                                QFX Fan Tray
```

NOTE: You must remove the fan tray to read the fan tray serial number from the serial number ID label. The fan tray serial number cannot be viewed through the CLI.

Locating the Chassis Serial Number ID Label on a QFX3600 or QFX3600-I Device

The chassis serial number ID label is located on a sliding panel to the right of the QSFP+ ports on the front panel of a QFX3600 or QFX3600-I device. See .

Figure 249: Location of the Serial Number ID Label on a QFX3600 or QFX3600-I Device

1–	LCD panel	6–	**C0** management port
2–	Chassis status LEDs	7–	**COS** management port
3–	Access and uplink ports	8–	**C1S** management port

> **NOTE**: If you want to find the serial number ID label on a component, you need to remove the component from the device chassis, for which you must have the required parts and tools available.

Listing the Chassis and Component Details Using the CLI

To list the QFX3500 device and components and their serial numbers, use the `show chassis hardware` CLI operational mode command. If you are using the QFX3500 device as a Node device in a QFabric system, you must first log in to the device using the `request component login` CLI operational mode command.

```
user@device> show chassis hardware
Hardware inventory:
Item              Version  Part number  Serial number    Description
Chassis                                 JN000TEST5       QFX3500
Routing Engine 0           BUILTIN      BUILTIN          QFX Routing Engine
FPC 0            REV 05    750-036931   EE0823           QFX 48x10G 4x40G Switch
  CPU                      BUILTIN      BUILTIN          FPC CPU
  PIC 0                    BUILTIN      BUILTIN          48x 10G-SFP+
  MGMT BRD       REV 08    750-036946   EE0731           QFX3500-MB
Power Supply 0   Rev 04    740-032091   UI00690          QFX PS 650W AC
Power Supply 1   Rev 04    740-032091   UI00679          QFX PS 650W AC
Fan Tray 0                                               QFX Fan Tray
Fan Tray 1                                               QFX Fan Tray
Fan Tray 2                                               QFX Fan Tray
```

> **NOTE**: You must remove the fan tray to read the fan tray serial number from the serial number ID label. The fan tray serial number cannot be viewed through the CLI. **Fan Tray 2** refers to the fan modules located in the management board.

Locating the Chassis Serial Number ID Label on a QFX3500 Device

The chassis serial number ID label is located on a sliding panel to the right of the fan tray on a QFX3500 device. See .

Figure 250: Location of the Serial Number ID Label on a QFX3500 Device
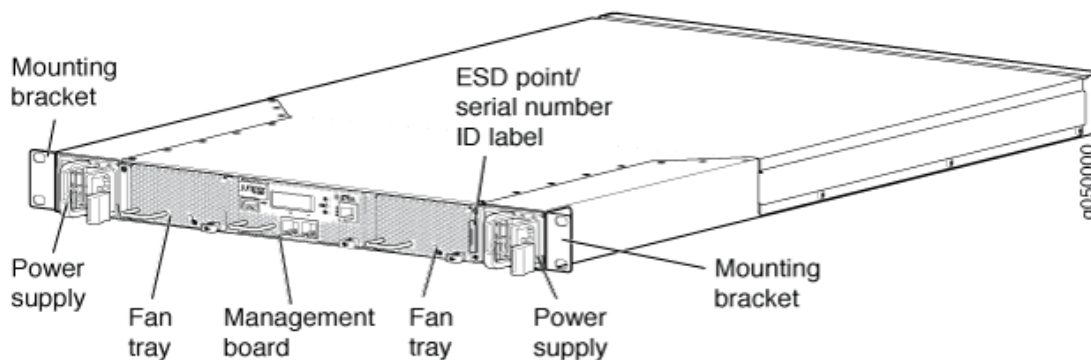
Locating the Serial Number ID Labels on FRU Components

The power supplies, fan trays, and management board installed in QFX3500 devices are field-replaceable units (FRUs). For each FRU, you must remove the FRU from the device chassis to see the FRU serial number ID label.

- AC power supply—The serial number ID label is on the top of the AC power supply.

- Fan tray—The serial number ID label is on the top of the fan tray.

- Management board—The serial number ID label is on the circuit board.

Returning a QFX3500 Device or Component for Repair or Replacement

Locating the Serial Number on an EX4300 Switch or Component

IN THIS SECTION

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 EX4300 Switch Hardware Components.

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:

```
show chassis hardware
```

The following output lists the switch components and serial numbers for an EX4300-48P switch:

```
user@switch> show chassis hardware
Hardware inventory:
Item              Version  Part number  Serial number    Description
Chassis                                 PD3113060008     EX4300-48P
Routing Engine 0 REV D    650-044930   PD3113060008     EX4300-48P
FPC 0            REV D    650-044930   PD3113060008     EX4300-48P
  CPU                     BUILTIN      BUILTIN          FPC CPU
  PIC 0         REV D    BUILTIN      BUILTIN          48x 10/100/1000 Base-T
  PIC 1         REV D    BUILTIN      BUILTIN          4x 40GE
  PIC 2         REV A0   611-044925   MY3112490109     4x 1G/10G SFP/SFP+
    Xcvr 0      REV 01   740-030658   AD0946A02ZT      SFP+-10G-USR
    Xcvr 1      REV 01   740-030658   AA1212ALZ5E      SFP+-10G-USR
  Power Supply 0 REV 01   740-046871   1EDA2490663      JPSU-1100-AC-AFO-A
  Power Supply 1 REV 01   740-046873   1EDE2430149      JPSU-350-AC-AFO-A
  Fan Tray 0                                            Fan Module, Airflow Out (AFO)
  Fan Tray 1                                            Fan Module, Airflow Out (AFO)
```

The following output lists the switch components and serial numbers for an EX4300-48MP switch:

```
user@switch> show chassis hardware
Hardware inventory:
Item               Version  Part number  Serial number     Description
Chassis                                  XR3617480018      EX4300-48MP
Pseudo CB 0
Routing Engine 0            BUILTIN      BUILTIN           RE-EX4300MP
FPC 0              REV 02   650-078100   XR3617480018      EX4300-48MP
  CPU                       BUILTIN      BUILTIN           FPC CPU
  PIC 0            REV 02   BUILTIN      BUILTIN           24x10M/100M/1G Base-T & 24x 100M/1G/
2.5G/5G/10G Base-T
  PIC 1            REV 02   650-078100   XR3617480018      4x40G QSFP+
  PIC 2            REV      650-080740   XS3617480045      4x10G SFP+
    Xcvr 0         REV 02   740-011613   NT33F2C           SFP-SX
    Xcvr 1         REV 01   740-021308   09T511103777      SFP+-10G-SR
    Xcvr 3         REV 01   740-030658   AA1229AZXZG       SFP+-10G-USR
Power Supply 0     REV 01   740-074873   1F197410083       JPSU-1400W-AC-AFO
Fan Tray 0                                                 Fan Module, Airflow Out (AFO)
Fan Tray 1                                                 Fan Module, Airflow Out (AFO)
```

For information about the `show chassis hardware` command, see show chassis hardware.

Locating the Chassis Serial Number ID Label on an EX4300 Switch

The serial number ID label is located on the rear panel of the chassis on EX4300 switches. Figure 251 on page 638 shows the location of the serial number ID label on 24-port and 48-port EX4300 switches except EX4300-48MP and EX4300-48MP-S switches. Figure 252 on page 638 shows the location of the serial number ID label on EX4300-48MP and EX4300-48MP-S switches. Figure 253 on page 638 shows the location of the serial number ID label on 32-port EX4300 switches.

Figure 251: Location of the Serial Number ID Label on 24-Port and 48-Port EX4300 Switches Except EX4300-48MP and EX4300-48MP-S Switches
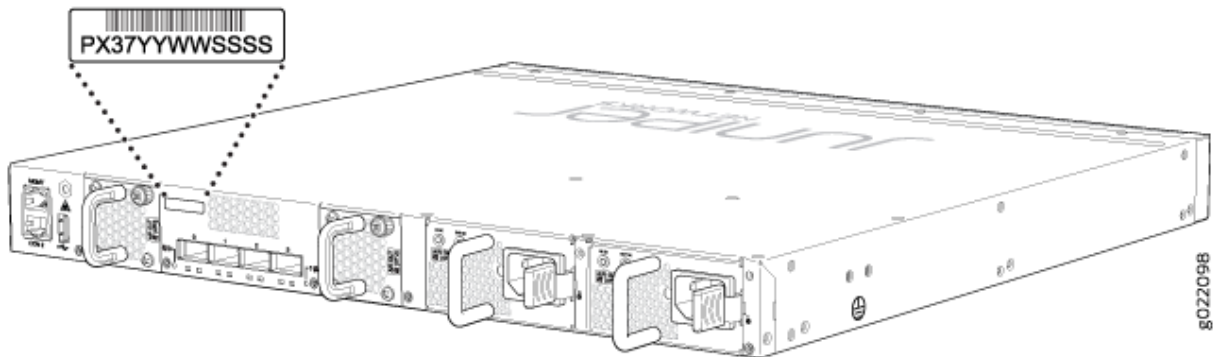
Figure 252: Location of the Serial Number ID Label on EX4300-48MP and EX4300-48MP-S Switches
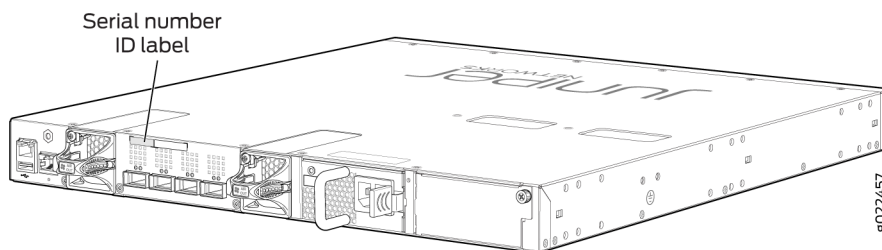
Figure 253: Location of the Serial Number ID Label on 32-Port EX4300 Switches

Locating the Serial Number ID Labels on FRUs in an EX4300 Switch

The power supplies, fan modules, and uplink modules, installed in EX4300 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 254 on page 639 shows the location of the serial number ID label on an AC power supply used in EX4300 switches except EX4300-48MP and EX4300-48MP-S switches, Figure 255 on page 640 shows the location of the serial number ID label on an AC power supply used in EX4300-48MP and EX4300-48MP-S switches, and Figure 256 on page 640 shows the location of the serial number ID label on a DC power supply. EX4300-48MP and EX4300-48MP-S switches do not support DC power supply. See*Removing an AC Power Supply from an EX4300 Switch* and *Removing an AC Power Supply from an EX4300 Switch*.

Figure 254: Location of the Serial Number ID Label on an AC Power Supply Used in EX4300 Switches Except EX4300-48MP and EX4300-48MP-S Switches
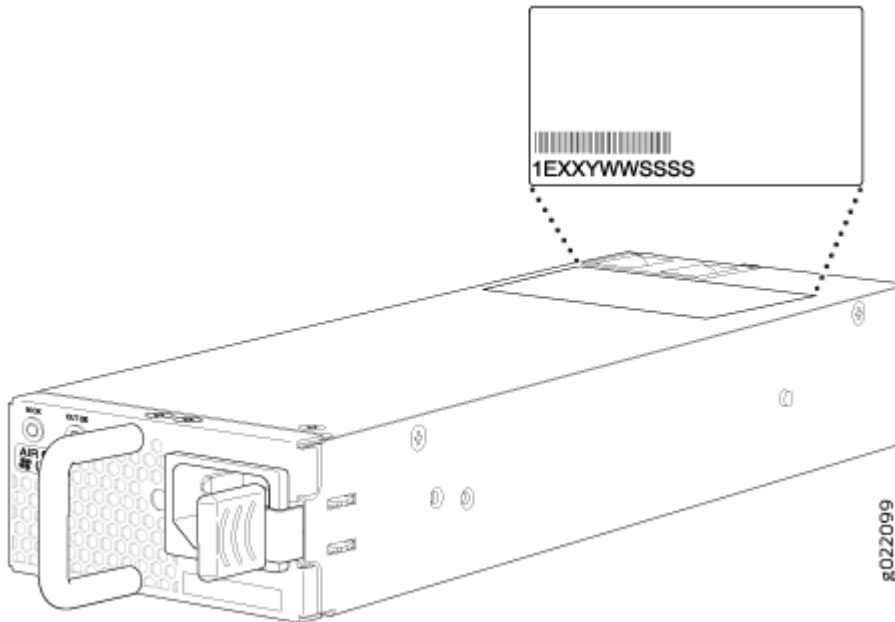
Figure 255: Location of the Serial Number ID Label on an AC Power Supply Used in EX4300-48MP and EX4300-48MP-S Switches
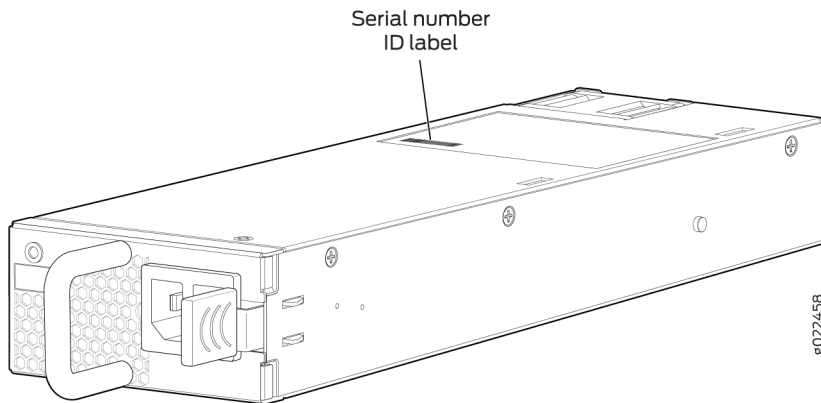
Figure 256: Location of the Serial Number ID Label on a DC Power Supply Used in EX4300 Switches

- *Fan module*—Figure 257 on page 641 shows the location of the serial number ID label on the fan module for EX4300 switches except EX4300-48MP and EX4300-48MP-S switches. Figure 258 on page 641 shows the location of the serial number ID label on the fan module for EX4300-48MP and EX4300-48MP-S switches. See *Removing a Fan Module from an EX4300 Switch*.
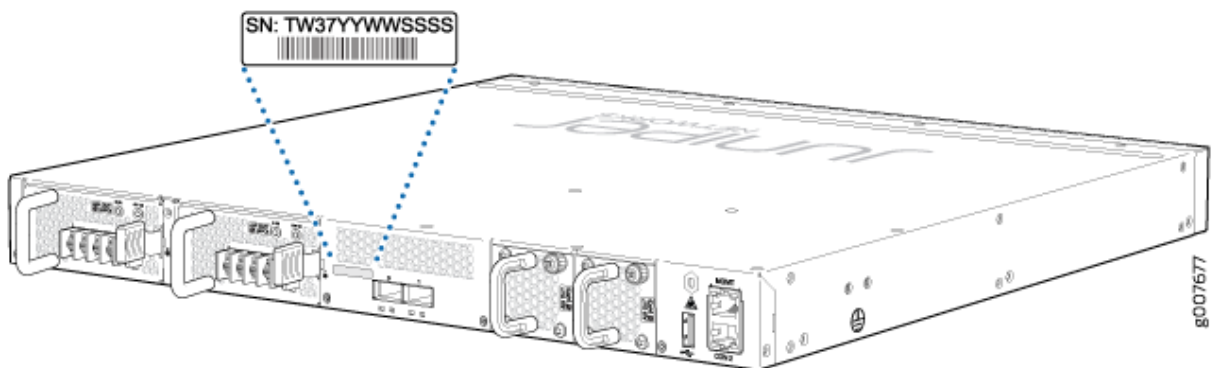
Figure 257: Location of the Serial Number ID Label on the Fan Module Used in an EX4300 Switches Except EX4300-48MP and EX4300-48MP-S Switches
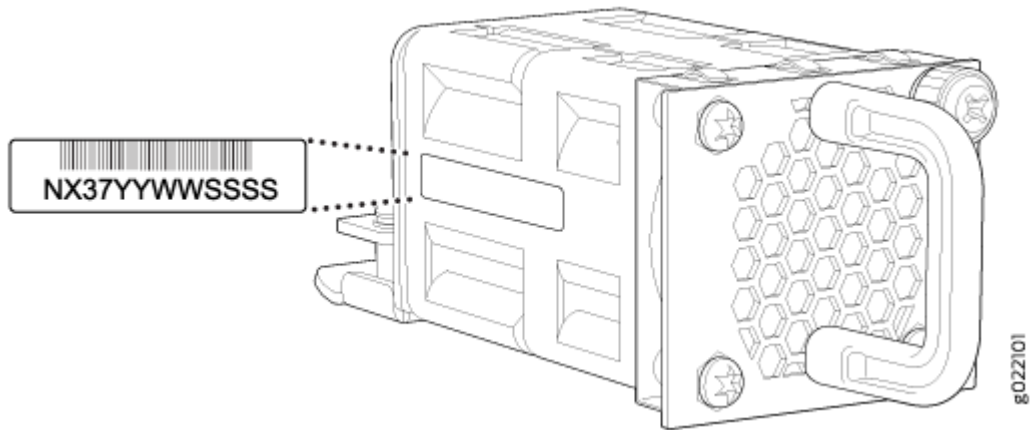
Figure 258: Location of the Serial Number ID Label on the Fan Module Used in an EX4300-48MP and EX4300-48MP-S Switches
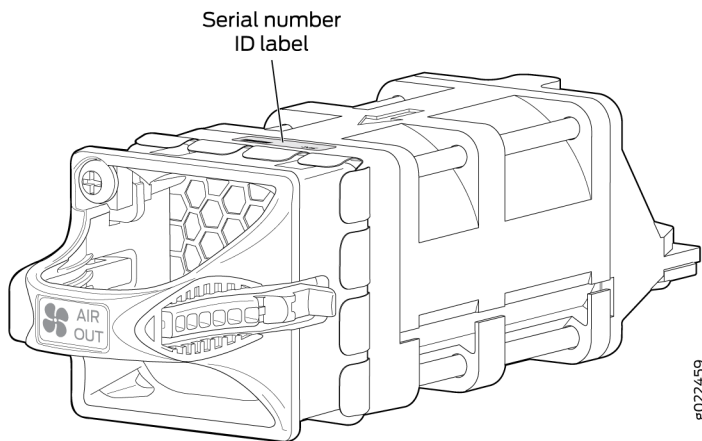
- *Uplink modules*

  - EX4300 switches except EX4300-48MP and EX4300-48MP-S switches—Figure 259 on page 642 shows the location of the serial number ID label on the QSFP+ uplink module, Figure 261 on page 643 shows the location of the serial number ID label on the 4-port SFP+ uplink module, and Figure 262 on page 643 shows the location of the serial number ID label on the 8-port SFP+ uplink module.

  - EX4300-48MP and EX4300-48MP-S switches—Figure 260 on page 642 shows the location of the serial number ID label on the 2-port 40-Gigabit Ethernet QSFP+/100-Gigabit Ethernet QSFP28 uplink module (model number: EX-UM-2QSFP-MR) and Figure 263 on page 644 shows

the location of the serial number ID label on the 4-port 1-Gigabit Ethernet SFP/10-Gigabit Ethernet SFP+ uplink module (model number: EX-UM-4SFPP-MR) for EX4300-48MP and EX4300-48MP-S switches.

See *Removing an Uplink Module from an EX4300 Switch*.

Figure 259: Location of the Serial Number ID Label on the QSFP+ Uplink Module
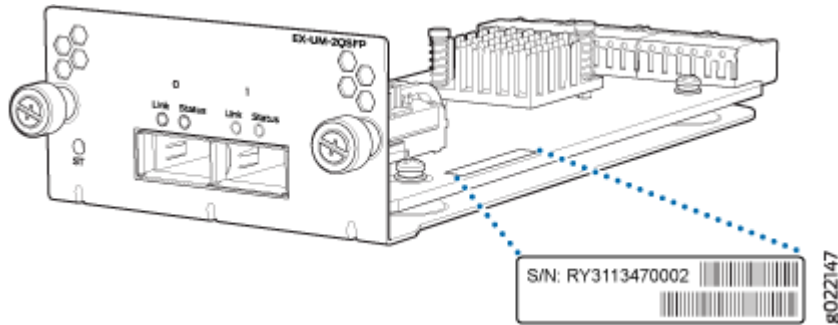
Figure 260: Location of the Serial Number ID Label on the 2-Port 40-Gigabit Ethernet QSFP+/100-Gigabit Ethernet QSFP28 Uplink Module for EX4300-48MP Switches
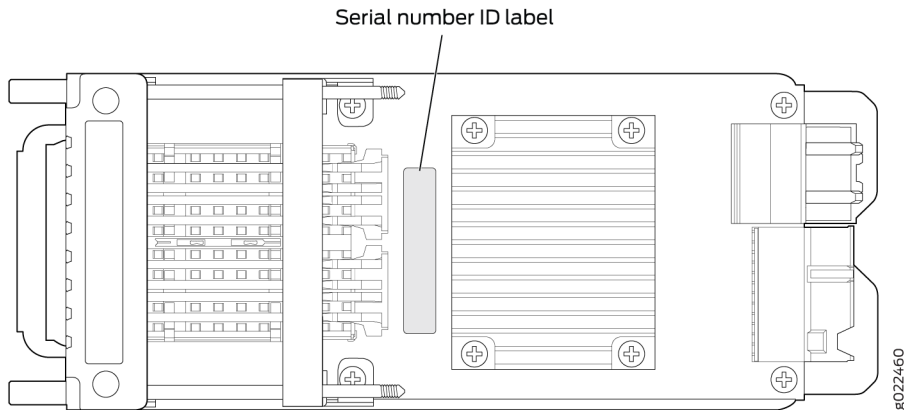
Figure 261: Location of the Serial Number ID Label on the 4-Port SFP+ Uplink Module for EX4300 Switches Except EX4300-48MP and EX4300-48MP-S Switches

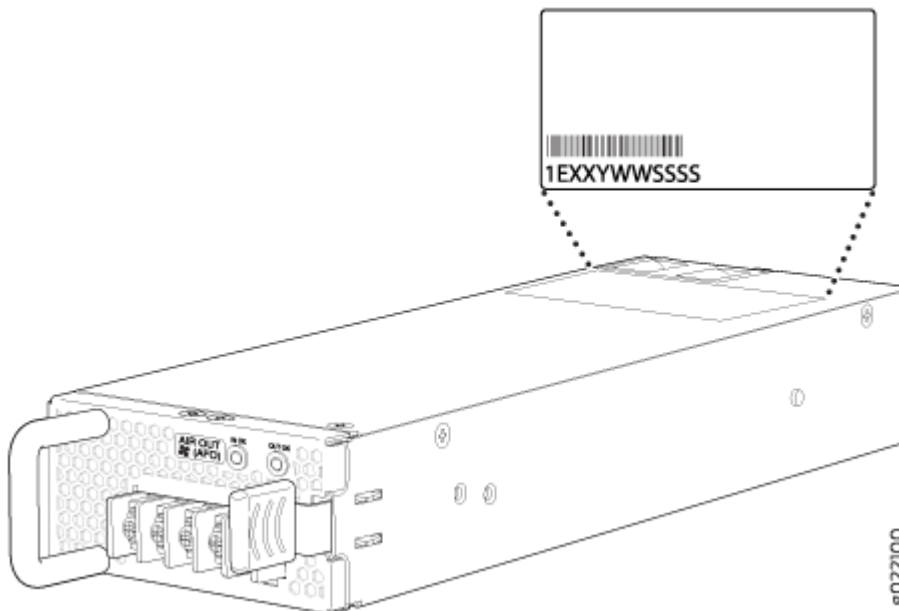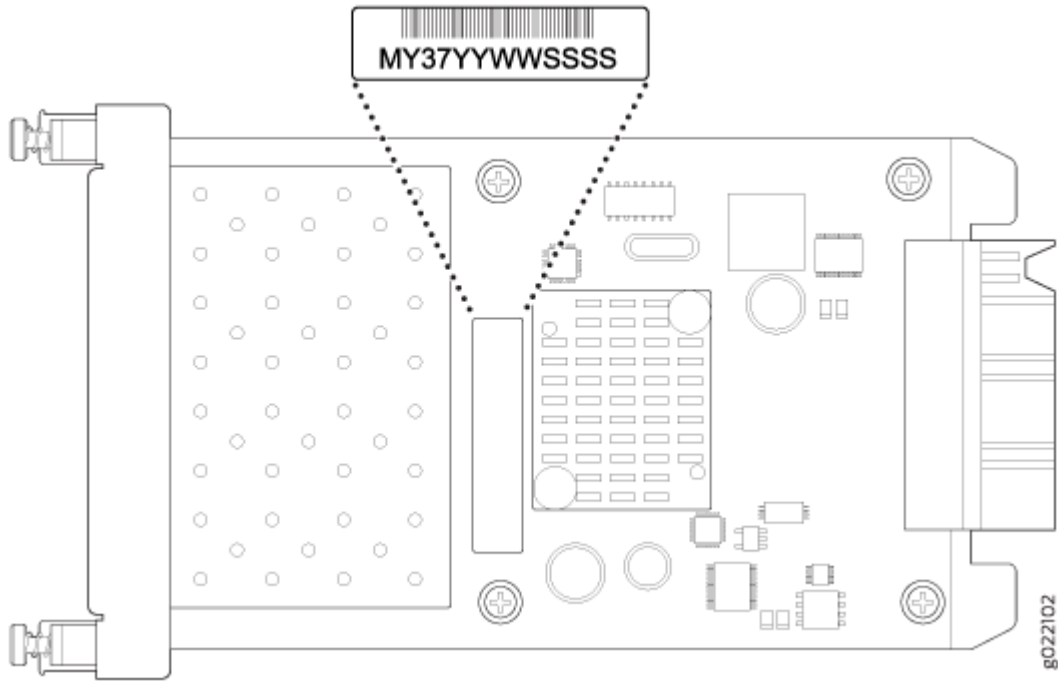**Figure 262: Location of the Serial Number ID Label on the 8-Port SFP+ Uplink Module**
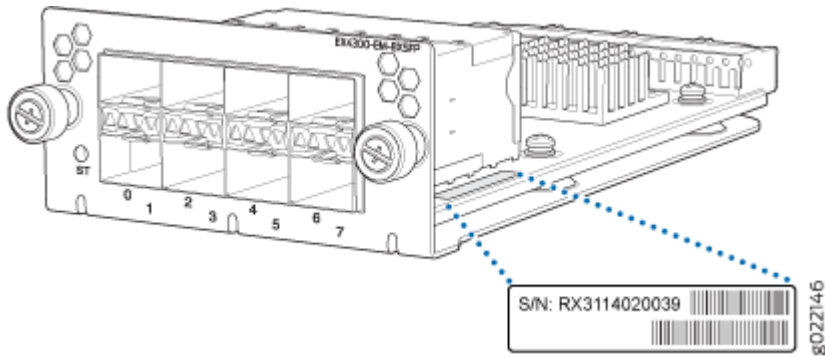
Figure 263: Location of the Serial Number ID Label on the 4-Port 1-Gigabit Ethernet SFP/10-Gigabit Ethernet SFP+ Uplink Module for EX4300-48MP Switches

Serial number ID label

g022469
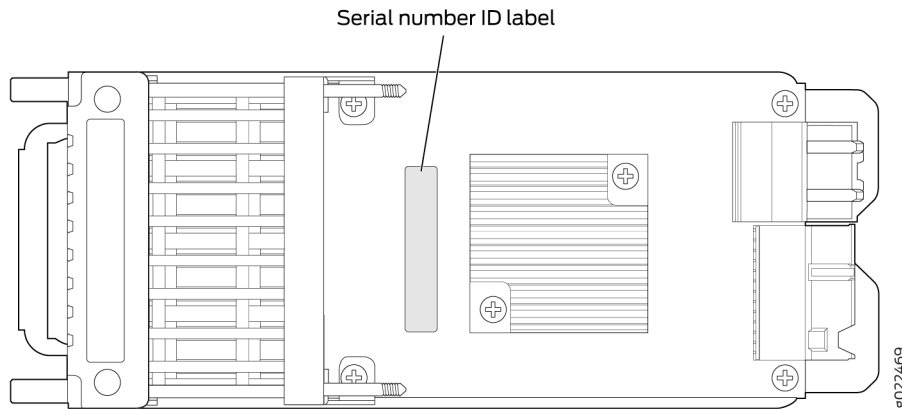
Packing an QFX5110 Device or Component for Shipping

IN THIS SECTION

- Packing a QFX5110 Switch for Shipping | **645**
- Packing QFX5110 Components for Shipping | **645**

If you are returning a QFX5110 or component to Juniper Networks for repair or replacement, pack the item as described in this topic.

Before you pack a QFX5110 or component:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See "Prevention of Electrostatic Discharge Damage" on page 252.

- Retrieve 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 a Return Materials Authorization for a QFX Series Device or Component" on page 657.

Ensure that you have the following parts and tools available:

- ESD grounding strap.

- Antistatic bag, one for each component.

- If you are returning the chassis, an appropriate screwdriver for the mounting screws used on your rack or cabinet.

This topic describes:

Packing a QFX5110 Switch for Shipping

To pack a QFX5110 for shipping:

1. Power down the switch and remove the power cables. See "Powering Off a QFX5110" on page 428.

2. Remove the cables that connect the QFX5110 to all external devices.

3. Remove all field-replaceable units (FRUs) from the switch.

4. Have one person support the weight of the switch while another person unscrews and removes the mounting screws.

5. Remove the switch from the rack or cabinet (see *QFX5110 Installation Safety Guidelines*) and place the switch in an antistatic bag.

6. Place the switch in the shipping carton.

7. Place the packing foam on top of and around the switch.

8. If you are returning accessories or FRUs with the switch, pack them as instructed in "Packing QFX5110 Components for Shipping" on page 645.

9. Replace the accessory box on top of the packing foam.

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 QFX5110 Components for Shipping

> ⚠️ **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 and ship QFX5110 components:

1. Place individual FRUs in antistatic bags.

2. Ensure that the components are adequately protected with packing materials and packed so that the pieces are prevented from moving around inside the carton.

3. Close the top of the cardboard shipping box and seal it with packing tape.

4. Write the RMA number on the exterior of the box to ensure proper tracking.

Packing a QFX5100 Device or Component for Shipping

IN THIS SECTION

If you are returning a QFX5100 switch or component to Juniper Networks for repair or replacement, pack the item as described in this topic.

Before you pack a QFX5100 switch or component:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.

- Retrieve 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 a Return Materials Authorization for a QFX Series Device or Component*.

Ensure that you have the following parts and tools available:

- ESD grounding strap.

- Antistatic bag, one for each component.

- If you are returning the chassis, an appropriate screwdriver for the mounting screws used on your rack or cabinet.

Packing a QFX5100 Switch for Shipping

To pack a QFX5100 switch for shipping:

1. Power down the switch and remove the power cables. See *Power Off a QFX5100 Device*.
2. Remove the cables that connect the QFX5100 switch to all external devices.
3. Remove all field-replaceable units (FRUs) from the switch.

4. Have one person support the weight of the switch while another person unscrews and removes the mounting screws.

5. Remove the switch from the rack or cabinet (see *QFX5100 Installation Safety Guidelines*) and place the switch in an antistatic bag.

6. Place the switch in the shipping carton.

7. Place the packing foam on top of and around the switch.

8. If you are returning accessories or FRUs with the switch, pack them as instructed in "Packing QFX5100 Switch Components for Shipping" on page 647.

9. Replace the accessory box on top of the packing foam.

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 QFX5100 Switch Components for Shipping

> ⚠️ **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 and ship QFX5100 switch components:

- Place individual FRUs in antistatic bags.

- Ensure that the components are adequately protected with packing materials and packed so that the pieces are prevented from moving around inside the carton.

- Close the top of the cardboard shipping box and seal it with packing tape.

- Write the RMA number on the exterior of the box to ensure proper tracking.

RELATED DOCUMENTATION

Returning a QFX5100 Device or Component for Repair or Replacement

Packing a QFX3600 or QFX3600-I Device or Component for Shipping

IN THIS SECTION

If you are returning a QFX3600 or QFX3600-I device or component to Juniper Networks for repair or replacement, pack the item as described in this topic.

Before you pack a QFX3600 or QFX3600-I device or component:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.

- Retrieve 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 a Return Materials Authorization for a QFX Series Device or Component*.

Ensure that you have the following parts and tools available:

- ESD grounding strap.

- Antistatic bag, one for each component.

- If you are returning the chassis, an appropriate screwdriver for the mounting screws used on your rack or cabinet.

Packing a QFX3600 or QFX3600-I Device for Shipping

To pack a QFX3600 or QFX3600-I device for shipping:

1. Power down the device and remove the power cables. See "Powering Off a QFX3600 Device" on page 433.
2. Remove the cables that connect the QFX3600 or QFX3600-I device to all external devices.
3. Remove all field-replaceable units (FRUs) from the device.
4. Have one person support the weight of the device while another person unscrews and removes the mounting screws.
5. Remove the device from the rack or cabinet (see *Chassis Lifting Guidelines for a QFX3600 or QFX3600-I Device*) and place the device in an antistatic bag.
6. Place the device in the shipping carton.
7. Place the packing foam on top of and around the device.
8. If you are returning accessories or FRUs with the device, pack them as instructed in "Packing QFX3600 or QFX3600-I Device Components for Shipping" on page 649.
9. Replace the accessory box on top of the packing foam.
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 QFX3600 or QFX3600-I Device Components for Shipping

> ⚠️ **CAUTION**: Do not stack device components. Return individual components in separate boxes if they do not fit together on one level in the shipping box.

To pack and ship QFX3600 or QFX3600-I device components:

- Place individual FRUs in antistatic bags.

- Ensure that the components are adequately protected with packing materials and packed so that the pieces are prevented from moving around inside the carton.

- Close the top of the cardboard shipping box and seal it with packing tape.

- Write the RMA number on the exterior of the box to ensure proper tracking.

RELATED DOCUMENTATION

Returning a QFX3600 or QFX3600-I Device or Component for Repair or Replacement

Packing a QFX3500 Device or Component for Shipping

IN THIS SECTION

- Packing a QFX3500 Device for Shipping | **650**
- Packing QFX3500 Device Components for Shipping | **650**

If you are returning a QFX3500 device or component to Juniper Networks for repair or replacement, pack the item as described in this topic.

Before you pack a QFX3500 device or component:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.

- Retrieve 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 a Return Materials Authorization for a QFX Series Device or Component*.

Ensure that you have the following parts and tools available:

- ESD grounding strap.

- Antistatic bag, one for each component.

- If you are returning the chassis, an appropriate screwdriver for the mounting screws used on your rack or cabinet.

Packing a QFX3500 Device for Shipping

To pack a QFX3500 device for shipping:

1. Power down the device and remove the power cables. See "Powering Off a QFX3500 Device" on page 435.
2. Remove the cables that connect the QFX3500 device to all external devices.
3. Remove all field-replaceable units (FRUs) from the device.
4. Have one person support the weight of the device while another person unscrews and removes the mounting screws.
5. Remove the device from the rack or cabinet (see *Chassis Lifting Guidelines for a QFX3500 Device*) and place the device in an antistatic bag.
6. Place the device in the shipping carton.
7. Place the packing foam on top of and around the device.
8. If you are returning accessories or FRUs with the device, pack them as instructed in "Packing QFX3500 Device Components for Shipping" on page 650.
9. Replace the accessory box on top of the packing foam.
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 QFX3500 Device Components for Shipping

> ⚠ **CAUTION**: Do not stack device components. Return individual components in separate boxes if they do not fit together on one level in the shipping box.

To pack and ship QFX3500 device components:

- Place individual FRUs in antistatic bags.

- Ensure that the components are adequately protected with packing materials and packed so that the pieces are prevented from moving around inside the carton.

- Close the top of the cardboard shipping box and seal it with packing tape.

- Write the RMA number on the exterior of the box to ensure proper tracking.

RELATED DOCUMENTATION

Returning a QFX3500 Device or Component for Repair or Replacement

Packing an EX4300 Switch or Component for Shipping

IN THIS SECTION

If you are returning an EX4300 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 *Contact Customer Support to Obtain Return Material Authorization*.

- 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 *Contact Customer Support to Obtain Return Material Authorization*.

- Ensure you understand how to prevent electrostatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.

This topic describes:

Packing an EX4300 Switch for Shipping

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 plug end of the power cord connected to the power source outlet.

3. Remove the cables that connect the switch to all external devices. See *Disconnect a Fiber-Optic Cable*.

4. Remove all optical transceivers installed in the switch. See *Remove a Transceiver*.

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.

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)

- 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 and place the switch on a flat, stable surface.

3. Use the screwdriver 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 EX4300 Switch Components for Shipping" on page 653.

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 EX4300 Switch Components for Shipping

Ensure that you have the following parts and tools available:

- Antistatic bag, one for each component

- ESD grounding strap

To pack the switch components, follow the instructions here.

> ⚠️ **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 EX4300 Switch or Component for Repair or Replacement

Unpacking an EX4300 Switch

Returning a QFX5110 or Component

To return a QFX5110 or component to Juniper Networks for repair or replacement:

1. Determine the serial number of the component. For instructions, see "Locating the Serial Number on a QFX5110 Device or Component" on page 623.

2. Obtain a Return Materials Authorization (RMA) number from the Juniper Technical Assistance Center (JTAC), as described in "Contacting Customer Support to Obtain a Return Materials Authorization for a QFX Series Device or Component" on page 657.

> **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 QFX5110 Device or Component for Shipping" on page 644.

For more information about return and repair policies, see the customer support page at https://www.juniper.net/support/guidelines.html.

RELATED DOCUMENTATION

QFX5110 Hardware Overview | 10

Returning a QFX5100 Device or Component for Repair or Replacement

If you need to return a QFX5100 switch or 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 a QFX5100 Device or Component*.

2. Obtain a Return Materials Authorization (RMA) number from the Juniper Technical Assistance Center (JTAC) as described in *Contacting Customer Support to Obtain a Return Materials Authorization for a QFX Series Device or Component*.

> **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 a QFX5100 Device or Component for Shipping*.

For more information about return and repair policies, see the customer support page at https://www.juniper.net/support/guidelines.html.

RELATED DOCUMENTATION

QFX5100 Device Hardware Overview

Returning a QFX3600 or QFX3600-I Device or Component for Repair or Replacement

If you need to return a QFX3600 or QFX3600-I device or 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 a QFX3600 or QFX3600-I Device or Component*.

2. Obtain a Return Materials Authorization (RMA) number from the Juniper Technical Assistance Center (JTAC) as described in *Contacting Customer Support to Obtain a Return Materials Authorization for a QFX Series Device or Component*.

> **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 a QFX3600 or QFX3600-I Device or Component for Shipping*.

For more information about return and repair policies, see the customer support page at https://www.juniper.net/support/guidelines.html.

Returning a QFX3500 Device or Component for Repair or Replacement

If you need to return a QFX3500 device or 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 a QFX3500 Device or Component*.

2. Obtain a Return Materials Authorization (RMA) number from the Juniper Technical Assistance Center (JTAC) as described in *Contacting Customer Support to Obtain a Return Materials Authorization for a QFX Series Device or Component*.

    > **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 device or component for shipping as described in *Packing a QFX3500 Device or Component for Shipping*.

For more information about return and repair policies, see the customer support page at https://www.juniper.net/support/guidelines.html.

Returning an EX4300 Switch or Component for Repair or Replacement

If you need to return an EX4300 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 EX4300 Switch or Component*.

2. Obtain an Return Materials Authorization (RMA) number from JTAC as described in *Contact Customer Support to Obtain Return Material Authorization*.

> **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 EX4300 Switch or Component for Shipping*.

For more information about return and repair policies, see the customer support page at https://www.juniper.net/support/guidelines.html .

Contacting Customer Support to Obtain a Return Materials Authorization for a QFX Series Device or Component

If you are returning a QFX Series device or component to Juniper Networks for repair or replacement, you must first obtain a Return Materials Authorization (RMA) from the Juniper Networks Technical Assistance Center (JTAC).

After locating the serial number of the device or component you want to return, open a service request with Juniper Networks Technical Assistance Center (JTAC) on the Web or by telephone.

For instructions on locating the serial number of the device or component you want to return, see the following device instructions:

- Locating the Serial Number on a QFX3008-I Interconnect Device or Component

- *Locating the Serial Number on a QFX3100 Director Device or Component*

- *Locating the Serial Number on a QFX3500 Device or Component*

- *Locating the Serial Number on a QFX3600 or QFX3600-I Device or Component*

- *Locating the Serial Number on a QFX5100 Device or Component*

- *Locating the Serial Number on a QFX5110 Device or Component*

- *Locating the Serial Number on a QFX5200 Device or Component*

- *Locating the Serial Number on a QFX10000 Switch or Component*

- *Locating the Serial Number on a QFX10002 or Component*

Before you request an RMA from JTAC, be prepared to provide the following information:

- Your existing service request 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 device 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:

- Service Request Manager: https://support.juniper.net/support/

- Telephone: +1-888-314-JTAC (+1-888-314-5822), toll-free in the USA, Canada, and Mexico

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

If you are contacting JTAC by telephone, enter your 12-digit service request 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

Returning a QFX3008-I Interconnect Device or Component for Repair or Replacement

Returning a QFX3100 Director Device or Component for Repair or Replacement

Returning a QFX3500 Device or Component for Repair or Replacement

Returning a QFX3600 or QFX3600-I Device or Component for Repair or Replacement

Returning a QFX5100 Device or Component for Repair or Replacement

Returning a QFX5110 or Component **| 654**

Returning a QFX5200 or Component for Repair or Replacement

Returning a QFX10002 or Component for Repair or Replacement

Returning a QFX10000 Switch or Component for Repair or Replacement

Contact Customer Support to Obtain a Return Material Authorization

If you need to return a device or hardware component to Juniper Networks for repair or replacement, obtain a Return Material Authorization (RMA) number from Juniper Networks Technical Assistance Center (JTAC). You must obtain an RMA number before you attempt to return the component.

After locating the serial number of the device or hardware component you want to return, open a service request with the Juniper Networks Technical Assistance Center (JTAC) on the Web or by telephone.

Before you request an RMA number from JTAC, be prepared to provide the following information:

- Your existing service request 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 device 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:

- Service Request Manager: https://support.juniper.net/support

- Telephone: +1-888-314-JTAC (+1-888-314-5822), toll free in U.S., Canada, and Mexico

> **NOTE**: For international or direct-dial options in countries without toll free numbers, see https://support.juniper.net/support.

If you are contacting JTAC by telephone, enter your 12-digit service request 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.

CHAPTER 44

Alarms and System Log Messages

IN THIS CHAPTER

Alarm Types and Severity Levels

The QFX Series switches support different alarm types and severity levels. Table 130 on page 660 provides a list of alarm terms and definitions that may help you in monitoring the device.

Table 130: Alarm Terms and Definitions

Term	Definition
Alarm	Signal that alerts you to conditions that might prevent normal operation. On the device, alarm indicators might include an LCD panel and LEDs on the device. The LCD panel (if present on the device) displays the chassis alarm message count. Blinking amber or yellow LEDs indicate yellow alarm conditions for chassis components.
Alarm condition	Failure event that triggers an alarm.

Table 130: Alarm Terms and Definitions *(Continued)*

Term	Definition
Alarm severity levels	Seriousness of the alarm. The level of severity can be either major (red) or minor (yellow). • Major (red)—Indicates a critical situation on the device that has resulted from one of the following conditions. A red alarm condition requires immediate action. • One or more hardware components have failed. • One or more hardware components have exceeded temperature thresholds. • An alarm condition configured on an interface has triggered a critical warning. • Minor (yellow or amber)—Indicates a noncritical condition on the device that, if left unchecked, might cause an interruption in service or a degradation in performance. A yellow alarm condition requires monitoring or maintenance. For example, a missing rescue configuration generates a yellow system alarm.
Alarm types	Alarms include the following types: • Chassis alarm—Predefined alarm triggered by a physical condition on the device such as a power supply failure or excessive component temperature. • Interface alarm—Alarm that you configure to alert you when an interface link is down. Applies to `ethernet`, `fibre-channel`, and `management-ethernet` interfaces. You can configure a red (major) or yellow (minor) alarm for the link-down condition, or have the condition ignored. • System alarm—Predefined alarm that might be triggered by a missing rescue configuration, failure to install a license for a licensed software feature, or high disk usage.

Chassis Alarm Messages

Chassis alarms indicate a failure on the device or one of its components. Chassis alarms are preset and cannot be modified.

Chassis alarms on QFX5100, QFX5110, QFX5210, and QFX5120 devices have two severity levels:

- Major (red)—Indicates a critical situation on the device that has resulted from one of the conditions described in Table 131 on page 662. A red alarm condition requires immediate action.

- Minor (yellow)—Indicates a noncritical condition on the device that, if left unchecked, might cause an interruption in service or degradation in performance. A yellow alarm condition requires monitoring or maintenance.

Table 131 on page 662 describes the chassis alarm messages on QFX5100, QFX5110, QFX5200, QFX5210, and QFX5120 devices.

Table 131: Chassis Alarm Messages

Component	Alarm Type	CLI Message	Recommended Action
Fans	Major (red)	`Fan Failure`	Replace the fan module and report the failure to customer support.
		`Fan I2C Failure`	Check the system log for one of the following error messages and report the message to customer support: - `CM ENV Monitor: Get fan speed failed.` - `fan-number is NOT spinning @ correct speed`, where `fan-number` can be 1, 2, 3, 4, or 5.
		`Fan fan-number Not Spinning`	Remove and check the fan module for obstructions, and then reinsert the fan module. If the problem persists, replace the fan module.

Table 131: Chassis Alarm Messages *(Continued)*

Component	Alarm Type	CLI Message	Recommended Action
	Minor (yellow)	`Fan/Blower Absent`	Check the system log for the error message *fan-number* `Absent`, where *fan-number* can be can be 1, 2, 3, 4, or 5. Install fan modules in the slots where they are absent.
Power supplies	Major (red)	`PEM` *pem-number* `Airflow not matching Chassis Airflow`	Replace the power supply with a power supply that supports the same airflow direction as supported by the chassis.
		`PEM` *pem-number* `I2C Failure`	Check the system log for one of the following error messages and report the message to customer support: • `I2C Read failed for device` *number*, where *number* where number ranges from 123 through 125. • `PS` *number*: `Transitioning from online to offline`, where power supply *number* is 1 or 2.
		`PEM` *pem-number* `is not powered`	Check the power cord connection and reconnect, if necessary.
		`PEM` *pem-number* `is not supported`	Replace the power supply with a supported power supply.
		`PEM` *pem-number* `Not OK`	Indicates a problem with the incoming AC power or outgoing DC power. Report the error to customer support.

Table 131: Chassis Alarm Messages *(Continued)*

Component	Alarm Type	CLI Message	Recommended Action
	Minor (yellow)	PEM *pem-number* Absent	Reboot the switch after removing one of the power supply. The switch can continue to operate with a single power supply. OR Replace the removed power supply and reboot the switch.
		PEM *pem-number* Power Supply Type Mismatch	Check whether there is a mix of AC and DC power supplies in the same chassis. Reboot the switch with only AC or only DC power supplies.
		PEM *pem-number* Removed	Replace the removed power supply or reboot the switch. The switch can continue to operate with a single power supply.
Temperature sensors	Major (red)	*sensor-location* Temp Sensor Fail	Check the system log for the following error message and report the message to customer support: Temp sensor *sensor-number* failed, where *sensor-number* ranges from 1 through 10.
		sensor-location Temp Sensor Too Hot	Check environmental conditions and alarms on other devices. Ensure that environmental factors (such as hot air blowing around the equipment) do not affect the temperature sensor. If the condition persists, the device might shut down.

Table 131: Chassis Alarm Messages *(Continued)*

Component	Alarm Type	CLI Message	Recommended Action
	Minor (yellow)	*sensor-location* `Temp Sensor Too Warm`	Check environmental conditions and alarms on other devices. Ensure that environmental factors (such as hot air blowing around the equipment) do not affect the temperature sensor.
Routing Engine	Minor (yellow)	`RE` *RE number* `/var partition usage is high`	Clean up the system file storage space on the switch. For more information, see *Cleaning Up the System File Storage Space*.
	Major (red)	`RE` *RE number* `/var partition is full`	Clean up the system file storage space on the switch. For more information, see *Cleaning Up the System File Storage Space*.
	Minor (yellow)	`Rescue configuration is not set`	Use the **request system configuration rescue save** command to set the rescue configuration. For more information, see *Setting or Deleting the Rescue Configuration*.
		Feature `usage requires a license` or `License for` *feature* `expired`	Install the required license for the feature specified in the alarm. For more information, see *Software Features That Require Licenses on the QFX Series*.

Table 131: Chassis Alarm Messages *(Continued)*

Component	Alarm Type	CLI Message	Recommended Action
Management Ethernet interface	Major (red)	`Management Ethernet 1 Link Down`	Check whether a cable is connected to the management Ethernet interface, or whether the cable is defective. Replace the cable, if required. On models that have both em0 and em1 management interfaces available, you must connect both interfaces. If both interfaces are not connected, the alarm is raised. However, the alarm has no service impact. If you are unable to resolve the problem, open a support case by using the Case Manager link at https://www.juniper.net/support/ or call 1-888-314-5822 (tollfree, US or 1-408-745-9500 (from outside the United States).

Chassis Alarm Messages on a QFX3600 or QFX3600-I Device

Chassis alarms indicate a failure on the device or one of its components. Chassis alarms are preset and cannot be modified.

The chassis alarm message count is displayed on the LCD panel on the front of the device. To view the chassis alarm message text remotely, use the `show chassis lcd` CLI command.

Chassis alarms on QFX3600 and QFX3600-I devices have two severity levels:

- Major (red)—Indicates a critical situation on the device that has resulted from one of the conditions described in . A red alarm condition requires immediate action.

- Minor (yellow or amber)—Indicates a noncritical condition on the device that, if left unchecked, might cause an interruption in service or degradation in performance. A yellow alarm condition requires monitoring or maintenance.

Table 132 on page 667 describes the chassis alarm messages on QFX3600 and QFX3600-I devices.

Table 132: QFX3600 and QFX3600-I Chassis Alarm Messages

Component	Alarm Type	CLI Message	Recommended Action
Fans	Major (red)	**Fan Failure**	Replace the fan and report the failure to customer support.
		Fan I2C Failure	Check the system log for one of the following messages and report the error message to customer support: • **CM ENV Monitor: Get fan speed failed**. • *Fan-number* **is NOT spinning @ correct speed**, where *fan-number* may be 1, 2, or 3.
		Fan *fan-number* **Not Spinning**	Remove and check the fan for obstructions, and then reinsert the fan. If the problem persists, replace the fan.
	Minor (yellow)	**Fan/Blower Absent**	The fan is missing. Install a fan.
Power supplies	Major (red)	**PEM** *pem-number* **Airflow not matching Chassis Airflow**	The power supply airflow direction is the opposite of the chassis airflow direction. Replace the power supply with a power supply that supports the same airflow direction as the chassis.

Table 132: QFX3600 and QFX3600-I Chassis Alarm Messages *(Continued)*

Component	Alarm Type	CLI Message	Recommended Action
		PEM *pem-number* I2C Failure	Check the system log for one of the following messages and report the error message to customer support: • **I2C Read failed for device** *number*, where *number* may be from 123 to 125. • **PS** *number*: **Transitioning from online to offline**, where power supply (PS) *number* may be 1 or 2.
		PEM *pem-number* is not powered	For information only. Check the power cord connection and reconnect it if necessary.
		PEM *pem-number* is not supported	Indicates a power supply problem, or the power supply is not supported on the device. Report the problem to customer support.
		PEM *pem-number* Not OK	Indicates a problem with the incoming AC or outgoing DC power. Replace the power supply.
	Minor (yellow)	PEM *pem-number* Absent	For information only. Indicates the device was powered on with two power supplies installed, but now one is missing. The device can continue to operate with a single power supply. If you wish to remove this alarm message, reboot the device with one power supply.

Table 132: QFX3600 and QFX3600-I Chassis Alarm Messages *(Continued)*

Component	Alarm Type	CLI Message	Recommended Action
		PEM *pem-number* **Power Supply Type Mismatch**	For information only. Indicates that an AC power supply and DC power supply have been installed in the same chassis. If you wish to remove this alarm message, reboot the device with two AC power supplies or two DC power supplies.
		PEM *pem-number* **Removed**	For information only. Indicates the device was powered on with two power supplies installed, but one has been removed. The device can continue to operate with a single power supply. If you wish to remove this alarm message, reboot the device with one power supply.
Temperature sensors	Major (red)	*sensor-location* **Temp Sensor Fail**	Check the system log for the following message and report it to customer support: **Temp sensor** *sensor-number* **failed**, where *sensor-number* may range from 1 through 10.
		sensor-location **Temp Sensor Too Hot**	Check environmental conditions and alarms on other devices. Ensure that environmental factors (such as hot air blowing around the equipment) are not affecting the temperature sensor. If the condition persists, the device may shut down.

Table 132: QFX3600 and QFX3600-I Chassis Alarm Messages *(Continued)*

Component	Alarm Type	CLI Message	Recommended Action
	Minor (yellow)	*sensor-location* Temp Sensor Too Warm	For information only. Check environmental conditions and alarms on other devices. Ensure that environmental factors (such as hot air blowing around the equipment) are not affecting the temperature sensor.

Chassis Status LEDs in the QFX3600 and QFX3600-I Device

Configuring Junos OS to Determine Conditions That Trigger Alarms on Different Interface Types

alarm

Chassis Alarm Messages on a QFX3500 Device

Chassis alarms indicate a failure on the device or one of its components. Chassis alarms are preset and cannot be modified.

The chassis alarm message count is displayed on the LCD panel on the front of the device. To view the chassis alarm message text remotely, use the `show chassis lcd` CLI command.

Chassis alarms on QFX3500 devices have two severity levels:

- Major (red)—Indicates a critical situation on the device that has resulted from one of the conditions described in Table 133 on page 671. A red alarm condition requires immediate action.

- Minor (yellow or amber)—Indicates a noncritical condition on the device that, if left unchecked, might cause an interruption in service or degradation in performance. A yellow alarm condition requires monitoring or maintenance.

Table 133 on page 671 describes the chassis alarm messages on QFX3500 devices.

Table 133: QFX3500 Chassis Alarm Messages

Component	Alarm Type	CLI Message	Recommended Action
Fans	Major (red)	`Fan/Blower Absent`	The fan is missing. Install a fan.
		`Fan Failure`	Replace the fan and report the failure to customer support.
		`Fan I2C Failure`	Check the system log for one of the following messages and report the error message to customer support: • `CM ENV Monitor: Get fan speed failed.` • `CM ENV Monitor: Get fan speed failed` *Fan-number* `is NOT spinning @ correct speed`, where *fan-number* may be 1, 2, or 3.
		fan-number `Not Spinning` Fan	Remove and check the fan for obstructions, and then reinsert the fan. If the problem persists, replace the fan.
Power Supplies	Major (red)	`PEM` *pem-number* `Airflow not matching Chassis Airflow`	The power supply airflow direction is the opposite of the chassis airflow direction. Replace the power supply with a power supply that supports the same airflow direction as the chassis.

Table 133: QFX3500 Chassis Alarm Messages *(Continued)*

Component	Alarm Type	CLI Message	Recommended Action
		PEM *pem-number* I2C Failure	Check the system log for one of the following messages and report the error message to customer support: • I2C Read failed for device *number*, where *number* may be from 123 to 125. • PS *number*: Transitioning from online to offline, where power supply (PS) *number* may be 1 or 2.
		PEM *pem-number* is not supported	Indicates a power supply problem, or the power supply is not supported on the device. Report the problem to customer support.
		PEM *pem-number* Not OK	Indicates a problem with the incoming AC or outgoing DC power. Replace the power supply.
	Minor (yellow)	PEM *pem-number* Absent	For information only. Indicates the device was powered on with two power supplies installed, but now one is missing. The device can continue to operate with a single power supply. If you wish to remove this alarm message, reboot the device with one power supply.
		PEM *pem-number* is not powered	For information only. Check the power cord connection and reconnect it if necessary.

Table 133: QFX3500 Chassis Alarm Messages *(Continued)*

Component	Alarm Type	CLI Message	Recommended Action
		PEM *pem-number* Power Supply Type Mismatch	For information only. Indicates that an AC power supply and DC power supply have been installed in the same chassis. If you wish to remove this alarm message, reboot the device with two AC power supplies or two DC power supplies.
		PEM *pem-number* Removed	For information only. Indicates the device was powered on with two power supplies installed, but one has been removed. The device can continue to operate with a single power supply. If you wish to remove this alarm message, reboot the device with one power supply.
Temperature Sensors	Major (red)	*sensor-location* Temp Sensor Fail	Check the system log for the following message and report it to customer support: Temp sensor *sensor-number* failed, where *sensor-number* may range from 1 through 10.
		sensor-location Temp Sensor Too Hot	Check environmental conditions and alarms on other devices. Ensure that environmental factors (such as hot air blowing around the equipment) are not affecting the temperature sensor. If the condition persists, the device may shut down.

Table 133: QFX3500 Chassis Alarm Messages *(Continued)*

Component	Alarm Type	CLI Message	Recommended Action
	Minor (yellow)	*sensor-location* Temp Sensor Too Warm	For information only. Check environmental conditions and alarms on other devices. Ensure that environmental factors (such as hot air blowing around the equipment) are not affecting the temperature sensor.

RELATED DOCUMENTATION

Front Panel of a QFX3500 Device

Configuring Junos OS to Determine Conditions That Trigger Alarms on Different Interface Types

alarm

Interface Alarm Messages

Interface alarms are alarms that you configure to alert you when an interface is down.

To configure an interface link-down condition to trigger a red or yellow alarm, or to configure the link-down condition to be ignored, use the `alarm` statement at the [`edit chassis`] hierarchy level. You can specify the `ethernet`, `fibre-channel`, or `management-ethernet` interface type.

> **NOTE**: Fibre Channel alarms are valid only on QFX3500 devices.

> **NOTE**: When red alarms or major alarms are issued on QFX5100 or EX4600 switches, the alarm LED glows amber instead of red.

By default, major alarms are configured for interface link-down conditions on the control plane and management network interfaces in a QFabric system. The link-down alarms indicate that connectivity to the control plane network is down. You can configure these alarms to be ignored using the `alarm` statement at the [`edit chassis`] hierarchy level.

> **NOTE**: If you configure a yellow alarm on the QFX3008-I Interconnect device, it is handled as a red alarm.

Understand Alarm Types and Severity Levels on EX Series Switches

> **NOTE**: This topic applies only to the J-Web Application package.

Alarms alert you to conditions that might prevent normal operation of the switch. Before monitoring alarms on a Juniper Networks EX Series Ethernet switch, become familiar with the terms defined in .

Table 134: Alarm Terms

Term	Definition
alarm	Signal alerting you to conditions that might prevent normal operation. On a switch, the alarm signal is the **ALM** LED lit on the front of the chassis.
alarm condition	Failure event that triggers an alarm.
alarm severity	Seriousness of the alarm. If the Alarm (**ALM**) LED is red, this indicates a major alarm. If the Alarm LED is yellow or amber, this indicates a minor alarm. If the Alarm LED is unlit, there is no alarm or the switch is halted.
chassis alarm	Preset alarm triggered by a physical condition on the switch such as a power supply failure, excessive component temperature, or media failure.
system alarm	Preset alarm triggered by a missing rescue configuration or failure to install a license for a licensed software feature. **NOTE**: On EX6200 switches, a system alarm can be triggered by an internal link error.

Alarm Types

The switch supports these alarms:

- Chassis alarms indicate a failure on the switch or one of its components. Chassis alarms are preset and cannot be modified.

- System alarms indicate a missing rescue configuration. System alarms are preset and cannot be modified, although you can configure them to appear automatically in the J-Web interface display or the CLI display.

Alarm Severity Levels

Alarms on switches have two severity levels:

- Major (red)—Indicates a critical situation on the switch that has resulted from one of the following conditions. A red alarm condition requires immediate action.

  - One or more hardware components have failed.

  - One or more hardware components have exceeded temperature thresholds.

  - An alarm condition configured on an interface has triggered a critical warning.

- Minor (yellow or amber)—Indicates a noncritical condition on the switch that, if left unchecked, might cause an interruption in service or degradation in performance. A yellow or amber alarm condition requires monitoring or maintenance.

  A missing rescue configuration generates a yellow or amber system alarm.

RELATED DOCUMENTATION

Dashboard for EX Series Switches

Check Active Alarms with the J-Web Interface

IN THIS SECTION

Purpose

Use the monitoring functionality to view alarm information for the EX Series switches including alarm type, alarm severity, and a brief description for each active alarm on the switching platform.

Action

To view the active alarms:

1. Select **Monitor** > **Events and Alarms** > **View Alarms** in the J-Web interface.

2. Select an alarm filter based on alarm type, severity, description, and date range.

3. Click **Go**.

   All the alarms matching the filter are displayed.

Meaning

Table 135 on page 677 lists the alarm output fields.

Table 135: Summary of Key Alarm Output Fields

Field	Values
Type	Category of the alarm: • Chassis—Indicates an alarm condition on the chassis (typically an environmental alarm such as one related to temperature). • System—Indicates an alarm condition in the system.
Severity	Alarm severity—either major (red) or minor (yellow or amber).

Table 135: Summary of Key Alarm Output Fields *(Continued)*

Field	Values
Description	Brief synopsis of the alarm.
Time	Date and time when the failure was detected.

Monitor System Log Messages

Dashboard for EX Series Switches

Understand Alarm Types and Severity Levels on EX Series Switches

Monitor System Log Messages

IN THIS SECTION

● Purpose | **678**

● Action | **678**

● Meaning | **682**

Purpose

NOTE: This topic applies only to the J-Web Application package.

Use the monitoring functionality to filter and view system log messages for EX Series switches.

Action

To view events in the J-Web interface, select **Monitor** > **Events and Alarms** > **View Events**.

Apply a filter or a combination of filters to view messages. You can use filters to display relevant events. Table 136 on page 679 describes the different filters, their functions, and the associated actions.

To view events in the CLI, enter the following command:

`show log`

Table 136: Filtering System Log Messages

Field	Function	Your Action
System Log File	Specifies the name of a system log file for which you want to display the recorded events. Lists the names of all the system log files that you configure. By default, a log file, `messages`, is included in the `/var/log/` directory.	To specify events recorded in a particular file, select the system log filename from the list— for example, **messages**. Select **Include archived files** to include archived files in the search.
Process	Specifies the name of the process generating the events you want to display. To view all the processes running on your system, enter the CLI command `show system processes`. For more information about processes, see the *Junos OS Installation and Upgrade Guide*.	To specify events generated by a process, type the name of the process. For example, type `mgd` to list all messages generated by the management process.
Date From To	Specifies the time period in which the events you want displayed are generated. Displays a calendar that allows you to select the year, month, day, and time. It also allows you to select the local time. By default, the messages generated during the last one hour are displayed. End Time shows the current time and Start Time shows the time one hour before End Time.	To specify the time period: • Click the **Calendar** icon and select the year, month, and date— for example, **02/10/2007**. • Click the **Calendar** icon and select the year, month, and date— for example, **02/10/2007**. • Click to select the time in hours, minutes, and seconds.

Table 136: Filtering System Log Messages *(Continued)*

Field	Function	Your Action
Event ID	Specifies the event ID for which you want to display the messages. Allows you to type part of the ID and completes the remainder automatically. An event ID, also known as a system log message code, uniquely identifies a system log message. It begins with a prefix that indicates the generating software process or library.	To specify events with a specific ID, type the partial or complete ID— for example, **TFTPD_AF_ERR**.
Description	Specifies text from the description of events that you want to display. Allows you to use regular expressions to match text from the event description. **NOTE**: Regular expression matching is case-sensitive.	To specify events with a specific description, type a text string from the description with regular expression. For example, type **^Initial*** to display all messages with lines beginning with the term *Initial*.
Search	Applies the specified filter and displays the matching messages.	To apply the filter and display messages, click **Search**.
Reset	Resets all the fields in the Events Filter box.	To reset the field values that are listed in the Events Filter box, click **Reset**.

Table 136: Filtering System Log Messages *(Continued)*

Field	Function	Your Action
Generate Raw Report **NOTE**: ● Starting in Junos OS Release 14.1X53, a Raw Report can be generated from the log messages being loaded in the Events Detail table. The Generate Raw Report button is enabled after the event log messages start loading in the Events Detail table. ● After the log messages are completely loaded in the Events Detail table, Generate Raw Report changes to Generate Report.	Generates a list of event log messages in nontabular format.	To generate a raw report: 1. Click **Generate Raw Report**. The *Opening filteredEvents.html* window appears. 2. Select **Open with** to open the HTML file or select **Save File** to save the file. 3. Click **OK**.

Table 136: Filtering System Log Messages *(Continued)*

Field	Function	Your Action
Generate Report **NOTE**: Starting in Junos OS Release 14.1X53, a Formatted Report can be generated from event log messages being loaded in an Events Detail table. The Generate Report button appears only after event log messages are completely loaded in the Events Detail table. The Generate Raw Report button is displayed while event log messages are being loaded.	Generates a list of event log messages in tabular format, which shows system details, events filter criteria, and event details.	To generate a formatted report: 1. Click **Generate Report**. The *Opening Report.html* window appears. 2. Select **Open with** to open the HTML file or select **Save File** to save the file. 3. Click **OK**.

Meaning

describes the Event Summary fields.

> **NOTE**: By default, the View Events page in the J-Web interface displays the most recent 25 events, with severity levels highlighted in different colors. After you specify the filters, Event Summary displays the events matching the specified filters. Click the **First**, **Next**, **Prev**, and **Last** links to navigate through messages.

Table 137: Viewing System Log Messages

Field	Function	Additional Information
Process	Displays the name and ID of the process that generated the system log message.	The information displayed in this field is different for messages generated on the local Routing Engine than for messages generated on another Routing Engine (on a system with two Routing Engines installed and operational). Messages from the other Routing Engine also include the identifiers **re0** and **re1** that identify the Routing Engine.
Severity	Severity level of a message is indicated by different colors. • **Unknown**—Gray—Indicates no severity level is specified. • **Debug/Info/Notice**—Green—Indicates conditions that are not errors but are of interest or might warrant special handling. • **Warning**—Yellow or Amber—Indicates conditions that warrant monitoring. • **Error**—Blue—Indicates standard error conditions that generally have less serious consequences than errors in the emergency, alert, and critical levels. • **Critical**—Pink—Indicates critical conditions, such as hard-drive errors. • **Alert**—Orange—Indicates conditions that require immediate correction, such as a corrupted system database. • **Emergency**—Red—Indicates system panic or other conditions that cause the switch to stop functioning.	A severity level indicates how seriously the triggering event affects switch functions. When you configure a location for logging a facility, you also specify a severity level for the facility. Only messages from the facility that are rated at that level or higher are logged to the specified file.

Table 137: Viewing System Log Messages *(Continued)*

Field	Function	Additional Information
Event ID	Displays a code that uniquely identifies the message. The prefix on each code identifies the message source, and the rest of the code indicates the specific event or error.	The event ID begins with a prefix that indicates the generating software process. Some processes on a switch do not use codes. This field might be blank in a message generated from such a process. An event can belong to one of the following type categories: • **Error**—Indicates an error or failure condition that might require corrective action. • **Event**—Indicates a condition or occurrence that does not generally require corrective action.
Event Description	Displays a more detailed explanation of the message.	
Time	Displays the time at which the message was logged.	

Change History Table

Feature support is determined by the platform and release you are using. Use Feature Explorer to determine if a feature is supported on your platform.

Release	Description
14.1X53	Starting in Junos OS Release 14.1X53, a Raw Report can be generated from the log messages being loaded in the Events Detail table.
14.1X53	Starting in Junos OS Release 14.1X53, a Formatted Report can be generated from event log messages being loaded in an Events Detail table.

RELATED DOCUMENTATION

Check Active Alarms with the J-Web Interface

Understand Alarm Types and Severity Levels on EX Series Switches