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# NFX150 Network Services Platform Hardware Guide



Modified: 2018-05-03

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## Documentation and Release Notes

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To obtain the most current version of all Juniper Networks<sup>®</sup> technical documentation, see the product documentation page on the Juniper Networks website at <https://www.juniper.net/documentation/>.

If the information in the latest release notes differs from the information in the documentation, follow the product Release Notes.

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## Supported Platforms

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For the features described in this document, the following platforms are supported:

- NFX150

## Documentation Conventions

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

Table 1: Notice Icons







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

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

Table 2: Text and Syntax Conventions

Convention	Description	Examples
<b>Bold text like this</b>	Represents text that you type.	To enter configuration mode, type the <b>configure</b> command:  user@host> <b>configure</b>
Fixed-width text like this	Represents output that appears on the terminal screen.	user@host> <b>show chassis alarms</b>  No alarms currently active
<i>Italic text like this</i>	<ul style="list-style-type: none"> <li>Introduces or emphasizes important new terms.</li> <li>Identifies guide names.</li> <li>Identifies RFC and Internet draft titles.</li> </ul>	<ul style="list-style-type: none"> <li>A policy <i>term</i> is a named structure that defines match conditions and actions.</li> <li><i>Junos OS CLI User Guide</i></li> <li>RFC 1997, <i>BGP Communities Attribute</i></li> </ul>
<i>Italic text like this</i>	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name:  [edit] root@# <b>set system domain-name</b> <i>domain-name</i>

Table 2: Text and Syntax Conventions (continued)

Convention	Description	Examples
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	<ul style="list-style-type: none"> <li>To configure a stub area, include the <b>stub</b> statement at the <code>[edit protocols ospf area area-id]</code> hierarchy level.</li> <li>The console port is labeled <b>CONSOLE</b>.</li> </ul>
< > (angle brackets)	Encloses optional keywords or variables.	<b>stub</b> <default-metric <i>metric</i> >;
(pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	<b>broadcast   multicast</b> <i>(string1   string2   string3)</i>
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	<b>rsvp { # Required for dynamic MPLS only</b>
[ ] (square brackets)	Encloses a variable for which you can substitute one or more values.	<b>community name members [community-ids]</b>
Indentation and braces ( { } )	Identifies a level in the configuration hierarchy.	<code>[edit] routing-options {   static {     route default {       nexthop <i>address</i>;       retain;     }   } }</code>
;(semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
<b>GUI Conventions</b>		
<b>Bold text like this</b>	Represents graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none"> <li>In the Logical Interfaces box, select <b>All Interfaces</b>.</li> <li>To cancel the configuration, click <b>Cancel</b>.</li> </ul>
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select <b>Protocols&gt;Ospf</b> .

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- Product warranties—For product warranty information, visit <https://www.juniper.net/support/warranty/>.
- JTAC hours of operation—The JTAC centers have resources available 24 hours a day, 7 days a week, 365 days a year.

## Self-Help Online Tools and Resources

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

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

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

## Opening a Case with JTAC

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

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



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



## CHAPTER 1

# Overview

- [NFX150 Device Hardware Overview on page 19](#)
- [NFX150 Chassis on page 24](#)
- [NFX150 Interface Modules on page 27](#)
- [LED Details of an NFX150 Device on page 33](#)
- [Cooling System and Airflow in an NFX150 Device on page 37](#)
- [NFX150 Power System on page 37](#)

## NFX150 Device Hardware Overview

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The Juniper Networks NFX150 Network Services Platform is a secure, automated, software-driven customer premises equipment (CPE) platform that delivers virtualized network and security services on demand. Leveraging Network Functions Virtualization (NFV) and built on the Juniper Cloud CPE solution, NFX150 enables service providers to deploy and chain multiple, secure, high-performance virtualized network functions (VNFs) on a single device.

The NFX150 is suited for small to medium-sized enterprises. With key security features and NFV, the NFX150 can be used in secure SD-WAN and secure router deployments.

This topic covers:

- [NFX150 Hardware on page 19](#)
- [System Software on page 20](#)
- [Junos OS Releases Supported on NFX Series Hardware on page 20](#)
- [NFX150 Device Models on page 20](#)
- [Benefits and Uses of NFX150 on page 24](#)

## NFX150 Hardware

The NFX150 portfolio consists of a compact desktop model and a rack-mount model. Both the models are available with or without LTE support.

The NFX150 device has four 1-GbE RJ-45 ports which can be used as either access ports or as uplinks, two SFP ports, two SFP+ ports, and one management port. The NFX150 device has a 1 U form factor and comes with built-in fans and power supply.

The NFX150 device can be used as:

- An integrated branch router and switch, extensible with VNFs.
- A CPE for service providers.
- A secure router for distributed enterprises.

## System Software

The NFX150 architecture integrates routing, switching, and security functions on a single platform that optimizes the usage of system resources. The architecture enables unified management of all the components through a single CLI. Key components in the NFX150 software include the Junos Control Plane (JCP), Juniper Device Manager (JDM), Layer 2 dataplane, Layer 3 dataplane, and Virtual Network Functions (VNFs). The JCP is the Junos virtual machine (VM) running on the host OS, Wind River Linux. The JCP functions as the single point of management for all the components. The JCP CLI is displayed when you log in to the NFX150 device.

## Junos OS Releases Supported on NFX Series Hardware

The following table provides details of Junos OS software releases supported on the NFX Series platforms:

NFX Series Platform	Supported Junos OS Release	Software Package	Software Downloads Page
NFX150	18.1R1 or later	nfx-3  (jinstall-host-nfx-3-x86-64-<release-number>-secure-signed.tgz)	<a href="#">NFX150 Software Download Page</a>
NFX250	15.1X53-D45, 15.1X53-D47, and 15.1X53-D470  17.2R1 or later	nfx-2  (jinstall-host-nfx-2-flex-x86-64-<release-number>-secure-signed.tgz)	<a href="#">NFX250 Software Download Page</a>

## NFX150 Device Models

The NFX150 device is available in five compact models and two rack mount models, with or without LTE support. All models are shipped with built-in AC power supply and have airflow-out (front-to-back) cooling.

The NFX150 is available in seven models. [Table 3 on page 20](#) lists the NFX150-C models and [Table 4 on page 21](#) lists the NFX150-S1 models.

**Table 3: NFX150-C (Compact Models)**

	NFX150-C-S1	NFX150-C-S1-AE	NFX150-C-S1-AA	NFX150-C-S1E-AE	NFX150-C-S1E-AA
CPU	2.2-GHz 4-core Intel CPU	2.2-GHz 4-core Intel CPU	2.2-GHz 4-core Intel CPU	2.2-GHz 4-core Intel CPU	2.2-GHz 4-core Intel CPU

Table 3: NFX150-C (Compact Models) (continued)

	NFX150-C-S1	NFX150-C-S1-AE	NFX150-C-S1-AA	NFX150-C-S1E-AE	NFX150-C-S1E-AA
RAM	8 GB	8 GB	8 GB	16 GB	16 GB
Storage	100 GB SSD	100 GB SSD	100 GB SSD	100 GB SSD	100 GB SSD
Form Factor	Desktop	Desktop	Desktop	Desktop	Desktop
Ports	Four 10/100/1000BASE-T RJ-45 ports which can be used as either access ports or uplinks	Four 10/100/1000BASE-T RJ-45 ports which can be used as either access ports or uplinks	Four 10/100/1000BASE-T RJ-45 ports which can be used as either access ports or uplinks	Four 10/100/1000BASE-T RJ-45 ports which can be used as either access ports or uplinks	Four 10/100/1000BASE-T RJ-45 ports which can be used as either access ports or uplinks
	Two 1-Gigabit Ethernet /10-Gigabit Ethernet SFP+ ports	Two 1-Gigabit Ethernet /10-Gigabit Ethernet SFP+ ports	Two 1-Gigabit Ethernet /10-Gigabit Ethernet SFP+ ports	Two 1-Gigabit Ethernet /10-Gigabit Ethernet SFP+ ports	Two 1-Gigabit Ethernet /10-Gigabit Ethernet SFP+ ports
	One 10/100/1000BASE-T RJ-45 management port	One 10/100/1000BASE-T RJ-45 management port	One 10/100/1000BASE-T RJ-45 management port	One 10/100/1000BASE-T RJ-45 management port	One 10/100/1000BASE-T RJ-45 management port
	Console ports (RJ-45 and mini-USB)	Console ports (RJ-45 and mini-USB)	Console ports (RJ-45 and mini-USB)	Console ports (RJ-45 and mini-USB)	Console ports (RJ-45 and mini-USB)
	One USB 3.0 port	One USB 3.0 port	One USB 3.0 port	One USB 3.0 port	One USB 3.0 port
Expansion module support	No	No	No	No	No
LTE support	No	Yes (integrated LTE modem for Europe and North America)	Yes (integrated LTE modem for Asia, Australia, and New Zealand)	Yes (integrated LTE modem for Europe and North America)	Yes (integrated LTE modem for Asia, Australia, and New Zealand)

Table 4: NFX150-S1 Models

	NFX150-S1	NFX150-S1E
CPU	2.2 GHz 8-core Intel CPU	2.2 GHz 8-core Intel CPU
RAM	16 GB	32 GB

Table 4: NFX150-S1 Models (continued)

	NFX150-S1	NFX150-S1E
Storage	200 GB SSD	200 GB SSD
Form Factor	1 RU	1 RU
Ports	Four 10/100/ 1000BASE-T RJ-45 ports which can be used as either access ports or uplinks	Four 10/100/ 1000BASE-T RJ-45 ports which can be used as either access ports or uplinks
	Two 1-Gigabit Ethernet/10-Gigabit Ethernet SFP+ ports	Two 1-Gigabit Ethernet/10-Gigabit Ethernet SFP+ ports
	One 10/100/ 1000BASE-T RJ-45 management port	One 10/100/1000BASE-T RJ-45 management port
	Console ports (RJ-45 and mini-USB)	Console ports (RJ-45 and mini-USB)
	One USB 3.0 port	One USB 3.0 port
LTE support	Yes (LTE expansion module)	Yes (LTE expansion module)
Expansion module support	Yes	Yes
Supported expansion modules	<ul style="list-style-type: none"> <li>NFX-EM-6T2SFP— Expansion module with six 1-Gigabit Ethernet RJ-45 ports and two 1-Gigabit Ethernet SFP ports</li> <li>NFX-LTE-AE—Expansion module with an LTE modem supporting the frequency bands in Europe and North America.</li> <li>NFX-LTE-AA—Expansion module with an LTE modem supporting the frequency bands in Asia, Australia, and New Zealand.</li> </ul>	<ul style="list-style-type: none"> <li>NFX-EM-6T2SFP— Expansion module with six 1-Gigabit Ethernet RJ-45 ports and two 1-Gigabit Ethernet SFP ports</li> <li>NFX-LTE-AE—Expansion module with an LTE modem supporting the frequency bands in Europe and North America.</li> <li>NFX-LTE-AA—Expansion module with an LTE modem supporting the frequency bands in Asia, Australia, and New Zealand.</li> </ul>

**NOTE:** You can install only one expansion module on the NFX150-S1 devices. The expansion module must be installed in the first slot, which is next to the chassis LEDs.

Figure 1 on page 22 shows the NFX150-C-S1, which is the compact model without an LTE support.

Figure 1: NFX150-C-S1

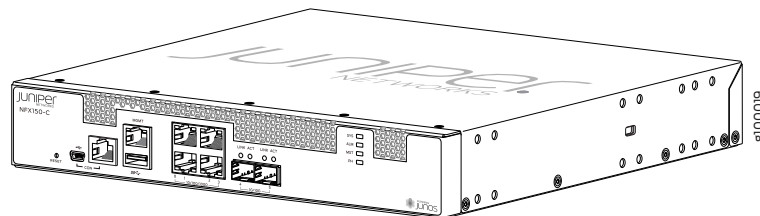


Figure 2 on page 23 shows the NFX150-C-S1-AA and NFX150-C-S1-AE devices. NFX150-C-S1-AA is a compact model with integrated LTE modem for Asia, Australia, and New Zealand. NFX150-C-S1-AE is a compact model with integrated LTE modem for Europe and North America.

Figure 2: NFX150-C-S1 with integrated LTE modem

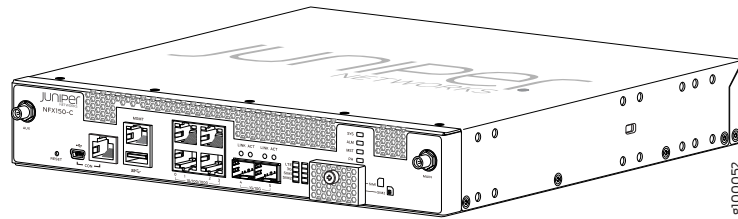


Figure 3 on page 23 shows the NFX150-S1, which is the rack-mount model.

Figure 3: NFX150-S1

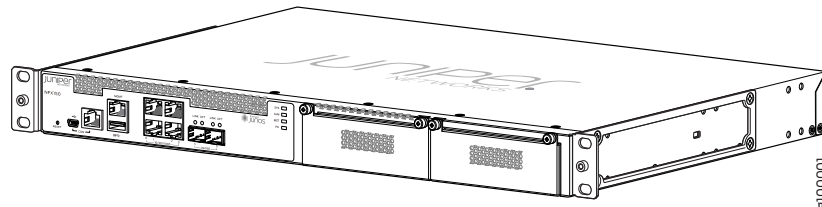
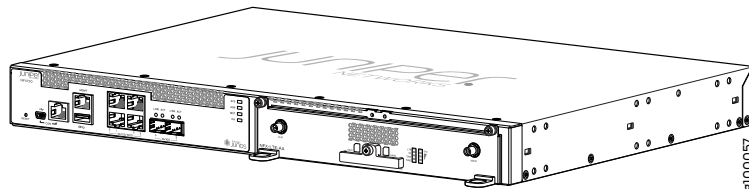


Figure 4 on page 23 shows the NFX150-S1 device with the LTE expansion module (NFX-LTE-AE and NFX-LTE-AA).

Figure 4: NFX150-S1 with the LTE expansion module



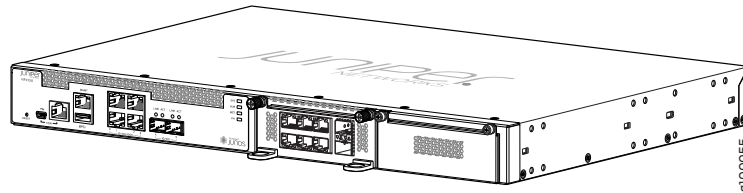
The LTE expansion module supports the following wireless standards:

- FCC Part 2
- FCC Part 22
- FCC Part 24, Part 27 and Part 90
- RSS 129 and RSS 133, RSS 130, RSS 199, and RSS 139
- RSS 132 and RSS 133
- EN 301 511 GSM
- EN 301 908-1
- EN 301 908-2
- The Certification and Engineering Bureau of Industry Canada (IC)
- Radio Equipment (RE) Directive of the European Union

- GCF
- CTIA-PTCRB

Figure 5 on page 24 shows the NFX150-S1 device with the NFX-EM-6T2SFP expansion module.

Figure 5: NFX150-S1 with the NFX-EM-6T2SFP expansion module



## Benefits and Uses of NFX150

The NFX150 Network Services Platform provides these benefits:

- Highly scalable, supporting multiple Juniper and third-party VNFs on a single device. The modular software architecture provides high performance and scalability for routing, switching, and security enhanced by carrier-class reliability.
- Integrated security, routing, and switching functionality in a single control plane simplifies management and deployment.
- Supports a variety of flexible deployments. A distributed services deployment model ensures high availability, performance, and compliance. The NFX150 provides an open framework that supports industry standards, protocols, and seamless API integration.
- In addition to Ethernet connections, Wireless WAN support through the LTE expansion module provides more flexibility in deployments.
- Supports advanced security features such as IPsec connectivity, applications detection, and filtering for malicious traffic.
- The Secure Boot feature safeguards device credentials, automatically authenticates system integrity, verifies system configuration, and enhances overall platform security.
- Automated configuration eliminates complex device setup and delivers a plug-and-play experience.

## NFX150 Chassis

- [Chassis Physical Specifications for an NFX150 Device on page 25](#)
- [Front Panel of an NFX150 Device on page 25](#)
- [Rear Panel of an NFX150 Device on page 26](#)



## Chassis Physical Specifications for an NFX150 Device

The NFX150 device chassis is a rigid sheet-metal structure that houses the hardware components. [Table 5 on page 25](#) summarizes the physical specifications of the NFX150 chassis.

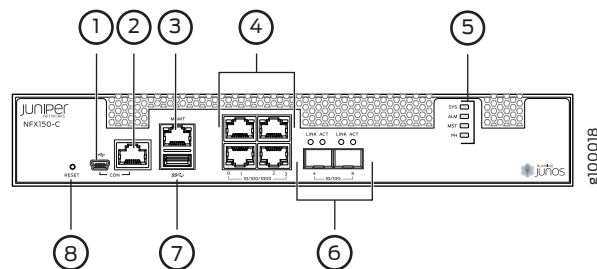
**Table 5: Physical Specifications for the NFX150 Device Chassis**

Product SKU	Height	Width	Depth	Weight
NFX150-C-S1	1.72 in. (4.37 cm)	10.66 in. (27.1 cm)	10.5 in. (26.67 cm)	8.6 lb (3.9 kg)
NFX150-C-S1-AA	1.72 in. (4.37 cm)	10.66 in. (27.1 cm)	10.5 in. (26.67 cm)	8.6 lb (3.9 kg)
NFX150-C-S1-AE	1.72 in. (4.37 cm)	10.66 in. (27.1 cm)	10.5 in. (26.67 cm)	8.6 lb (3.9 kg)
NFX150-C-S1E-AA	1.72 in. (4.37 cm)	10.66 in. (27.1 cm)	10.5 in. (26.67 cm)	8.6 lb (3.9 kg)
NFX150-C-S1E-AE	1.72 in. (4.37 cm)	10.66 in. (27.1 cm)	10.5 in. (26.67 cm)	8.6 lb (3.9 kg)
NFX150-S1	1.72 in. (4.37 cm)	17.36 in. (44.1 cm)	12 in. (30.5 cm)	11.68 lb (5.3 kg)
NFX150-S1E	1.72 in. (4.37 cm)	17.36 in. (44.1 cm)	12 in. (30.5 cm)	11.68 lb (5.3 kg)

## Front Panel of an NFX150 Device

[Figure 6 on page 25](#) shows the front panel components of an NFX150-C-S1 device.

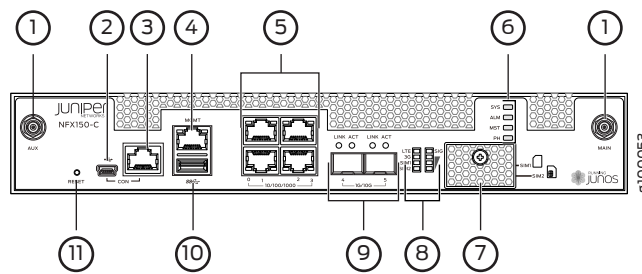
**Figure 6: Front Panel Components of NFX150-C-S1**



1—Mini-USB console port	5—System status LEDs
2—RJ-45 console port	6—Two 1-Gigabit Ethernet/10-Gigabit Ethernet SFP+ WAN ports
3—One 10/100/1000BASE-T RJ-45 management port	7—USB 3.0 port
4—Four 10/100/1000BASE-T RJ-45 LAN ports	8—Reset button

[Figure 7 on page 26](#) shows the front panel components of NFX150-C-S1-AA and NFX150-C-S1-AE devices.

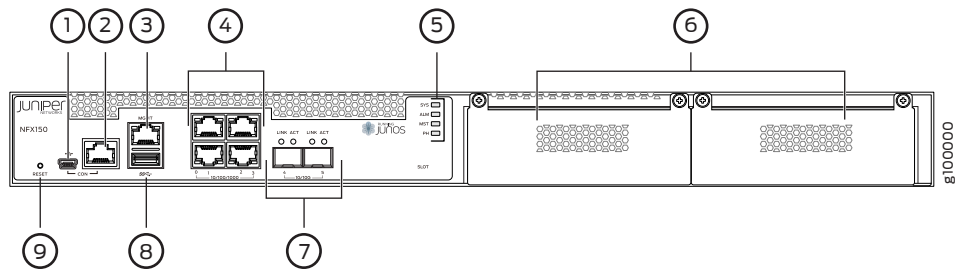
Figure 7: Front Panel Components of NFX150-C-S1-AA and NFX150-C-S1-AE



1— Antenna slot	7— SIM card cover
2— Mini USB console port	8— LTE modem LEDs
3— RJ-45 console port	9— Two 1-Gigabit Ethernet/10-Gigabit Ethernet SFP+ WAN ports
4— One 10/100/1000BASE-T RJ-45 management port	10— USB 3.0 port
5— Four 10/100/1000BASE-T RJ-45 LAN ports	11— Reset button
6— System status LEDs	

Figure 8 on page 26 shows the front panel components of an NFX150-S1 device.

Figure 8: Front Panel Components of NFX150-S1

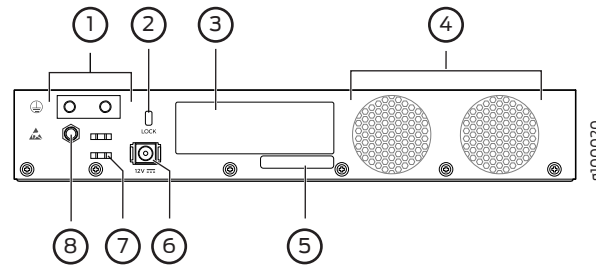


1— Mini USB console Port	6— Expansion module slots
2— RJ-45 console port	7— Two 1-Gigabit Ethernet/10-Gigabit Ethernet SFP+ WAN ports
3— One 10/100/1000BASE-T RJ-45 management port	8— USB 3.0 port
4— Four 10/100/1000BASE-T RJ-45 LAN ports	9— Reset button
5— System status LEDs	

## Rear Panel of an NFX150 Device

Figure 9 on page 27 shows the rear panel of the NFX150-C-S1 device. The rear panel of the NFX150-C-S1 device consists of the following components:

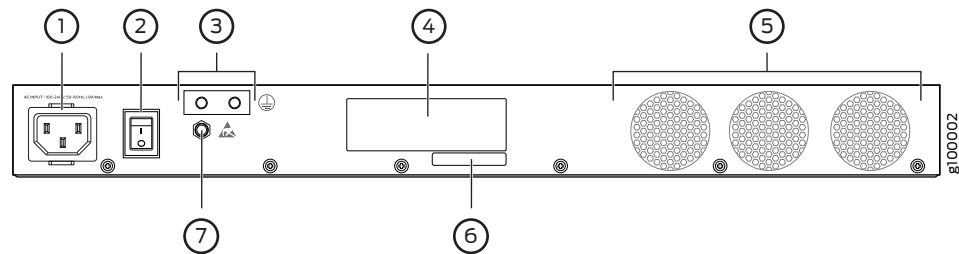
Figure 9: Rear Panel Components of NFX150-C-S1



1— Grounding point	5— CLEI code
2— Lock	6— Power supply input
3— Serial number	7— Cable tie holder
4— Fans	8— Electrostatic discharge (ESD) point

Figure 10 on page 27 shows the rear panel of the NFX150-S1 device. The rear panel of the NFX150-S1 device consists of the following components:

Figure 10: Rear Panel Components of NFX150-S1



1— AC power cord inlet	5— Fans
2— Power switch	6— CLEI code
3— Grounding point	7— Electrostatic discharge (ESD) point
4— Serial number	

## NFX150 Interface Modules

- [LTE on NFX Devices on page 27](#)
- [Front Panel of an LTE Expansion Module \(NFX-LTE-AE and NFX-LTE-AA\) on page 30](#)
- [Hardware Specifications for the LTE Expansion Module on page 32](#)
- [Front Panel of the NFX-EM-6T2SFP Expansion Module on page 32](#)
- [Hardware Specifications for the NFX-EM-6T2SFP Expansion Module on page 33](#)

## LTE on NFX Devices

- [Overview on page 28](#)
- [Features Supported on the LTE Module for NFX Devices on page 28](#)

- [Understanding the LTE Physical Interface on page 29](#)
- [Understanding the LTE Logical Interface on page 29](#)

### Overview

The LTE module operates on both 3G and 4G networks and provides wireless WAN support on the NFX150 devices. The NFX150 portfolio consists of models with or without LTE support. provides a summary of the models that support LTE.

**Table 6: LTE Models**

Model	Mode	Operating Region	Frequency Band
<ul style="list-style-type: none"> <li>• NFX150-C-S1-AE</li> <li>• NFX150-C-S1E-AE</li> <li>• NFX-LTE-AE (expansion module supported on the NFX150-S1 and NFX150-S1E models)</li> </ul>	<ul style="list-style-type: none"> <li>• LTE</li> <li>• HSPA+</li> </ul>	<ul style="list-style-type: none"> <li>• North America</li> <li>• European Union</li> </ul>	For LTE: <ul style="list-style-type: none"> <li>• Bands 1 through 5, 7, 8, 12, 13, 20, 25, 26, 29, 30, and 41</li> </ul> For 3G (HSPA+): <ul style="list-style-type: none"> <li>• Bands 1 through 5, and 8</li> </ul>
<ul style="list-style-type: none"> <li>• NFX150-C-S1-AA</li> <li>• NFX150-C-S1E-AA</li> <li>• NFX-LTE-AA (expansion module supported on the NFX150-S1 and NFX150-S1E models)</li> </ul>	<ul style="list-style-type: none"> <li>• LTE</li> <li>• HSPA+</li> </ul>	<ul style="list-style-type: none"> <li>• Asia</li> <li>• Australia</li> <li>• New Zealand</li> </ul>	For LTE: <ul style="list-style-type: none"> <li>• Bands 1,3, 5, 7, 8, 18, 19, 21, 28, 38, 39, 40, and 41</li> </ul> For 3G (HSPA+): <ul style="list-style-type: none"> <li>• Bands 1, 5, 6, 8, 9, and 19</li> </ul>

### Features Supported on the LTE Module for NFX Devices

The LTE module supports the following features:

- Automatic switchover between service providers through dual SIMs—The module supports up to two Subscriber Identity Module (SIM) cards. Dual SIM cards allow connectivity to two different ISP networks and provide a failover mechanism when the current active network fails. Each SIM card is associated with a profile, which is used to connect to the network.
- Multiple service provider and access point name (APN) profiles—You can configure up to 16 profiles for each SIM, although only one profile can be active at a time. The LTE module supports two SIM cards and so you can configure a total of 32 profiles.
- LTE carrier aggregation—Carrier aggregation expands the LTE bandwidth by combining secondary bands, which results in increased capacity and network efficiency.
- SIM security functions—The module supports security functions such as SIM lock and unlock, and PIN change.
- Always-on, dial-on-demand, and backup modes—The Mini-PIM can be configured in three modes:
  - Always-on—The LTE module connects to the 3G/4G network after booting. The connection is always maintained, as long as there are no network or connectivity problems.

- Dial-on-demand—The Mini-PIM initiates a connection when it receives interesting traffic. You define interesting traffic using the dialer filter. To configure dial-on-demand using a dialer filter, you first configure the dialer filter and then apply the filter to the dialer interface.



**NOTE:** The dial-on-demand mode is supported only if the LTE module is configured as a primary interface.

- Backup—The module connects to the 3G/4G network when the primary connection fails.
- Primary and backup interface—You can configure the LTE module either as a primary interface or as a backup interface.

When configured as the primary interface, the LTE module supports both the Always-on and Dial-on-demand modes.

When configured as the backup interface, the LTE module connects to the network only when the primary interface fails.

- Over-the-air upgrade for modem firmware—Over-the-air (OTA) firmware upgrade enables automatic and timely upgrade of modem firmware when new firmware versions are available. The OTA upgrade can be enabled or disabled on the LTE module.



**NOTE:** OTA upgrade is disabled by default.

### Understanding the LTE Physical Interface

The physical interface for the LTE module uses the name cl-1/1/0. You configure the following properties on the physical interface:

- A dialer pool to which the physical interface belongs and the priority of the interface in the pool.
- Profiles for the SIM cards.
- Radio access technology (automatic, 3G, LTE)

### Understanding the LTE Logical Interface

The dialer interface, dl0, is a logical interface, which is used to trigger calls. When traffic is sent to the dl0 interface, it enables the physical interface in the dialer pool and places calls through the physical interface. The dialer interface can perform backup and dialer filter functions. You can configure the dialer interface to operate in any one of the following ways:

- Primary interface—The dialer interface connects to the network and is always on.
- Backup interface for the primary WAN connection—The dialer interface is activated only when the primary connection fails.

- Dial-on-demand—The dialer interface activates the connection to the wireless network only when it receives interesting traffic.

The following rules apply when you configure dialer interfaces:

- You cannot configure the dialer interface as a constituent link in a multilink bundle.
- You cannot configure any dial-in options for the dialer interface.

You configure the following for a dialer interface:

- A dialer pool to which the physical interface belongs.
- Dial string (destination number to be dialed).

You can also specify optional operating parameters for the dialer interface:

- Activation delay—Number of seconds after the primary interface is down before the backup interface is activated. The default value is 0 seconds, and the maximum value is 60 seconds.
- Deactivation delay—Number of seconds after the primary interface is up before the backup interface is deactivated. The default value is 0 seconds, and the maximum value is 60 seconds.

## Front Panel of an LTE Expansion Module (NFX-LTE-AE and NFX-LTE-AA)

Figure 4 on page 23 shows the front panel components of the LTE expansion module.

Figure 11: Front Panel Components of the NFX-LTE-AE and NFX-LTE-AA

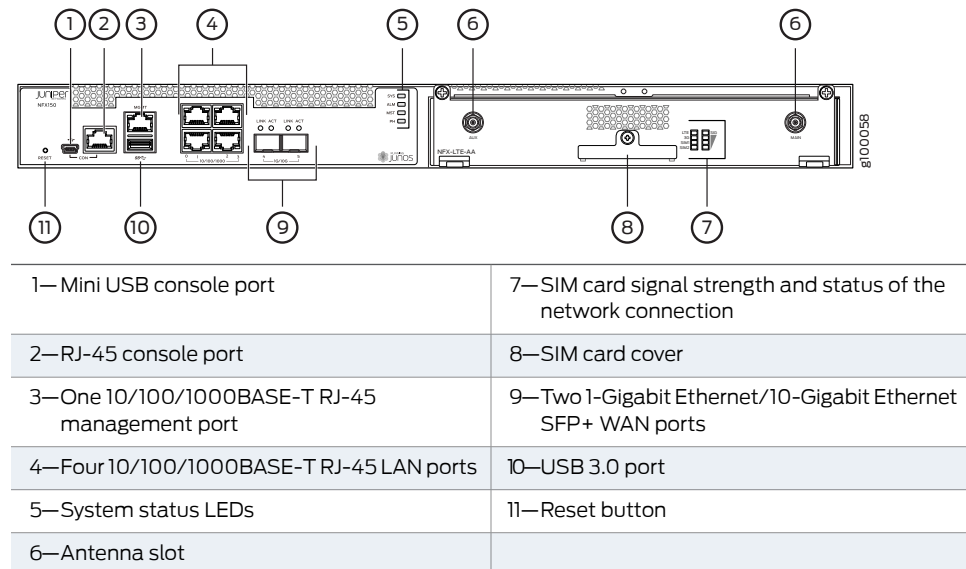


Table 7 on page 31 lists the components on the front panel of the LTE expansion module.

**Table 7: LTE Expansion Module Front Panel Components**

Component	Description
Antenna connectors	Two SubMiniature version A (SMA) connectors.
SIM slots	Two slots, <b>SIM1</b> and <b>SIM2</b> , for inserting the SIM cards. The LTE Mini-PIM supports standard, micro, and nano SIMs. The standard SIM can be inserted directly in the SIM slot. To insert micro and nano SIMs, use the SIM adapters supplied with the Mini-PIM. The Mini-PIM is shipped with two SIM adapters.
LEDs	Indicate the status at a glance.

The LTE expansion module supports two multi-band swivel-mount dipole antennas, which can be rotated 360°. You can rotate the antennas and select the angle at which the signal strength is high. [Table 8 on page 31](#) lists the specifications for the antenna.

**Table 8: Specifications for the LTE Expansion Module Antenna**

Specification	Value
Part number	640-077768
Operating frequency range	<ul style="list-style-type: none"> <li>• 700~960 MHz</li> <li>• 1575~2700 MHz</li> </ul>
Voltage Standing Wave Ratio (VSWR)	<=2.8
Impedance	50 Ohms
Radiation	Omnidirectional
Gain	1-4 dBi
Polarization	Vertical
Connector type	SMA
Length	120 mm

The antenna is connected to the NFX150 device through the magnetic antenna base. [Table 9 on page 31](#) lists the specifications for the antenna base.

**Table 9: Antenna Base Specifications**

Specification	Value
Part number	640-077767
Cable length	3 m
Connector type	SMA

Table 9: Antenna Base Specifications (continued)

Specification	Value
Dimensions (H x W x L)	29.50 mm x 73 mm x 73 mm

## Hardware Specifications for the LTE Expansion Module

Table 10 on page 32 provides the hardware specifications for the LTE expansion module.

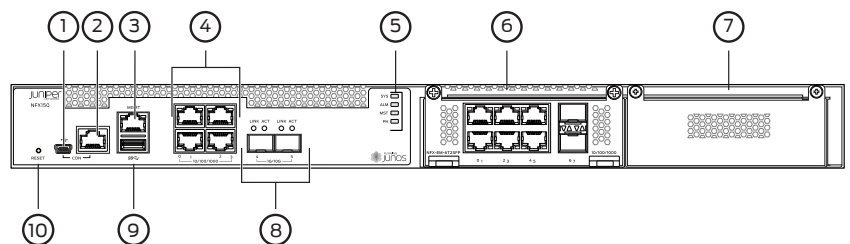
Table 10: LTE Expansion module Hardware Specifications

Description	Value
Dimensions (W x D x H)	8.40 in x 5.20 in x 1.45 in
Weight	368 grams
Connector Type	Golden Finger
Environmental Operating Temperature	32° to 104° F (0° to 40° C)
Storage Temperature	- 40°F to 158° F (-40° to 70° C)
Relative Humidity	(Operating) 5 to 90% non-condensing

## Front Panel of the NFX-EM-6T2SFP Expansion Module

Figure 5 on page 24 shows the front panel components of NFX-EM-6T2SFP.

Figure 12: Front Panel Components of the NFX-EM-6T2SFP



1—Mini USB console port	6—6T2SFP interface module
2—RJ-45 console port	7—Blank panel
3—One 10/100/1000BASE-T RJ-45 management port	8—Two 1-Gigabit Ethernet/10-Gigabit Ethernet SFP+ WAN ports
4—Four 10/100/1000BASE-T RJ-45 LAN ports	9—USB 3.0 port
5—System status LEDs	10—Reset button



## Hardware Specifications for the NFX-EM-6T2SFP Expansion Module

Table 11 on page 33 provides the hardware specifications for the NFX-EM-6T2SFP expansion module.

Table 11: Hardware Specifications for NFX-EM-6T2SFP

Description	Value
Dimensions (W x D x H)	4.20 in x 5.20 in x 1.45 in
Weight	242 gms
Connector Type	Golden Finger
Environmental Operating Temperature	32° to 104° F (0° to 40° C)
Storage Temperature	- 40°F to 158° F (-40° to 70° C)
Relative Humidity	(Operating) 5 to 90% non-condensing

## LED Details of an NFX150 Device

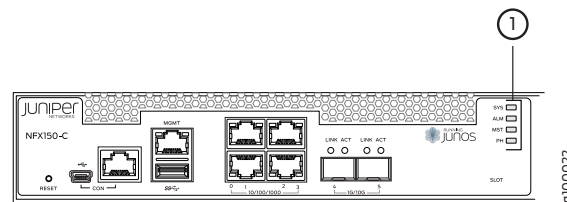
- Chassis Status LEDs on page 33
- Network Port and Uplink Port LEDs on page 35
- Management Port LEDs on page 35
- LTE Module LEDs on page 36

### Chassis Status LEDs

The front panel of an NFX150-C-S1 and NFX150-S1 devices have chassis status LEDs labeled **ALM**, **SYS**, **MST** and **PH**.

Figure 13 on page 33 shows the chassis status LEDs in an NFX150-C-S1 device.

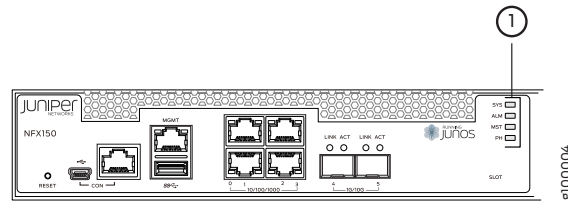
Figure 13: Chassis Status LEDs in an NFX150-C-S1 Device



1— Chassis status LEDs (**ALM**, **SYS**, **MST**, and **PH**)

Figure 14 on page 34 shows the chassis status LEDs in an NFX150-S1 device.

Figure 14: Chassis Status LEDs in an NFX150-S1 Device



1—Chassis status LEDs (ALM, SYS, MST, and PH)  
2—Slot

Table 12 on page 34 describes the chassis status LEDs in an NFX150 device, their colors and states, and the status they indicate. You can view the colors of the four LEDs remotely through the CLI by issuing the operational mode command **show chassis led**.

Table 12: Chassis Status LEDs in an NFX150 Device

LED Label	Color	State and Description
ALM (Alarm)	Unlit	There is no alarm or the device is halted.
	Red	There is a major alarm.
	Amber	There is a minor alarm.
SYS (System)	Green	<ul style="list-style-type: none"> <li>On steadily—Junos OS has been loaded on the device.</li> <li>Blinking—The device is booting.</li> <li>Off—The device is powered off or is halted.</li> </ul>
	Green	<ul style="list-style-type: none"> <li>On steadily—The device is functioning normally.</li> <li>Off—The device is powered off or is halted.</li> </ul>
	Green	<ul style="list-style-type: none"> <li>On steadily—Network Service Activator transaction is successfully completed. That is, the Network Service Orchestrator in NFX150 contacted the Network Service Activator and provisioned the software image successfully.</li> <li>Blinking—Network Service Activator transaction is underway.</li> <li>Off—The device is powered off or is halted.</li> </ul>
PH	Unlit	There is no Network Service Activator transaction.
	Green	<ul style="list-style-type: none"> <li>On steadily—Network Service Activator transaction is successfully completed. That is, the Network Service Orchestrator in NFX150 contacted the Network Service Activator and provisioned the software image successfully.</li> <li>Blinking—Network Service Activator transaction is underway.</li> <li>Off—The device is powered off or is halted.</li> </ul>
	Amber	<ul style="list-style-type: none"> <li>On steadily—Network Service Activator transaction is terminated unsuccessfully.</li> <li>Blinking—Network Service Activator transaction is waiting for user input.</li> </ul>

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

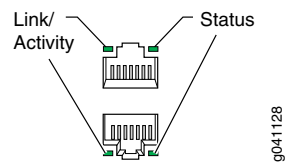
A minor alarm (amber) indicates a noncritical condition that requires monitoring or maintenance. A minor alarm left unchecked might cause interruption in service or performance degradation.

All four LEDs can be lit simultaneously.

## Network Port and Uplink Port LEDs

Each network port and uplink port on the front panel of an NFX150 has two LEDs that indicate link activity and port status (see [Figure 15 on page 35](#)).

*Figure 15: LEDs on the Network Port*



[Table 13 on page 35](#) describes the Link/Activity LED.

*Table 13: Link/Activity LED on the Network Ports and Uplink Ports in NFX150 Devices*

LED	Color	State and Description
Link/Activity	Green	<ul style="list-style-type: none"> <li>Blinking—The port and the link are active, and there is link activity.</li> <li>On steadily—The port and the link are active, but there is no link activity.</li> <li>Off—The port is not active.</li> </ul>

## Management Port LEDs

The management port on the front panel of an NFX150 device has two LEDs that indicate link activity and port status.

[Table 14 on page 35](#) describes the Link/Activity LED.

*Table 14: Link/Activity LED on the Management Port of an NFX150 Device*

LED	Color	State and Description
Link/Activity	Green	<ul style="list-style-type: none"> <li>Blinking—The port and the link are active, and there is link activity.</li> <li>On steadily—The port and the link are active, but there is no link activity.</li> <li>Off—The port is not active.</li> </ul>

[Table 15 on page 36](#) describes the status LED.

**Table 15: Status LED on the Management Port of an NFX150 Device**

LED	Color	State and Description
Status	Green	Indicates the speed. The speed indicators are: <ul style="list-style-type: none"> <li>• One blink per second—10 Mbps</li> <li>• Two blinks per second—100 Mbps</li> <li>• Three blinks per second—1000 Mbps</li> </ul>

## LTE Module LEDs

Table 16 on page 36 lists the LEDs on the LTE module and their indications.

**Table 16: LTE Module LED States**

LED	Description
SIG (Received Signal Strength indicator)	Solid green (One bar) – Low signal strength. (<= -99dBm)
	Solid green (Two bars) – Low signal strength. (From -98dBm to -87dBm)
	Solid green (Three bars) – Low signal strength. (From -86dBm to -76dBm)
	Solid green (Four bars) – High signal strength. (>=-75dBm)
	Unlit – No signal
3G	Solid green – 3G connection is established.
	Blinking green – Connection to a 3G network.
LTE	Solid green – LTE connection is established.
	Blinking green – Connection to a LTE network.
SIM1	Solid green – SIM1 is active.
SIM2	Solid green – SIM2 is active.



**NOTE:** If all the LEDs are blinking, it indicates that firmware updates are in progress. Do not power off the device before the updates complete.

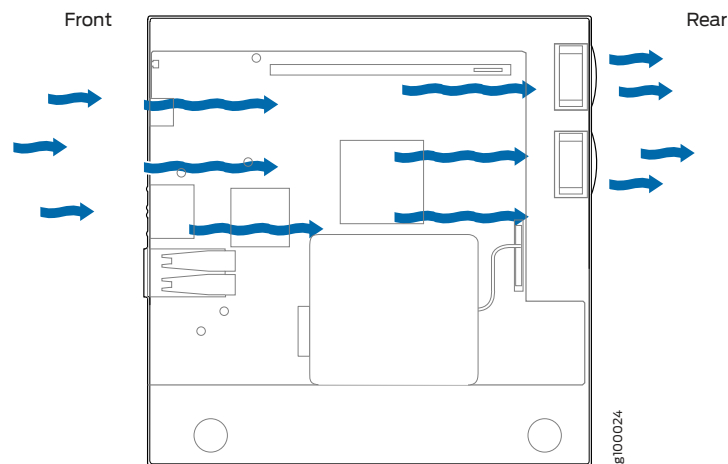
**Related Documentation**

- [NFX150 Device Hardware Overview on page 19](#)

## Cooling System and Airflow in an NFX150 Device

The NFX150 devices have front-to-back airflow. The air intake to cool the chassis is located on the front of the chassis. Air is pulled into the chassis and pushed toward the fans, which are built-in. Hot air exhausts from the rear of the chassis. See [Figure 16 on page 37](#).

*Figure 16: Front-to-Back Airflow Through the NFX150 Chassis*



- Related Documentation**
- [Rear Panel of an NFX150 Device](#)
  - [Prevention of Electrostatic Discharge Damage on page 142](#)

## NFX150 Power System

- [Power Supply in NFX150 Devices on page 37](#)
- [AC Power Supply Specifications for an NFX150 Device on page 38](#)
- [AC Power Cord Specifications for an NFX150 Device on page 38](#)

### Power Supply in NFX150 Devices

NFX150 devices use a fixed, internal AC power supply. The power supply distributes different output voltages to the device components according to their voltage requirements. The power supply is fixed in the chassis and is not field-replaceable.

The power supply has a single AC appliance inlet that requires a dedicated AC power feed. The AC power cord inlet is on the rear panel of the device.

- See Also**
- [AC Power Supply Specifications for an NFX150 Device on page 38](#)

## AC Power Supply Specifications for an NFX150 Device

Table 17 on page 38 describes the AC power specifications for an NFX150 device.

**Table 17: AC Power Specifications for an NFX150 Device**

Product SKU	AC Input Voltage (Operating Range)	AC Input Line Frequency	AC Input Current Rating	Maximum Power Consumption	Power Supply Type
NFX150-S1	100 through 240 VAC	50–60 Hz nominal	1.8 A at 240 VAC	150 W	Internal
NFX150-S1E	100 through 240 VAC	50–60 Hz nominal	1.8 A at 240 VAC	150 W	Internal

- See Also**
- [AC Power Cord Specifications for an NFX150 Device on page 38](#)
  - [General Safety Guidelines and Warnings on page 117](#)
  - [General Electrical Safety Guidelines and Warnings on page 140](#)

## AC Power Cord Specifications for an NFX150 Device

A detachable AC power cord is supplied with the AC power supplies. The coupler is type C13 as described by International Electrotechnical Commission (IEC) standard 60320. The plug at the male end of the power cord fits into the power source outlet that is standard for your geographical location.



**CAUTION:** The AC power cord provided with each power supply is intended for use with that power supply only and not for any other use.



**NOTE:** In North America, AC power cords must not exceed 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 supplied with the switch are in compliance.

Table 18 on page 38 gives the AC power cord specifications for the countries and regions listed in the table.

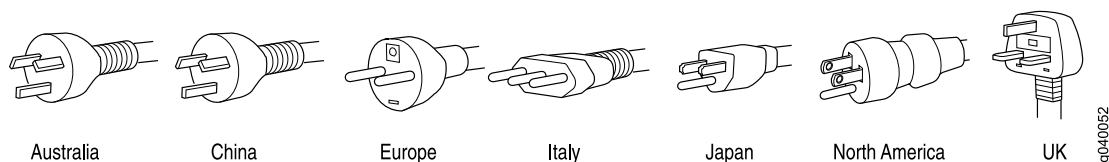
**Table 18: AC Power Cord Specifications**

Country/Region	Electrical Specifications	Plug Standards	Juniper Model Number
Argentina	250 VAC, 10 A, 50 Hz	IRAM 2073 Type RA/3	CBL-EX-PWR-C13-AR
Australia	250 VAC, 10 A, 50 Hz	AS/NZS 3112 Type SAA/3	CBL-EX-PWR-C13-AU

**Table 18: AC Power Cord Specifications (continued)**

Country/Region	Electrical Specifications	Plug Standards	Juniper Model Number
Brazil	250 VAC, 10 A, 50 Hz	NBR 14136 Type BR/3	CBL-EX-PWR-C13-BR
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
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
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/13	CBL-EX-PWR-C13-SA
Switzerland	250 VAC, 10 A, 50 Hz	SEV 6534-2 Type 12G	CBL-EX-PWR-C13-SZ
Taiwan	125 VAC, 11 A and 15 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

Figure 17 on page 39 illustrates the plug on the power cord for some of the countries or regions listed in Table 18 on page 38.

**Figure 17: AC Plug Types**

- See Also**
- [General Safety Guidelines and Warnings on page 117](#)
  - [General Electrical Safety Guidelines and Warnings on page 140](#)
  - [Prevention of Electrostatic Discharge Damage on page 142](#)





## CHAPTER 2

# Site Planning, Preparation, and Specifications

- Site Preparation Checklist for NFX150 Devices on page 41
- NFX150 Site Guidelines and Requirements on page 43
- Network Cable and Transceiver Planning for NFX150 on page 50
- Transceiver and Cable Specifications, and Pinouts for NFX150 on page 54

### Site Preparation Checklist for NFX150 Devices

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The checklist in [Table 19 on page 41](#) summarizes the tasks you need to perform when preparing a site for NFX150 devices installation.

*Table 19: Site Preparation Checklist*

Item or Task	For More Information	Performed by	Date
<b>Environment</b>			
Verify that environmental factors such as temperature and humidity do not exceed device tolerances.	"Environmental Requirements and Specifications for an NFX150 Device" on page 44		
<b>Power</b>			
Measure distance between external power sources and device installation site.			
Locate sites for connection of system grounding.			
Calculate the power consumption and requirements.	"AC Power Supply Specifications for an NFX150 Device" on page 38		
<b>Hardware Configuration</b>			
Choose the number and types of devices you want to install.	"NFX150 Device Hardware Overview" on page 19		
<b>Rack or Cabinet</b>			

Table 19: 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 device.	<p>"Rack Requirements for NFX150 Devices" on page 48</p> <p>"Cabinet Requirements for an NFX150 Device" on page 49</p>		
Plan rack or cabinet location, including required space clearances.	"Clearance Requirements for Airflow and Hardware Maintenance for an NFX150 Device" on page 45		
Secure the rack or cabinet to the floor and building structure.			
<b>Desk</b>			
Verify that the desk meets the minimum requirements for the installation of the device.	"Requirements for Mounting an NFX150 Device on a Desktop or Other Level Surface" on page 47		
Verify that there is appropriate clearance in your selected location.	"Clearance Requirements for Airflow and Hardware Maintenance for an NFX150 Device" on page 45		
<b>Wall</b>			
Verify that the wall meets the minimum requirements for the installation of the NFX150 device.	"Requirements for Mounting an NFX150 Device on a Wall" on page 47		
Verify that there is appropriate clearance in your selected location.	"Clearance Requirements for Airflow and Hardware Maintenance for an NFX150 Device" on page 45		
<b>Cables</b>			
Acquire cables and connectors:			
<ul style="list-style-type: none"> <li>Determine the number of cables needed based on your planned configuration.</li> <li>Review the maximum distance allowed for each cable. Choose the length of cable based on the distance between the hardware components being connected.</li> </ul>			
Plan the cable routing and management.			

**Related Documentation**

- [General Safety Guidelines and Warnings on page 117](#)
- [General Site Guidelines on page 43](#)
- [Installing and Connecting an NFX150 Device on page 64](#)
- [Mounting an NFX150 Device on page 64](#)

## NFX150 Site Guidelines and Requirements

- [General Site Guidelines on page 43](#)
- [Chassis Physical Specifications for an NFX150 Device on page 43](#)
- [Environmental Requirements and Specifications for an NFX150 Device on page 44](#)
- [Site Electrical Wiring Guidelines on page 45](#)
- [Clearance Requirements for Airflow and Hardware Maintenance for an NFX150 Device on page 45](#)
- [Requirements for Mounting an NFX150 Device on a Desktop or Other Level Surface on page 47](#)
- [Requirements for Mounting an NFX150 Device on a Wall on page 47](#)
- [Rack Requirements for NFX150 Devices on page 48](#)
- [Cabinet Requirements for an NFX150 Device on page 49](#)

### General Site Guidelines

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

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

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

### Chassis Physical Specifications for an NFX150 Device

NFX150 device chassis is a rigid sheet-metal structure that houses the hardware components. [Table 5 on page 25](#) summarizes the physical specifications of the NFX150 chassis.

*Table 20: Physical Specifications for the NFX150 Device Chassis*

Product SKU	Height	Width	Depth	Weight
NFX150-C-S1	1.72 in. (4.37 cm)	10.66 in. (27.1 cm)	11.17 in. (28.38 cm)	8.6 lb (3.9 kg)
NFX150-C-S1-AA	1.72 in. (4.37 cm)	10.66 in. (27.1 cm)	11.17 in. (28.38 cm)	8.6 lb (3.9 kg)

**Table 20: Physical Specifications for the NFX150 Device Chassis (continued)**

Product SKU	Height	Width	Depth	Weight
NFX150-C-S1-AE	1.72 in. (4.37 cm)	10.66 in. (27.1 cm)	11.17 in. (28.38 cm)	8.6 lb (3.9 kg)
NFX150-C-S1E-AA	1.72 in. (4.37 cm)	10.66 in. (27.1 cm)	11.17 in. (28.38 cm)	8.6 lb (3.9 kg)
NFX150-C-S1E-AE	1.72 in. (4.37 cm)	10.66 in. (27.1 cm)	11.17 in. (28.38 cm)	8.6 lb (3.9 kg)
NFX150-S1	1.72 in. (4.37 cm)	17.36 in. (44.1 cm)	12 in. (30.5 cm)	11.68 lb (5.3 kg)
NFX150-S1E	1.72 in. (4.37 cm)	17.36 in. (44.1 cm)	15.50 in. (39.4 cm)	11.68 lb (5.3 kg)

## Environmental Requirements and Specifications for an NFX150 Device

The device 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 device cooling system.
- Maintain ambient airflow for normal operation of the device. 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 21 on page 44](#) provides the required environmental conditions for normal operation of the device.

**Table 21: NFX150 Device Environmental Tolerances**

Description	Tolerance
Altitude	No performance degradation up to 6500 feet (1828 meters) at 96° F (40° C)
Relative humidity	Normal operation ensured in relative humidity range of 5% through 90%, noncondensing
Temperature	Normal operation ensured in temperature range of 32° F through 122° F (0° C through 40° C)
Seismic	Complies with Zone 4 earthquake requirements as per GR-63, Issue 4

- See Also**
- [Clearance Requirements for Airflow and Hardware Maintenance for an NFX150 Device on page 45](#)
  - [Installing and Connecting an NFX150 Device on page 64](#)

## Site Electrical Wiring Guidelines

Table 22 on page 45 describes the factors you must consider while planning the electrical wiring at your site.



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

**Table 22: Site Electrical Wiring Guidelines**

Site Wiring Factor	Guidelines
Signaling limitations	<p>If your site experiences any of the following problems, consult experts in electrical surge suppression and shielding:</p> <ul style="list-style-type: none"> <li>Improperly installed wires cause radio frequency interference (RFI).</li> <li>Damage from lightning strikes occurs when wires exceed recommended distances or pass between buildings.</li> <li>Electromagnetic pulses (EMPs) caused by lightning damage unshielded conductors and electronic devices.</li> </ul>
Radio frequency interference	<p>To reduce or eliminate RFI from your site wiring, do the following:</p> <ul style="list-style-type: none"> <li>Use a twisted-pair cable with a good distribution of grounding conductors.</li> <li>If you must exceed the recommended distances, use a high-quality twisted-pair cable with one ground conductor for each data signal when applicable.</li> </ul>
Electromagnetic compatibility	<p>If your site is susceptible to problems with electromagnetic compatibility (EMC), particularly from lightning or radio transmitters, seek expert advice.</p> <p>Some of the problems caused by strong sources of electromagnetic interference (EMI) are:</p> <ul style="list-style-type: none"> <li>Destruction of the signal drivers and receivers in the device</li> <li>Electrical hazards as a result of power surges conducted over the lines into the equipment</li> </ul>

## Clearance Requirements for Airflow and Hardware Maintenance for an NFX150 Device

When planning the site for installing an NFX150 device, you must allow sufficient clearance around the installed chassis (see [Figure 18 on page 46](#) and [Figure 19 on page 46](#)).

Figure 18: Clearance Requirements for Airflow and Hardware Maintenance for an NFX150-S1 Device

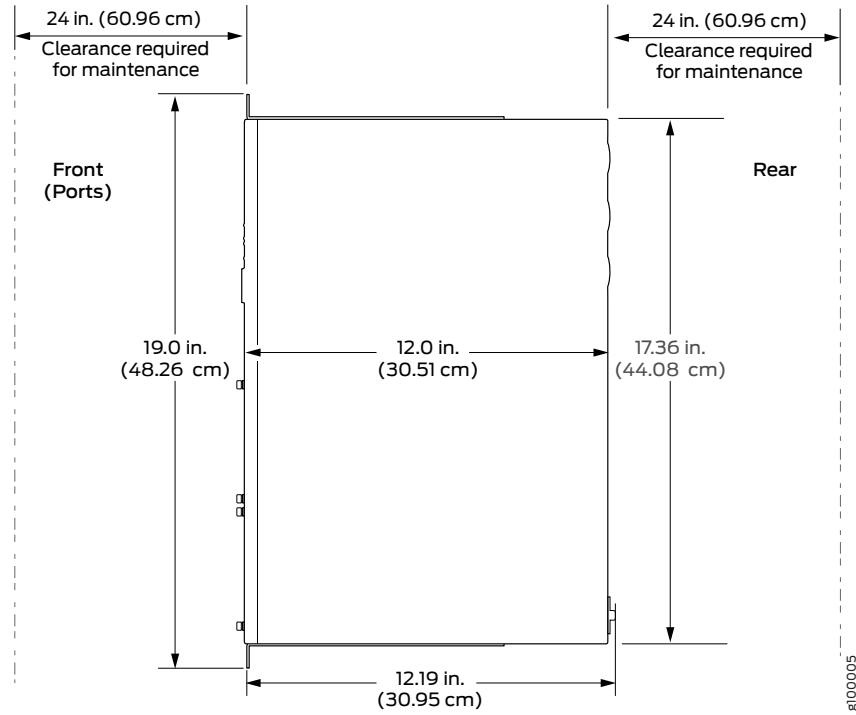
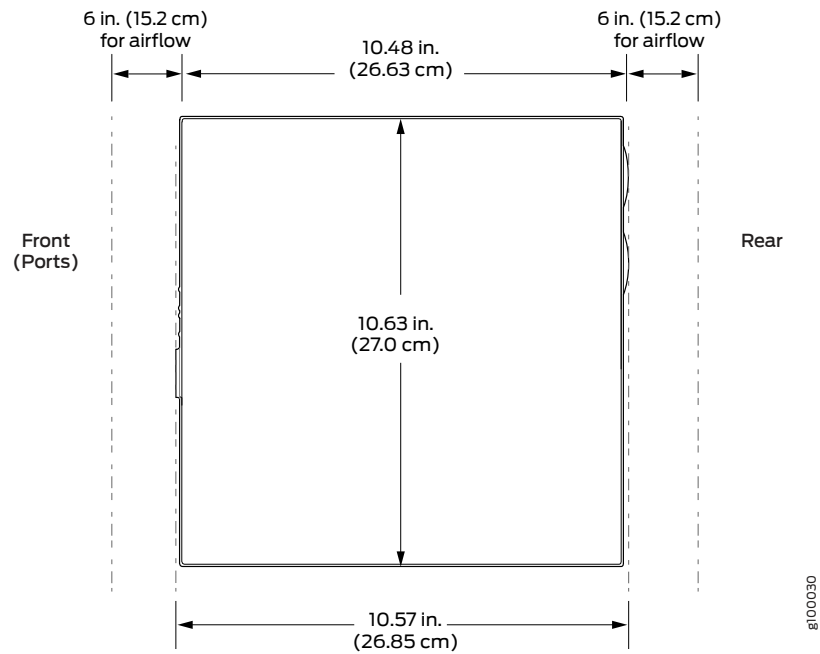


Figure 19: Clearance Requirements for Airflow and Hardware Maintenance for Wall Mounting an NFX150-C-S1 Device



- For the cooling system to function properly, the airflow around the chassis must be unrestricted. See [“Cooling System and Airflow in an NFX150 Device” on page 37](#) for more information about the airflow through the chassis.
- If you are mounting an NFX150 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 NFX150 device. For service personnel to remove and install hardware components, you must leave adequate space at the front and back of the NFX150. 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.

- See Also**
- [Rack Requirements for NFX150 Devices on page 48](#)
  - [Cabinet Requirements for an NFX150 Device on page 49](#)
  - [General Site Guidelines on page 43](#)
  - [Rack-Mounting and Cabinet-Mounting Warnings on page 126](#)

## Requirements for Mounting an NFX150 Device on a Desktop or Other Level Surface

You can install NFX150 device on a desktop or other such level surface, by attaching the four rubber feet (provided) to the bottom of the chassis.

When choosing a location, allow at least 6 in. (15.2 cm) of clearance between the front and back of the chassis and adjacent equipment or walls.

Ensure that the desktop or other level surface on which the device is installed is stable and securely supported.

- See Also**
- [Clearance Requirements for Airflow and Hardware Maintenance for an NFX150 Device on page 45](#)

## Requirements for Mounting an NFX150 Device on a Wall

You can install the NFX150 device on a wall. When choosing a location, allow at least 6 in. (15.2 cm) of clearance between the front and back of the chassis and adjacent equipment or walls.

Ensure that the wall onto which the device is installed is stable and securely supported.

If you are mounting the device in sheetrock (wall board with a gypsum plaster core) or in wall board not backed by wall studs, use hollow wall anchors capable of supporting the combined weight of two fully loaded chassis. Insert the screws into wall studs wherever possible to provide added support for the chassis.

Use the wall-mount kit from Juniper Networks to mount the device on a wall. The wall-mount kit is not part of the standard package and must be ordered separately.

- See Also**
- [Clearance Requirements for Airflow and Hardware Maintenance for an NFX150 Device on page 45](#)
  - [Mounting an NFX150 Device on a Wall on page 67](#)

## Rack Requirements for NFX150 Devices

You can mount the NFX150 devices on two-post racks or four-post racks.

Rack requirements consist of:

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

[Table 23 on page 48](#) provides the rack requirements and specifications for the device.

**Table 23: Rack Requirements and Specifications for the Device**

Rack Requirement	Guidelines
Rack type	<p>Use a two-post rack or a four-post rack. You can mount the device on any two-post or four-post rack that provides bracket holes or hole patterns spaced at 1 U (1.75 in. or 4.45 cm) increments and that meets the size and strength requirements to support the weight.</p> <p>A U is the standard rack unit defined in <i>Cabinets, Racks, Panels, and Associated Equipment</i> (document number EIA-310–D) published by the Electronics Industry Association (<a href="http://www.ecianow.org/standards-practices/standards/">http://www.ecianow.org/standards-practices/standards/</a>).</p> <p>The rack must meet the strength requirements to support the weight of the chassis.</p>
Mounting bracket hole spacing	<p>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.</p>
Rack size and strength	<ul style="list-style-type: none"> <li>• Ensure that the rack complies with the standard defined for 19-in. rack as defined in <i>Cabinets, Racks, Panels, and Associated Equipment</i> (document number EIA-310–D) published by the Electronics Industry Association (<a href="http://www.ecianow.org/standards-practices/standards/">http://www.ecianow.org/standards-practices/standards/</a>).</li> <li>• Ensure that the rack rails are spaced widely enough to accommodate the device chassis' external dimensions of 1.72 in. (4.3 cm) height, 17.36 in. (44.1 cm) width, and 12 in. (30.5 cm) depth. The 19-in. rack brackets dimensions are 0.82 in. (2.1 cm) wide, 1.72 in. (4.3 cm) height, and 2.1 in. (5.4 cm) depth. The 23-in. rack brackets dimensions are 3.3 in. (8.4 cm) wide, 1.72 in. (4.3 cm) height, and 8.5 in. (21.6 cm) depth.</li> <li>• The rack must be strong enough to support the weight of the device.</li> <li>• Ensure that the spacing of rails and adjacent racks allows for the proper clearance around the device and rack.</li> </ul>
Rack connection to building structure	<ul style="list-style-type: none"> <li>• Secure the rack to the building structure.</li> <li>• If earthquakes are a possibility in your geographical area, secure the rack to the floor.</li> <li>• Secure the rack to the ceiling brackets as well as wall or floor brackets for maximum stability.</li> </ul>



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

- See Also**
- [NFX150 Chassis on page 24](#)
  - [Clearance Requirements for Airflow and Hardware Maintenance for an NFX150 Device on page 45](#)
  - [Rack-Mounting and Cabinet-Mounting Warnings on page 126](#)
  - [Mounting an NFX150 Device on Two Posts in a Rack on page 71](#)
  - [Mounting an NFX150 Device on Four Posts in a Rack or Cabinet](#)

## Cabinet Requirements for an NFX150 Device

You can mount the NFX150 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

[Table 24 on page 49](#) provides the cabinet requirements and specifications for the NFX150 device.

**Table 24: Cabinet Requirements for the NFX150 Device**

Cabinet Requirement	Guidelines
Cabinet size and clearance	The minimum cabinet size for accommodating an NFX150 device is 36 in. (91.4 cm) deep. Large cabinets improve airflow and reduce the chance of overheating.
Cabinet airflow requirements	<p>When you mount the NFX150 device in a cabinet, ensure that ventilation through the cabinet is sufficient to prevent overheating.</p> <ul style="list-style-type: none"> <li>• Ensure that the cool air supply you provide through the cabinet adequately dissipates the thermal output of the NFX150 device.</li> <li>• Ensure that the cabinet allows the chassis hot exhaust air to exit the cabinet without recirculating into the NFX150 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.</li> <li>• Install the NFX150 device in the cabinet in a way that maximizes the open space on the side of the chassis that has the hot air exhaust.</li> <li>• Route and dress all cables to minimize the blockage of airflow to and from the chassis.</li> <li>• Ensure that the spacing of rails and adjacent cabinets allows for the proper clearance around the NFX150 device and cabinet.</li> <li>• A cabinet larger than the minimum required provides better airflow and reduces the chance of overheating.</li> </ul>

- See Also**
- [Clearance Requirements for Airflow and Hardware Maintenance for an NFX150 Device on page 45](#)
  - [Rack Requirements for NFX150 Devices on page 48](#)

## Network Cable and Transceiver Planning for NFX150

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- [Understanding NFX150 Devices Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion on page 50](#)
- [Calculating the Fiber-Optic Cable Power Budget for an NFX150 Device on page 51](#)
- [Calculating the Fiber-Optic Cable Power Margin for an NFX150 Device on page 52](#)

### Understanding NFX150 Devices 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. The NFX150 devices use various types of network cable, including multimode and single-mode fiber-optic cables.

- [Signal Loss in Multimode and Single-Mode Fiber-Optic Cables on page 50](#)
- [Attenuation and Dispersion in Fiber-Optic Cable on page 50](#)

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

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Multimode fiber is large enough in diameter to allow rays of light to reflect internally (bounce off the walls of the fiber). Interfaces with multimode optics typically use LEDs as light sources. However, LEDs are not coherent light sources. They spray varying wavelengths of light into the multimode fiber, which reflects the light at different angles. Light rays travel in jagged lines through a multimode fiber, causing signal dispersion. When light traveling in the fiber core radiates into the fiber cladding (layers of lower refractive index material in close contact with a core material of higher refractive index), higher-order mode loss 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 NFX150 devices, see [“Pluggable Transceivers Supported on NFX150 Devices” on page 54](#). Exceeding the maximum transmission distances can result in significant signal loss, which causes unreliable transmission.

#### Attenuation and Dispersion in Fiber-Optic Cable

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An optical data link functions correctly provided that modulated light reaching the receiver has enough power to be demodulated correctly. Attenuation is the reduction in strength

of the light signal during transmission. Passive media components such as cables, cable splices, and connectors cause attenuation. Although attenuation is significantly lower for optical fiber than for other media, it still occurs in both multimode and single-mode transmission. An efficient optical data link must transmit enough light to overcome attenuation.

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

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

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

An efficient optical data link must have enough light to exceed the minimum power that the receiver requires to operate within its specifications. In addition, the total dispersion must be within the limits specified for the type of link in Telcordia Technologies document GR-253-CORE (Section 4.3) and International Telecommunications Union (ITU) document G.957.

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

- See Also**
- [Calculating the Fiber-Optic Cable Power Budget for an NFX150 Device on page 51](#)
  - [Calculating the Fiber-Optic Cable Power Margin for an NFX150 Device on page 52](#)

## Calculating the Fiber-Optic Cable Power Budget for an NFX150 Device

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

To calculate the worst-case estimate for fiber-optic cable power budget ( $P^B$ ) for the link:

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

$$P_T = -15 \text{ dBm}$$

$$P_R = -28 \text{ dBm}$$



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

- Calculate the power budget (PB) by subtracting ( $P_R$ ) from (PT):  
 $-15 \text{ dBm} - (-28 \text{ dBm}) = 13 \text{ dBm}$

- See Also**
- [Understanding NFX150 Devices Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion on page 50](#)
  - [Calculating the Fiber-Optic Cable Power Margin for an NFX150 Device on page 52](#)

## Calculating the Fiber-Optic Cable Power Margin for an NFX150 Device

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

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

Before you begin to calculate the power margin:

- Calculate the power budget. See [“Calculating the Fiber-Optic Cable Power Budget for an NFX150 Device” on page 51](#).

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

- Determine the maximum value for link loss (LL) by adding estimated values for applicable link-loss factors—for example, use the sample values for various factors as provided in [Table 25 on page 52](#) (here, the link is 2 km long and multimode, and the ( $P_B$ ) is 13 dBm):

**Table 25: Estimated Values for Factors Causing Link Loss**

Link-Loss Factor	Estimated Link-Loss Value	Sample Link Loss (LL) Calculation Values
Higher-order mode losses	Multimode—0.5 dBm	0.5 dBm
	Single-mode—None	0 dBm

Table 25: Estimated Values for Factors Causing Link Loss (continued)

Link-Loss Factor	Estimated Link-Loss Value	Sample Link Loss (LL) Calculation Values
Modal and chromatic dispersion	Multimode—None, if product 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 ( $P_B$ ):

$$P_B - LL = P_M$$

$$13 \text{ dBm} - 0.5 \text{ dBm [HOL]} - 5 (0.5 \text{ dBm}) - 2 (0.5 \text{ dBm}) - 2 \text{ km (1.0 dBm/km)} - 1 \text{ dB [CRM]} = P_M$$

$$13 \text{ dBm} - 0.5 \text{ dBm} - 2.5 \text{ dBm} - 1 \text{ dBm} - 2 \text{ dBm} - 1 \text{ dBm} = P_M$$

$$P_M = 6 \text{ dBm}$$

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.

- See Also**
- [Understanding NFX150 Devices Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion on page 50](#)
  - [Calculating the Fiber-Optic Cable Power Budget for an NFX150 Device on page 51](#)

## Transceiver and Cable Specifications, and Pinouts for NFX150

- [Pluggable Transceivers Supported on NFX150 Devices on page 54](#)
- [SFP+ Direct Attach Cables for NFX150 Devices on page 54](#)
- [Cable Specifications for Console and Management Connections for the NFX150 Devices on page 56](#)
- [Mini-USB Type-B Console Port Specifications for an NFX150 Device on page 56](#)
- [Console Port Connector Pinouts for NFX150 Devices on page 57](#)
- [USB Port Specifications for an NFX150 Device on page 58](#)
- [Management Port Connector Pinout Information for an NFX150 Device on page 58](#)
- [Network Port Connector Pinout Information for an NFX150 Device on page 59](#)
- [RJ-45 to DB-9 Serial Port Adapter Pinout Information for an NFX150 Device on page 60](#)

### Pluggable Transceivers Supported on NFX150 Devices

Uplink module ports on NFX150 devices support SFP and SFP+ transceivers.



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



**CAUTION:** If you 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.

For the list of supported transceivers and its specifications, see the [Hardware Compatibility Tool](#).

**See Also** • [NFX150 Chassis on page 24](#)

### SFP+ Direct Attach Cables for NFX150 Devices

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

This topic describes:

- [Cable Specifications on page 55](#)
- [Standards Supported by DAC Cables on page 55](#)

### Cable Specifications

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NFX150 devices support SFP+ passive DAC cables. The passive Twinax cable is a straight cable with no active electronic components. NFX150 devices support 1 m, 3 m, and 5 m long SFP+ passive DAC cables.



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



**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.

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

For the list of supported DAC cables and its specifications, see the [Hardware Compatibility Tool](#).

### Standards Supported by DAC Cables

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The cables comply with the following standards:

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

- See Also**
- [Pluggable Transceivers Supported on NFX150 Devices on page 54](#)
  - [Installing a Transceiver in an NFX150 Device on page 80](#)
  - [Removing a Transceiver from an NFX150 Device on page 99](#)

## Cable Specifications for Console and Management Connections for the NFX150 Devices

Table 26 on page 56 lists the specifications for the cables that connect the NFX150 devices to a management device.

**Table 26: Cable Specifications for Console and Management Connections for the NFX150 Devices**

Port on NFX150 Device	Cable Specification	Cable Supplied	Maximum Length	Device Receptacle
Console port	RS-232 (EIA-232) serial cable	One 7-foot (2.13-meter) long RJ-45 patch cable and RJ-45 to DB-9 adapter	7 feet (2.13 meters)	RJ-45
Management port	Category 5 cable or equivalent suitable for 1000BASE-T operation	One 7-foot (2.13-meter) long RJ-45 patch cable	328 feet (100 meters)	RJ-45

- See Also**
- [Console Port Connector Pinouts for NFX150 Devices on page 57](#)
  - [Management Port Connector Pinout Information for an NFX150 Device on page 58](#)
  - [Connecting an NFX150 Device to a Management Console on page 78](#)
  - [Connecting an NFX150 Device to a Network for Out-of-Band Management on page 77](#)

### Mini-USB Type-B Console Port Specifications for an NFX150 Device

NFX150 Device has two: an RJ-45 port, and a Mini-USB port.

By default, the RJ-45 port is set as the active console port. It can display all the early boot and low-level message output and you can access the device through this port in the debugger prompt.

The Mini-USB port is the passive console port. You can change the status of the port to active or passive using the **port-type** configuration statement. See [Configuring the Console Port Type \(CLI Procedure\)](#).

The Mini-USB console port uses a Mini-B plug (5-pin) connector to connect to a console management device. The default baud rate for the console port is 9600 baud.

Table 27 on page 56 provides the pinout information of the Mini-USB Type-B console port.

**Table 27: Mini-USB Type-B Console Port Pinout Information for NFX150 Devices**

Pin	Signal	Description
1	VCC	+5 VDC
2	D-	Data -
3	D+	Data +



**Table 27: Mini-USB Type-B Console Port Pinout Information for NFX150 Devices (continued)**

Pin	Signal	Description
X	N/C	May be N/C, GND or used as an attached device presence indicator
4	GND	Ground

**See Also** • [NFX150 Device Hardware Overview on page 19](#)

## Console Port Connector Pinouts for NFX150 Devices

The console port (labeled **CON**) is an RS-232 serial interface that uses an RJ-45 connector to connect to a console management device. The default baud rate for the console port is 9600 baud.

[Table 28 on page 57](#) provides the pinout information for the RJ-45 console connector. An RJ-45 cable and RJ-45 to DB-9 adapter are supplied with the NFX150 device.



**NOTE:** If your laptop or PC does not have a DB-9 male connector pin and you want to connect your laptop or PC directly to an NFX150 device, use a combination of the RJ-45 cable and RJ-45 to DB-9 adapter supplied with the device and a USB to DB-9 male adapter. You must provide the USB to DB-9 male adapter.

**Table 28: Console Port Connector Pinouts for the NFX150 Device**

Pin	Signal	Description
1	RTS Output	Request to send
2	DTR Output	Data terminal ready
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
8	CTS Input	Clear to send

**See Also** • [Connecting an NFX150 Device to a Management Console on page 78](#)

## USB Port Specifications for an NFX150 Device

The following Juniper Networks USB flash drives have been tested and are officially supported for the USB port in the NFX150 devices:

- RE-USB-1G-S—1-gigabyte (GB) USB flash drive
- RE-USB-2G-S—2-GB USB flash drive
- RE-USB-4G-S—4-GB USB flash drive



**CAUTION:** Any USB memory product not listed as supported for the NFX150 device 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 NFX150 device. Failure to do so could expose your device to unpredictable behavior.



**NOTE:** Executing the `request system snapshot` CLI command on a NFX150 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 NFX150 device must support USB 2.0 or later.

**See Also** • [NFX150 Chassis on page 24](#)

## Management Port Connector Pinout Information for an NFX150 Device

The 1000BASE-T RJ-45 management port on an NFX150 device uses an RJ-45 connector to connect to a management device for out-of-band management.

Table 29 on page 58 provides the pinout information of the RJ-45 management port connector.

*Table 29: RJ-45 Management Port Connector Pinouts for the NFX150 Devices*

Pin	Signal	Description
1	TRP1+	Transmit/receive data pair 1

**Table 29: RJ-45 Management Port Connector Pinouts for the NFX150 Devices (continued)**

Pin	Signal	Description
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

**See Also** • [LED Details of an NFX150 Device on page 33](#)

### Network Port Connector Pinout Information for an NFX150 Device

A network port on an NFX150 device uses an RJ-45 connector to connect to a device.

The port uses an autosensing RJ-45 connector to support a 10/100/1000Base-T connection. Two LEDs on the port indicate link/activity on the port and the port status. See “[LED Details of an NFX150 Device](#)” on page 33.

[Table 30 on page 59](#) provides the pinout information for the RJ-45 connector. An RJ-45 cable, with a connector attached, is supplied with the switch.

**Table 30: Network Port Connector Pinout Information for NFX150 Devices**

Pin	Signal	Description
1	TRP1+	Transmit/receive data pair 1 Negative Vport (in PoE models)
2	TRP1-	Transmit/receive data pair 1 Negative Vport (in PoE models)
3	TRP2+	Transmit/receive data pair 2 Positive Vport (in PoE models)
4	TRP3+	Transmit/receive data pair 3
5	TRP3-	Transmit/receive data pair 3

**Table 30: Network Port Connector Pinout Information for NFX150 Devices (continued)**

Pin	Signal	Description
6	TRP2-	Transmit/receive data pair 2 Positive Vport (in PoE models)
7	TRP4+	Transmit/receive data pair 4
8	TRP4-	Transmit/receive data pair 4

**See Also** • [NFX150 Device Hardware Overview on page 19](#)

### RJ-45 to DB-9 Serial Port Adapter Pinout Information for an NFX150 Device

The console port is an RS-232 serial interface that uses an RJ-45 connector to connect to a management device such as a PC or a laptop. If your laptop or PC does not have a DB-9 male connector pin and you want to connect your laptop or PC to an NFX150 device, use a combination of the RJ-45 to DB-9 female adapter supplied with the switch along with a USB to DB-9 male adapter.

[Table 31 on page 60](#) provides the pinout information for the RJ-45 to DB-9 serial port adapter.

**Table 31: RJ-45 to DB-9 Serial Port Adapter Pinout Information**

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

**See Also** • [Connecting an NFX150 Device to a Management Console on page 78](#)

## CHAPTER 3

# Initial Installation and Configuration

- [Unpacking the NFX150 on page 61](#)
- [Installing the NFX150 on page 63](#)
- [Connecting the NFX150 to Power on page 73](#)
- [Connecting the NFX150 to the Network on page 77](#)
- [Initial Configuration on NFX150 Devices on page 83](#)
- [Installing and Configuring the Expansion Modules on page 86](#)
- [Upgrading the Modem Firmware on NFX Devices Through Over-the-Air \(OTA\) on page 94](#)

## Unpacking the NFX150

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- [Unpacking an NFX150 Device on page 61](#)
- [Parts Inventory \(Packing List\) for an NFX150 Device on page 62](#)
- [Registering Products—Mandatory for Validating SLAs on page 63](#)

### Unpacking an NFX150 Device

The NFX150 devices are shipped in a cardboard carton, secured with foam packing material. The carton has an accessory compartment and contains the quick start instructions.



.....  
**CAUTION:** NFX150 devices are maximally protected inside the shipping carton. Do not unpack the devices until you are ready to begin installation.  
.....

To unpack the device:

1. Open the carton.
2. Pull out the packing material holding the device in place.

3. Verify the parts received against the inventory on the label attached to the carton. See “Parts Inventory (Packing List) for an NFX150 Device” on page 62.
4. Save the shipping carton and packing materials in case you need to move or ship the device later.

**See Also** • [NFX150 Device Hardware Overview on page 19](#)

## Parts Inventory (Packing List) for an NFX150 Device

The device shipment includes a packing list. Check the parts you receive in the device shipping carton against the items on the packing list. The parts shipped depend on the configuration you order.

If any part on the packing list is missing, contact your customer service representative or contact Juniper customer care from within the U.S. or Canada by telephone at 1-888-314-5822. For international-dial or direct-dial options in countries without toll-free numbers, see <https://www.juniper.net/support/requesting-support.html>.

Table 32 on page 62 lists the parts and their quantities in the packing list.

**Table 32: Packing List for an NFX150 Device**

Component	Quantity
Device	1
AC power cord appropriate for your geographical location	1
AC power cord retainer clip	1
	<b>NOTE:</b> The AC power cord retainer clip is provided only with NFX150-S1 device.
Mounting brackets	2
Mounting screws to attach the mounting brackets to the device chassis	8
Rubber feet	4
RJ-45 cable and RJ-45 to DB-9 serial port adapter	1
Quick Start installation instructions	1
Juniper Networks Product Warranty	1
End User License Agreement	1



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

**See Also** • [NFX150 Device Hardware Overview on page 19](#)

## Registering Products—Mandatory for Validating SLAs

Register all new Juniper Networks hardware products and changes to an existing installed product using the Juniper Networks website to activate your hardware replacement service-level agreements (SLAs).



**CAUTION:** Register product serial numbers on the Juniper Networks website and update the installation base data if there is any addition or change to the installation base or if the installation base is moved. Juniper Networks will not be held accountable for not meeting the hardware replacement service-level agreement for products that do not have registered serial numbers or accurate installation base data.

Register your product(s) at: <https://tools.juniper.net/svcreg/SRegSerialNum.jsp> .

Update your install base at:

<https://www.juniper.net/customers/csc/management/updateinstallbase.jsp> .

**See Also** • [Contacting Customer Support to Obtain Return Material Authorization](#)  
• [Contacting Customer Support to Obtain a Return Materials Authorization for an MX150](#)

## Installing the NFX150

- [Installing and Connecting an NFX150 Device on page 64](#)
- [Mounting an NFX150 Device on page 64](#)
- [Mounting an NFX150 Device on a Desk or Other Level Surface on page 65](#)
- [Mounting an NFX150 Device on a Wall on page 67](#)
- [Mounting an NFX150 Device on Two Posts in a Rack on page 71](#)

## Installing and Connecting an NFX150 Device

To install and connect an NFX150 device:

1. Follow instructions in [“Unpacking an NFX150 Device” on page 61](#).
2. Mount the device by following instructions appropriate for your site:
  - [“Mounting an NFX150 Device on a Desk or Other Level Surface” on page 65](#) (using the rubber feet provided)
  - [“Mounting an NFX150 Device on Two Posts in a Rack” on page 71](#) (using the mounting brackets provided)
  - [Mounting an NFX150 Device on Four Posts in a Rack or Cabinet](#) (using the separately orderable four-post rack-mount kit)
  - [“Mounting an NFX150 Device on a Wall” on page 67](#) (using the separately orderable wall-mount kit)
3. Follow instructions in [“Connecting Earth Ground to an NFX150 Device” on page 73](#).
4. Follow instructions in [“Connecting AC Power to an NFX150 Device” on page 75](#).
5. Perform initial configuration of the device by following instructions in [Configuring an NFX150 Device](#).
6. Set the device's management options by following the appropriate instructions:
  - [Connecting an NFX150 Device to a Management Console on page 78](#)
  - [Connecting an NFX150 Device to a Network for Out-of-Band Management on page 77](#)

- See Also**
- [Rack Requirements for NFX150 Devices on page 48](#)
  - [Cabinet Requirements for an NFX150 Device on page 49](#)
  - [Clearance Requirements for Airflow and Hardware Maintenance for an NFX150 Device on page 45](#)

## Mounting an NFX150 Device

[Table 33 on page 65](#) lists the methods you can use to mount an NFX150 device.



**Table 33: NFX150 Device Mounting Methods**

Mounting Method	Device Model	Comments
Desk or other level surface (using rubber feet)	<ul style="list-style-type: none"> <li>• NFX150-C-S1</li> <li>• NFX150-C-S1-AE</li> <li>• NFX150-C-S1-AA</li> <li>• NFX150-C-S1E-AE</li> <li>• NFX150-C-S1E-AA</li> </ul>	On a desk or other level surface by using rubber feet provided with the device.
Two-post rack or cabinet	<ul style="list-style-type: none"> <li>• NFX150-S1</li> <li>• NFX150-S1E</li> </ul>	On two posts in a rack or cabinet by using the mounting brackets.
Four-post rack or cabinet	<ul style="list-style-type: none"> <li>• NFX150-S1</li> <li>• NFX150-S1E</li> </ul>	On four posts in a rack or cabinet by using the mounting brackets.
Wall mounting	<ul style="list-style-type: none"> <li>• NFX150-S1</li> <li>• NFX150-S1E</li> <li>• NFX150-C-S1</li> <li>• NFX150-C-S1-AE</li> <li>• NFX150-C-S1-AA</li> <li>• NFX150-C-S1E-AE</li> <li>• NFX150-C-S1E-AA</li> </ul>	On a wall by using wall mounting brackets.

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 or cabinet that provides holes spaced at that distance.

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

- See Also**
- [Mounting an NFX150 Device on a Desk or Other Level Surface on page 65](#)
  - [Mounting an NFX150 Device on Two Posts in a Rack on page 71](#)
  - [Mounting an NFX150 Device on Four Posts in a Rack or Cabinet](#)
  - [Mounting an NFX150 Device on a Wall on page 67](#)
  - [Connecting Earth Ground to an NFX150 Device on page 73](#)

## Mounting an NFX150 Device on a Desk or Other Level Surface

You can mount an NFX150-C-S1 device on a desk or other level surface by using the four rubber feet that are shipped with the device. The rubber feet stabilize the chassis.

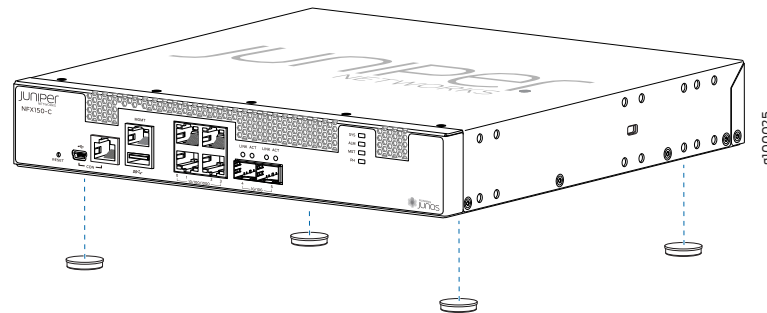
Before mounting the device on a desk or other level surface:

- Verify that the site meets the requirements described in “[Site Preparation Checklist for NFX150 Devices](#)” on page 41.
- Place the desk in its permanent location, allowing adequate clearance for airflow and maintenance, and secure it to the building structure.
- Read “[General Safety Guidelines and Warnings](#)” on page 117, with particular attention to “[Chassis Lifting Guidelines for NFX150 Devices](#)” on page 123.
- Ensure that you have the 4 rubber feet to stabilize the chassis on the a desk or other level surface (provided in the accessory box in the device carton)

To mount an NFX150-C-S1 device on a desk or other level surface:

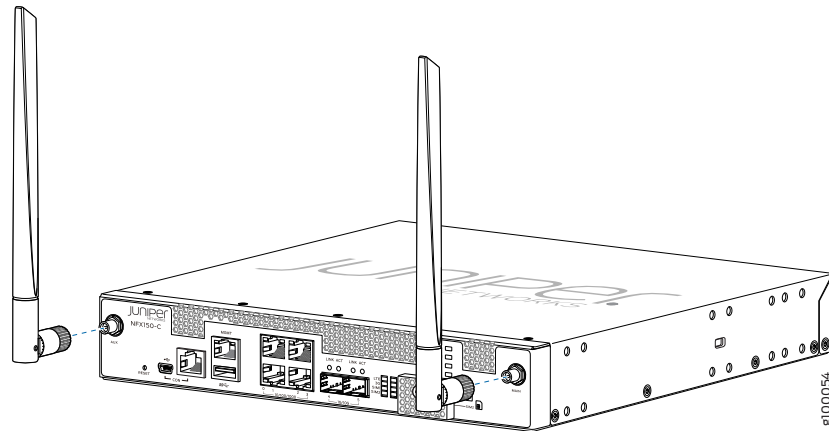
1. Remove the device from the shipping carton (see “[Unpacking an NFX150 Device](#)” on page 61).
2. Turn the chassis upside down on the desk or the level surface where you intend to mount the device.
3. Attach the rubber feet to the bottom of the chassis as shown in [Figure 20 on page 66](#)
4. Turn the chassis right side up on the desk or the level surface.

*Figure 20: Attaching Rubber Feet to the NFX150-C-S1 Device*



5. Attach the antennas to the antenna base of compact models such as NFX150-C-S1-AA and NFX150-C-S1-AE with integrated LTE modem support. See [Figure 21 on page 67](#).

Figure 21: Attaching Antennas to NFX150-C-S1-AA and NFX150-C-S1-AE



- See Also**
- [Connecting Earth Ground to an NFX150 Device on page 73](#)
  - [Connecting AC Power to an NFX150 Device on page 75](#)
  - [Clearance Requirements for Airflow and Hardware Maintenance for an NFX150 Device on page 45](#)

## Mounting an NFX150 Device on a Wall

You can mount an NFX150 device on a wall by using the separately orderable wall-mount kit.

Before mounting an NFX150 device on a wall:

- Verify that the site meets the requirements described in “[Site Preparation Checklist for NFX150 Devices](#)” on page 41.
- Read “[General Safety Guidelines and Warnings](#)” on page 117, with particular attention to “[Chassis Lifting Guidelines for NFX150 Devices](#)” on page 123.
- Remove the device from the shipping carton (see “[Unpacking an NFX150 Device](#)” on page 61).

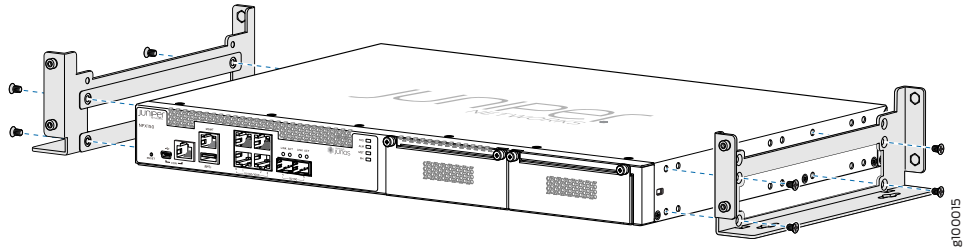
Ensure that you have the following parts and tools available:

- Phillips (+) screwdriver, number 2
- 2 wall-mount brackets (provided with the wall-mount kit)
- 8 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 included)
- Hollow wall anchors capable of supporting the weight of a fully loaded NFX150 device, up to 9 lb (4 kg) (not included)—if you are mounting the device in sheetrock (wall board with a gypsum plaster core) or in wall board not backed by wall studs

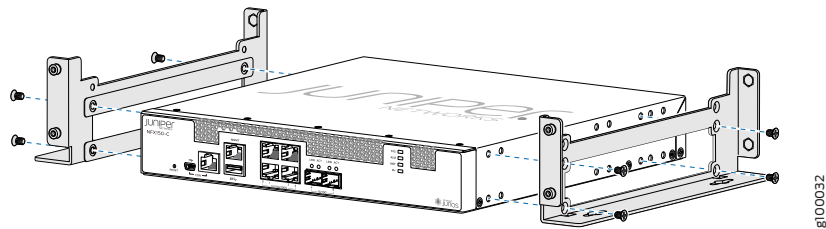
To mount the device on a wall:

1. Attach the wall-mount brackets to the sides of the chassis using four of the wall-mount bracket screws on each side, as shown in [Figure 22 on page 68](#) and [Figure 23 on page 68](#).

*Figure 22: Attaching Wall-Mount Brackets to the NFX150 Device Chassis*



*Figure 23: Attaching Wall-Mount Brackets to the NFX150-C-S1 Device Chassis*



2. Install four mounting screws on the wall as shown in [Figure 24 on page 69](#) and [Figure 25 on page 69](#).

Figure 24: Measurements for Installing Mounting Screws for NFX150-S1 Device on a Wall

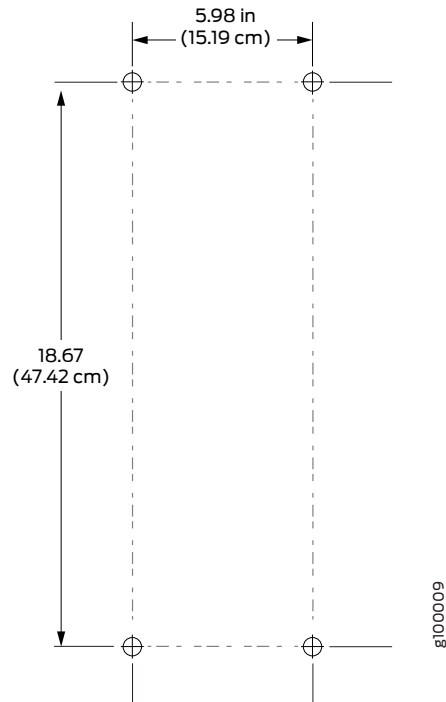
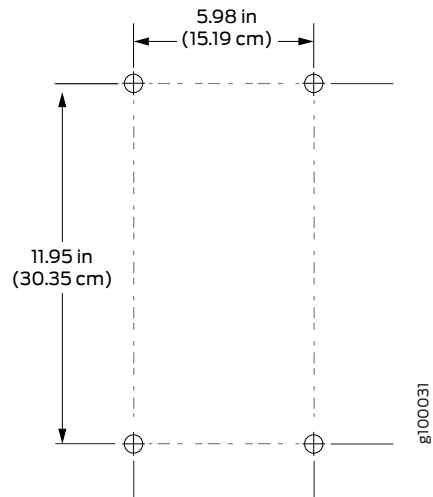


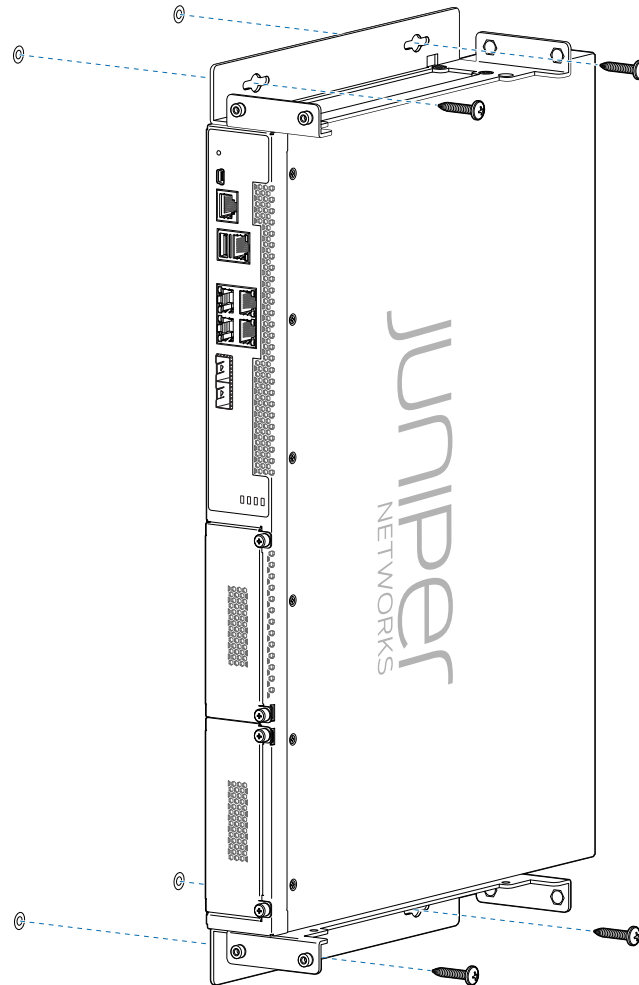
Figure 25: Measurements for Installing Mounting Screws for NFX150-C-S1 Device on a Wall



- a. Drill a hole A and install a mounting screw.
- b. Drill a hole B at a distance of 5.98 in. (15.19 cm.) on a level line to the right from hole A and install a mounting screw.

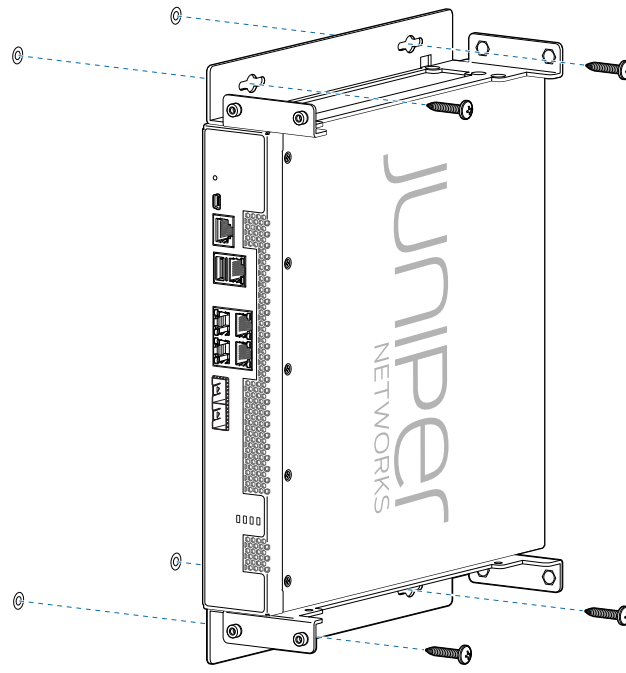
- c. Drill two holes at a distance of 18.67 in. (47.42 cm) on a plumb line from hole A and B, install the mounting screws.
  - d. Screw the mounting screws only part way in, leaving about 1/4 in. (6 mm) distance between the head of the screw and the wall.
3. If the mounting screws are inserted in wall board with no stud behind it, you must use dry wall anchors rated to support 20 lb (9 kg). Insert the screws into wall studs wherever possible to provide added support for the chassis.
  4. Grasp each side of the device, lift the device, and hang the brackets from the mounting screws such that the front panel of the device faces to your right or left side as shown in [Figure 26 on page 70](#) and [Figure 27 on page 71](#).

*Figure 26: Mounting the NFX150-S1 Device on a Wall*



8100016

Figure 27: Mounting the NFX150-C-S1 Device on a Wall



8100033

5. Tighten the mounting screws.

**See Also** • [Configuring an NFX150 Device](#)

### Mounting an NFX150 Device on Two Posts in a Rack

You can mount an NFX150 device on two posts of a 19-in. rack (either a two-post or a four-post rack).



**NOTE:** If you need to mount the device in a recessed position on either a two-post rack or a four-post rack, you can use the 2-in.-recess front brackets provided in the separately orderable four-post rack-mount kit.

Before mounting an NFX150 device on two posts in a rack:

- Place the rack in its permanent location, allowing adequate clearance for airflow and maintenance, and secure it to the building structure.
- Read [“General Safety Guidelines and Warnings”](#) on page 117.
- Remove the device from the shipping carton.

Ensure that you have the following parts and tools available:

- Phillips (+) screwdriver, number 2
- 2 mounting brackets and 8 mounting screws (provided in the accessory box shipped with the device)
- Screws to secure the chassis to the rack (not provided)



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

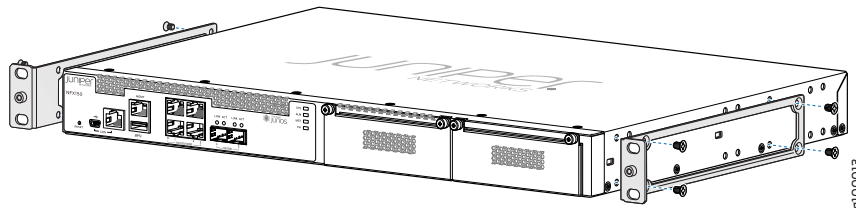


**CAUTION:** If you are mounting multiple devices on a rack, mount a device in the bottom of the rack first and proceed to mount the rest of the devices from bottom to top.

To mount the device on two posts in a rack:

1. Place the device on a flat, stable surface.
2. Align the mounting brackets along the front, rear, or center 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. See [Figure 28 on page 72](#).

*Figure 28: Attaching the Mounting Bracket to the Side Panel of the Device*



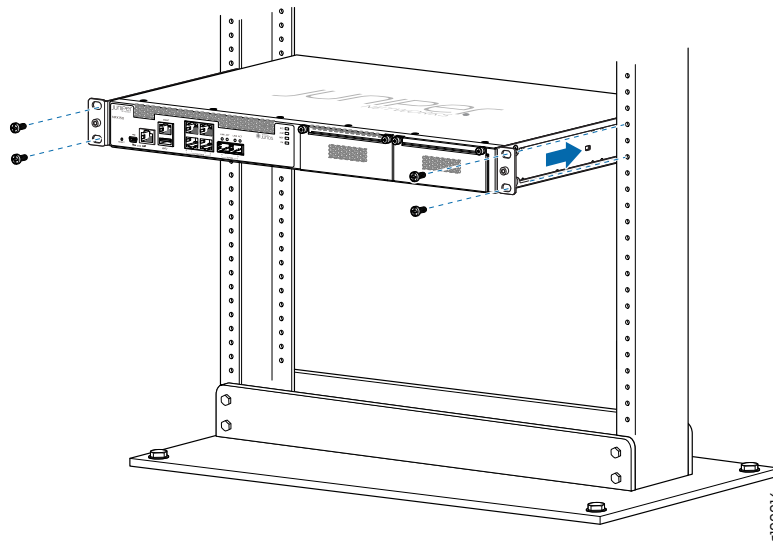
**NOTE:** If you need to mount the device in a recessed position, use the 2-in.-recess front mount brackets from the separately orderable four-post rack-mount kit.

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



6. Have one person grasp both sides of the device, lift the device, 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 29 on page 73](#).

*Figure 29: Mounting the Device on Two Posts in a Rack*



7. Have a second person secure the device to the rack by using the appropriate screws. Tighten the screws.
8. 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.

- See Also**
- [Connecting AC Power to an NFX150 Device on page 75](#)
  - [Connecting Earth Ground to an NFX150 Device on page 73](#)
  - [Rack-Mounting and Cabinet-Mounting Warnings on page 126](#)

## Connecting the NFX150 to Power

- [Connecting Earth Ground to an NFX150 Device on page 73](#)
- [Connecting AC Power to an NFX150 Device on page 75](#)

## Connecting Earth Ground to an NFX150 Device

Earth grounding is recommended, but optional for the NFX150 device. The device functions normally without earth grounding. Electromagnetic Compatibility (EMC) and Electrostatic Discharge (ESD) requirements are met by the device chassis. The AC power cord provides surge protection.

To connect NFX150 device to earth ground, you must use the protective earthing terminal on the device chassis.

This topic describes:

- [Parts and Tools Required for Connecting an NFX150 Device to Earth Ground on page 74](#)
- [Connecting Earth Ground to an NFX150 Device on page 74](#)

### Parts and Tools Required for Connecting an NFX150 Device to Earth Ground

Table 34 on page 74 lists the earthing terminal location, grounding cable requirements, grounding lug specifications, screws and washers required, and the screwdriver needed for connecting a device to earth ground. Before you begin connecting a device to earth ground, ensure you have the parts and tools required for your device.

*Table 34: Parts and Tools Required for Connecting an NFX150 Device to Earth Ground*

Device	Earthing Terminal Location	Grounding Cable Requirements	Grounding Lug Specifications	Screws and Washers	Screwdriver
NFX150-S1	Rear panel of chassis	14 AWG (2 mm <sup>2</sup> ), minimum 90°C wire, or as permitted by the local code	Panduit LCC10-14BWL or equivalent—not provided	<ul style="list-style-type: none"> <li>• Two 10-32 x .25 in. screws with #10 split-lock washer—not provided</li> <li>• Two #10 flat washers—not provided</li> </ul>	Phillips (+) number 2
NFX150-C-S1	Rear panel of chassis	14 AWG (2 mm <sup>2</sup> ), minimum 90°C wire, or as permitted by the local code	Panduit LCC10-14BWL or equivalent—not provided	<ul style="list-style-type: none"> <li>• Two 10-32 x .25 in. screws with #10 split-lock washer—not provided</li> <li>• Two #10 flat washers—not provided</li> </ul>	Phillips (+) number 2

### Connecting Earth Ground to an NFX150 Device

To connect earth ground to a 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. See [Figure 30 on page 75](#) and [Figure 31 on page 75](#).

Figure 30: Connecting a Grounding Cable to an NFX150-S1 Device

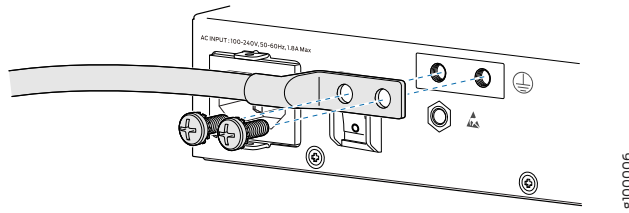
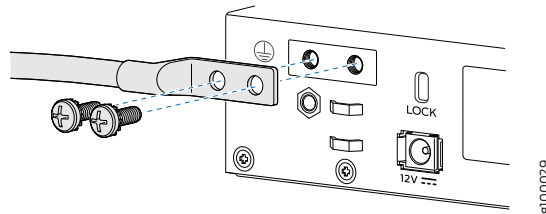


Figure 31: Connecting a Grounding Cable to an NFX150-C-S1 Device



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



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

**See Also** • [Connecting AC Power to an NFX150 Device on page 75](#)

## Connecting AC Power to an NFX150 Device

The power supply in an NFX150 device is located on the rear panel.

Ensure that you have the following parts and tools available:

- A power cord appropriate for your geographical location
- A power cord retainer clip



**CAUTION:** NFX150 device gets 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 an NFX150 Device” on page 38](#)).

To connect AC power to the device:

1. Squeeze the two sides of the power cord retainer clip and insert the L-shaped ends of the wire clip into the holes in the bracket on each side of the AC power cord inlet on the rear panel.

The power cord retainer clip extends out of the chassis by 3 in.

2. 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 an NFX150 Device”](#) on page 38.



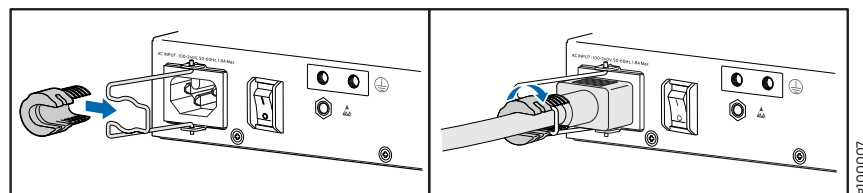
**WARNING:** Ensure that the power cord does not drape where people can trip on it or block access to device components.

3. Insert the coupler end of the power cord into the AC power cord inlet on the rear panel.
4. Push the power cord into the slot in the adjustment nut of the power cord retainer clip. Turn the nut until it is tight against the base of the coupler and the slot in the nut is turned 90° from the top of the device.
5. If the AC power source outlet has a power switch, set it to the OFF (O) position.
6. Insert the power cord plug into an AC power source outlet.
7. If the AC power source outlet has a power switch, set it to the ON (I) position.



**NOTE:** The retainer brackets on your device might be above and below the power inlet rather than on either side.

*Figure 32: Connecting an AC Power Cord to the AC Power Cord Inlet on NFX150 Device*



- See Also**
- [AC Power Supply Specifications for an NFX150 Device](#) on page 38
  - [AC Power Cord Specifications for an NFX150 Device](#) on page 38

## Connecting the NFX150 to the Network

- [Connecting an NFX150 Device to a Network for Out-of-Band Management on page 77](#)
- [Connecting an NFX150 Device to a Management Console on page 78](#)
- [Connecting an NFX150 Device to a Management Console Using Mini-USB Type-B Console Port on page 79](#)
- [Installing a Transceiver in an NFX150 Device on page 80](#)
- [Connecting a Fiber-Optic Cable to an NFX150 Device on page 82](#)

### Connecting an NFX150 Device to a Network for Out-of-Band Management

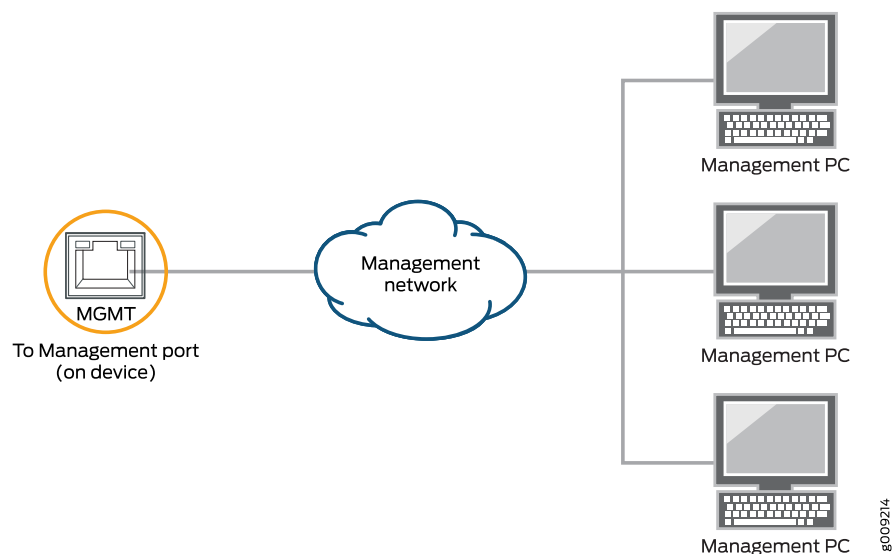
You can monitor and manage the NFX150 device using a dedicated management channel. NFX150 devices have one management port, eight 1-Gigabit Ethernet RJ-45 ports, two 1-Gigabit Ethernet RJ-45 network/uplink ports, two 1-Gigabit Ethernet small form-factor pluggable (SFP) ports, and two 1/10-Gigabit Ethernet SFP+ ports. Use the management port to connect the NFX150 device to a network for out-of-band management.

Ensure that you have an appropriate cable available.

To connect an NFX150 device to a network for out-of-band management (see [Figure 33 on page 77](#)):

1. Connect one end of the cable to the management port (labeled **MGMT**) on the NFX150 device.
2. Connect the other end of the cable to the management switch (see [Figure 33 on page 77](#)).

*Figure 33: Connecting an NFX150 Device to a Network for Out-of-Band Management*



- See Also**
- [NFX150 Chassis on page 24](#)
  - [Connecting an NFX150 Device to a Management Console on page 78](#)

## Connecting an NFX150 Device to a Management Console

NFX150 device 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.

Ensure that you have an RJ-45 to DB-9 rollover cable available. An RJ-45 cable with an RJ-45 to DB-9 adapter is provided with the device.

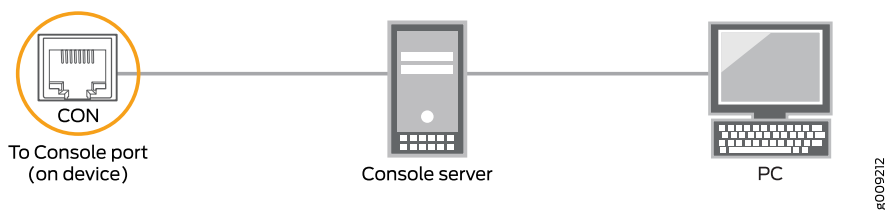


**NOTE:** If your laptop or PC does not have a DB-9 male connector pin and you want to connect your laptop or PC directly to the NFX150 device, use a combination of the RJ-45 cable and RJ-45 to DB-9 adapter supplied with the device and a USB to DB-9 male adapter. You must provide the USB to DB-9 male adapter.

To connect the NFX150 device to a management console (see [Figure 34 on page 78](#) and [Figure 35 on page 78](#)):

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 34 on page 78](#)) or management console (see [Figure 35 on page 78](#)).

*Figure 34: Connecting the NFX150 Device to a Management Console Through a Console Server*



*Figure 35: Connecting the NFX150 Device Directly to a Management Console*



**See Also** • [Console Port Connector Pinouts for NFX150 Devices on page 57](#)

## Connecting an NFX150 Device to a Management Console Using Mini-USB Type-B Console Port

You can configure and manage NFX150 devices by using the RJ-45 console port or the Mini-USB Type-B console port. However, the console input will be active only on one port at a time—only one port will be set active at a time.

By default, the RJ-45 port is set as an active console port and the Mini-USB Type-B port is the passive console port.

If your laptop or PC does not have a DB-9 male connector pin or RJ-45 connector pin, you can connect your laptop or PC directly to an NFX150 device by using a mini-USB cable that has a Standard-A USB connector on one end and a Mini-USB Type-B (5 pin) connector on the other end.

This section describes the process of connecting an NFX150 device to the management console by using the Mini-USB Type-B console port.

For information about configuring and managing an NFX150 device by using the RJ-45 console port, see [“Connecting an NFX150 Device to a Management Console” on page 78](#).

Before you begin connecting an NFX150 device by using the Mini-USB Type-B console port:

- Ensure that the USB to Serial driver is installed on the host machine. You can download the driver from <https://webdownload.juniper.net/swdl/dl/secure/site/1/record/5029.html>
- Ensure that the hyper terminal properties of the console server or laptop are set as follows:
  - Baud rate—9600
  - Flow control—None
  - Data—8
  - Parity—None
  - Stop bits—1
  - DCD state—Disregard

Ensure that you have the following parts and tools available:

- 1 mini-USB cable with Standard-A and Mini-USB Type-B (5-pin) connectors (not provided).

To connect the NFX150 device to the console using Mini-USB Type-B console port:

1. Connect the Standard-A connector of the mini-USB cable to the host machine (PC or Laptop).
2. Connect the Mini-USB Type-B (5-pin) connector of the mini-USB cable to the Mini-USB Type-B console port (labeled **CON**) on the NFX150 device.
3. Set the Mini-USB Type-B console port as the active console port by using the command **port-type**.
4. Reboot the NFX150 device.

After the connection is established, the Mini-USB Type-B becomes the active console port. The host machine connected to the Mini-USB Type-B console port displays log messages and lets you control NFX150 device functionality through it.

**See Also** • [Connecting an NFX150 Device to a Network for Out-of-Band Management on page 77](#)

## Installing a Transceiver in an NFX150 Device

The transceivers for the NFX150 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.

Before you begin installing a transceiver in an NFX150 device, ensure that you have taken the necessary precautions for safe handling of lasers (see [“Laser and LED Safety Guidelines and Warnings for the NFX150 Devices” on page 129](#)).

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

To install a transceiver in a NFX150 device:



**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.





**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. See [Figure 36 on page 81](#) for the correct orientation for your device.

5. Slide the transceiver in gently until it is fully seated. See [Figure 36 on page 81](#) for an example of inserting an SFP or SFP+ transceiver.
6. Remove the rubber safety cap when you are ready to connect the cable to the transceiver.



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

*Figure 36: Installing a Transceiver in an NFX150-S1 Device*

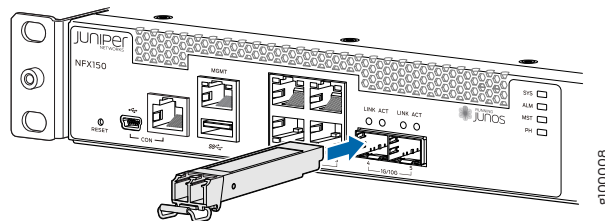
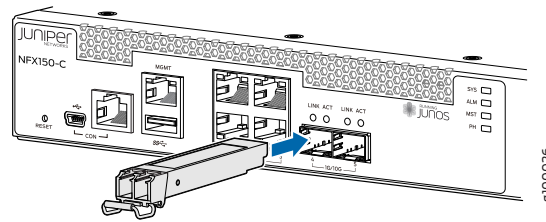


Figure 37: Installing a Transceiver in an NFX150-C-S1 Device



## Connecting a Fiber-Optic Cable to an NFX150 Device

You can connect fiber-optic cables to the field-replaceable unit (FRU) optical transceivers installed in NFX150 devices.

Before you connect a fiber-optic cable to an optical transceiver installed in an NFX150 device, ensure that you have taken the necessary precautions for safe handling of lasers (see “[Laser and LED Safety Guidelines and Warnings for the NFX150 Devices](#)” on page 129).

To connect a fiber-optic cable to an optical transceiver installed in an NFX150 device:



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



**WARNING:** Do not 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 (see [Figure 38 on page 83](#)).
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.

Figure 38: Inserting a Fiber-Optic Cable into a Transceiver on an NFX150-S1 Device

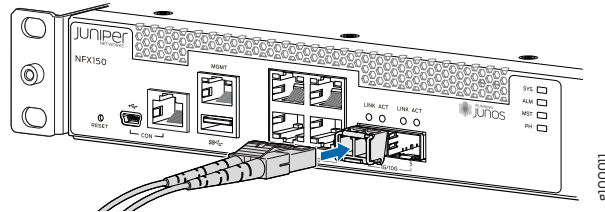
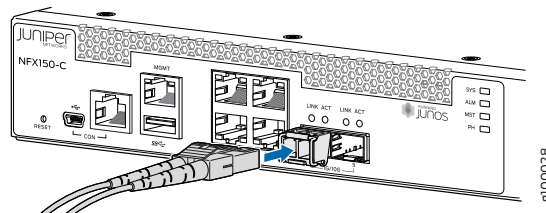


Figure 39: Inserting a Fiber-Optic Cable into a Transceiver on an NFX150-C-S1 Device



- See Also**
- [Disconnecting a Fiber-Optic Cable from an NFX150 Device on page 101](#)
  - [Maintaining Fiber-Optic Cables in an NFX150 Device on page 101](#)

## Initial Configuration on NFX150 Devices

- [Factory-Default Settings on page 83](#)
- [Enabling Basic Connectivity on page 84](#)
- [Establish the Connection on page 86](#)

### Factory-Default Settings

The NFX150 device is shipped with the following factory-default settings:

Table 35: Security Policies

Source Zone	Destination Zone	Policy Action
trust	trust	permit
trust	untrust	permit

**Table 36: Interface Mapping**

Port Label	Interface	Virtual Interface	Security Zone	DHCP State	IP Address
0/0 to 0/3	heth-0-0 to heth-0-3	ge-0/0/0 to ge-0/0/3	trust	Server	192.168.2.1/24
0/4	heth-0-4	ge-1/0/1	untrust	Client	ISP assigned
0/5	heth-0-5	ge-1/0/2	untrust	Client	ISP assigned
MGMT	fxp0	N/A	N/A	N/A	192.168.1.1/24

**Table 37: LTE Interfaces**

Interface	Security Zone	IP Address
cl-1/1/0	N/A	N/A
dl0 (logical)	untrust	ISP assigned

The NFX150 device is shipped with the following services enabled by default: DHCP, HTTPS, and TFTP.

To provide secure traffic, a basic set of screens are configured on the untrust zone.

### Enabling Basic Connectivity

1. Ensure that the NFX150 device is powered on.
2. Connect to the console port:
  - a. Plug one end of the Ethernet cable into the console port on your NFX150 device.
  - b. Connect the other end of the Ethernet cable to the RJ-45-to-DB-9 serial port adapter shipped with your device.
  - c. Connect the RJ-45-to-DB-9 serial port adapter to the serial port on the management device. Use the following values to configure the serial port:  
Baud rate—9600; Parity—N; Data bits—8; Stop bits—1; Flow control—None.



**NOTE:** Alternately, you can use the USB cable to connect to the mini-USB console port on the device. To use the mini-USB console port, you must download the USB driver from the following page and install it on the management device:

<https://www.juniper.net/support/downloads/junos.html>

3. Use any terminal emulation program, such as HyperTerminal, to connect to the device console. The CLI displays a login prompt.

4. Log in as **root** and enter the password **juniper123**. If the software completes booting before you connect to the console, you might need to press the **Enter** key for the prompt to appear:

```
login: root
password: juniper123
```

5. Start the CLI:

```
root@:~ # cli
root@>
```

6. Enter configuration mode:

```
root@> configure
[edit]
root@#
```

7. Change the password for the root administration user account:

```
[edit]
root@# set system root-authentication plain-text-password
New password: password
Retype new password: password
```

8. Enable SSH service for the root user:

```
[edit]
root@# set system services ssh root-login allow
```

9. (Optional) Enable the Internet connection for devices connected on LAN by setting the DNS IP:

```
[edit]
root@# set access address-assignment pool junosDHCPPool family inet dhcp-attributes
name-server dns-server-ip
```

10. Commit the configuration:

```
[edit]
root@# commit
```

## Establish the Connection

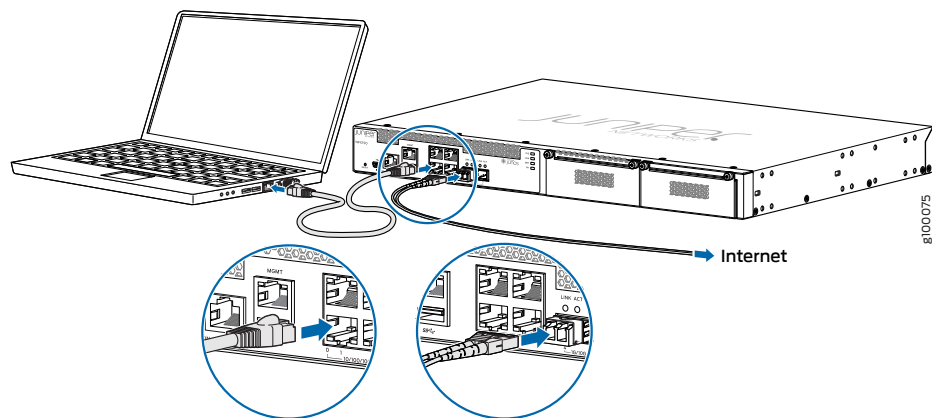
1. Connect the device to the Internet Service Provider (ISP) by using the following step:



**NOTE:** For information on interface mapping, see [Table 36 on page 84](#) and [Table 37 on page 84](#).

Connect one of the WAN ports such as **heth-0-4** or **heth-0-5** to the ISP. The device is assigned an IP address by the ISP through DHCP.

*Figure 40: Connecting the Interfaces on an NFX150-S1 Device*



Optionally, you can obtain a SIM card from the ISP and connect the device through LTE.



**NOTE:** The LTE expansion module must be purchased separately.

2. Connect the laptop to one of the front panel LAN ports such as **heth-0-0**, **heth-0-1**, **heth-0-2**, or **heth-0-3**. The laptop is assigned an IP address by the DHCP server running on the interface.
3. Open a browser on your laptop, navigate to [www.juniper.net](http://www.juniper.net), and verify your connectivity.

### Related Documentation

- [Configuring the LTE Module on NFX Devices](#)

## Installing and Configuring the Expansion Modules

- [Installing the Expansion Module on page 87](#)
- [Installing the LTE Expansion Module on page 87](#)

- [Configuring the LTE Expansion Module on page 89](#)
- [Configuring the LTE Expansion Module for Primary Mode on page 89](#)
- [Configuring the LTE Expansion Module for Dial-on-Demand Mode on page 91](#)
- [Configuring the LTE Expansion Module for Backup Mode on page 93](#)

## Installing the Expansion Module



**NOTE:** You can install only one expansion module on the NFX150-S1 devices. The expansion module must be installed in the first slot, which is present beside the chassis LEDs.

To install the expansion module such as NFX-EM-6T2SFP in an NFX150 device:

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the grounding point on the back of the device.
2. Power off the device using the following command:
 

```
request system power-off
```
3. Remove both the blank modules installed on the device:
  - Loosen the screws on the faceplate of the blank module.
  - Grasp the screws on each side and remove the blank module.
4. Remove the expansion module from the electrostatic bag.
5. Grasp the screws on each side of the module faceplate and align the notches in the connector at the rear of the module with the notches in the module slot in the device.
6. Slide the module in until it lodges firmly in the services gateway.
7. Using a 1/8-in. (3-mm) flat-blade (–) screwdriver, tighten the screws on each side of the module faceplate.
8. Power on the device.

## Installing the LTE Expansion Module

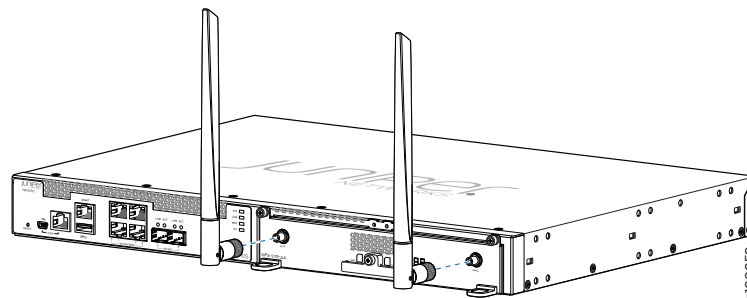


**NOTE:** You can install only one expansion module on the NFX150-S1 devices. The expansion module must be installed in the first slot, which is present beside the chassis LEDs.

To install the LTE expansion modules such as NFX-LTE-AE and NFX-LTE-AA in an NFX150 device:

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the grounding point on the back of the device.
2. Power off the device using the following command:  
**request system power-off**
3. Remove both the blank modules installed on the device:
  - Loosen the screws on the faceplate of the blank module.
  - Grasp the screws on each side and remove the blank module.
4. Remove the LTE expansion module from the electrostatic bag.
5. Grasp the screws on each side of the module faceplate and align the notches in the connector at the rear of the module with the notches in the module slot in the device.
6. Slide the module in until it lodges firmly in the services gateway.
7. Using a 1/8-in. (3-mm) flat-blade (–) screwdriver, tighten the screws on each side of the module faceplate.
8. Remove the cover from the SIM slot, SIM 1. Insert the SIM card into the SIM slot. You can use the other slot, SIM 2, for installing a secondary SIM.
9. Replace the cover over the SIM slots.
10. Attach the antennas to the chassis. See [Figure 41 on page 88](#).

*Figure 41: Attaching Antennas to the LTE Expansion Module*



11. Power on the device.



## Configuring the LTE Expansion Module

The LTE expansion module can be configured in three modes:

- Always-on—The LTE expansion module connects to the 3G/4G network after booting. The connection is always maintained, as long as there are no network or connectivity problems.



**NOTE:** The default mode for LTE expansion module is always-on. For the LTE expansion module to be operational, you only need to install one SIM card on the LTE expansion module before powering on the device. There is no additional configuration required.

- Dial-on-demand—The LTE expansion module initiates a connection when it receives interesting traffic. You define interesting traffic using the dialer filter. To configure dial-on-demand using a dialer filter, you first configure the dialer filter and then apply the filter to the dialer interface.
- Backup—The LTE expansion module connects to the 3G/4G network when the primary connection fails.

You can configure the LTE expansion module either as a primary interface or as a backup interface. When configured as the primary interface, the LTE expansion module supports both the always-on and dial-on-demand modes. When configured as the backup interface, the LTE expansion module connects to the network only when the primary interface fails.

Profile configuration is not needed in most scenarios, as LTE has a built-in database of many service providers and can automatically select the profile to use. Occasionally, you might need to specify profiles explicitly in the configuration, in which case, the automatic profile selection is disabled.

Before you begin the configuration, insert the Subscriber Identity Module (SIM) in the LTE expansion module. The SIM uses a profile to establish a connection with the network. You can configure up to 16 profiles for each SIM card. The LTE expansion module supports two SIM cards and so you can configure a total of 32 profiles, although only one profile can be active at a time. To configure the SIM profile, you will require the following information from the service provider:

- Username and password
- Access Point Name (APN)
- Authentication (Challenge Handshake Authentication Protocol (CHAP) or Password Authentication Protocol (PAP))

## Configuring the LTE Expansion Module for Primary Mode

Before you begin the procedure, ensure that the logical interface (dl0.0) is not configured as a backup. If dl0.0 is configured as a backup option for any interface on the device,

then this configuration overrides the configuration outlined in this procedure, and the LTE expansion module will function as a backup interface.

Use the **show interfaces | display set | match backup-option | match dl0.0** command to check whether any interface uses dl0.0 as a backup interface. If dl0.0 is configured as a backup interface, then delete the configuration by issuing the following command:  
**delete interfaces *interface-name* unit 0 backup-options interface dl0.0**

To configure the LTE expansion module as a primary interface:

1. Configure the dialer interface:

```
user@host# set interfaces dl0 unit 0 family inet negotiate-address
user@host# set interfaces dl0 unit 0 family inet6 negotiate-address
user@host# set interfaces dl0 unit 0 dialer-options pool dialer-pool-number
user@host# set interfaces dl0 unit 0 dialer-options dial-string dial-number
user@host# set interfaces dl0 unit 0 dialer-options always-on
```

2. Configure the dialer pool for the LTE physical interface:

```
user@host# set interfaces cl-1/1/0 dialer-options pool dialer-pool-number
```



**NOTE:** The *dialer-pool-number* is always 1 as there is only one LTE interface on the NFX150.

3. Configure the profile.

```
user@host# run request modem wireless create-profile profile-id profile-id cl-1/1/0 slot
sim-slot-number access-point-name apn-name authentication-method none
```



**NOTE:** *sim-slot-number* is the slot on the module in which the SIM card is inserted.

4. Verify that the profile is configured successfully:

```
user@host# run show modem wireless profiles cl-1/1/0 slot 1
```

5. Activate the SIM card:

```
user@host# set interfaces cl-1/1/0 act-sim sim-slot-number
```

6. Select the profile and configure the radio access type for the SIM card:

```
user@host# set interfaces cl-1/1/0 cellular-options sim sim-slot-number select-profile profile-id
profile-id
user@host# set interfaces cl-1/1/0 cellular-options sim sim-slot-number radio-access
automatic
```



**NOTE:** If a SIM card is installed in the second slot, then select the profile and configure the radio access type for the SIM card in the second slot as well.

7. Verify the status of the wireless network and dialer interface:

```
user@host# run show modem wireless network
user@host# run show interfaces dl0.0
```

## Configuring the LTE Expansion Module for Dial-on-Demand Mode

When the LTE expansion module is configured as a primary interface, it can function either in always-on mode or in dial-on-demand mode. In always-on mode, the interface remains connected to the network whereas in dial-on-demand mode, the connection is established only when needed.

In dial-on-demand mode, the dialer interface is enabled only when network traffic configured as an “interesting traffic” arrives on the network. Interesting traffic triggers or activates the wireless WAN connection. You define an interesting packet by using the dialer filter. To configure dial-on-demand by using a dialer filter, you first configure the dialer filter and then apply the filter to the dialer interface.

Once the traffic is sent over the network, an inactivity timer is triggered and the connection is closed after the timer expires.



**NOTE:** The dial-on-demand mode is supported only if the LTE expansion module is configured as a primary interface.

To configure the LTE expansion module as a dial-on-demand interface:

1. Configure the dialer interface:

```
user@host# set interfaces dl0 unit 0 family inet negotiate-address
user@host# set interfaces dl0 unit 0 family inet6 negotiate-address
user@host# set interfaces dl0 unit 0 family inet filter dialer dialer-filter-name
user@host# set interfaces dl0 unit 0 dialer-options pool dialer-pool-number
user@host# set interfaces dl0 unit 0 dialer-options dial-string dial-number
```

2. (Optional) Configure the **idle-timeout** value, which determines the duration for which the connection will remain enabled in the absence of interesting traffic.

```
user@host# set interfaces dl0 unit 0 dialer-options idle-timeout idle-timeout-value
```

3. Configure the dialer pool for the LTE physical interface:

```
user@host# set interfaces cl-1/1/0 dialer-options pool dialer-pool-number
```



**NOTE:** The *dialer-pool-number* is always 1 as there is only one LTE interface on the NFX150.

4. Create the dialer filter rule:

```
user@host# set firewall family inet dialer-filter dialer-filter-name term term1 from
destination-address ip-address then note
```

5. Set the default route:

```
set routing-options static route ip-address next-hop dl0.0
```

6. Configure the profile.

```
user@host# run request modem wireless create-profile profile-id profile-id cl-1/1/0 slot
sim-slot-number access-point-name apn-name authentication-method none
```



**NOTE:** *sim-slot-number* is the slot on the module in which the SIM card is inserted.

7. Verify that the profile is configured successfully:

```
user@host# run show modem wireless profiles cl-1/1/0 slot 1
```

8. Activate the SIM card:

```
user@host# set interfaces cl-1/1/0 act-sim sim-slot-number
```

9. Select the profile and configure the radio access type for the SIM card:

```
user@host# set interfaces cl-1/1/0 cellular-options sim sim-slot-number select-profile profile-id
profile-id
user@host# set interfaces cl-1/1/0 cellular-options sim sim-slot-number radio-access
automatic
```



**NOTE:** If a SIM card is installed in the second slot, then select the profile and configure the radio access type for the SIM card in the second slot as well.

10. Verify the configuration by sending traffic to the destination address. The traffic is routed to the dl0 interface and if it matches the dialer filter rule, then the dl0 is triggered to dial.

11. Verify the status of the wireless network and dialer interface:

```
user@host# run show modem wireless network
user@host# run show interfaces dl0.0
```

## Configuring the LTE Expansion Module for Backup Mode

You can configure the LTE expansion module as a backup interface. If the primary interface fails, the LTE expansion module connects to the network and remains online only until the primary interface becomes functional. The dialer interface is enabled only when the primary interface fails.

To configure the LTE expansion module as a backup interface:

1. Configure the dialer interface:

```
user@host# set interfaces dl0 unit 0 family inet negotiate-address
user@host# set interfaces dl0 unit 0 family inet6 negotiate-address
user@host# set interfaces dl0 unit 0 dialer-options pool dialer-pool-number
user@host# set interfaces dl0 unit 0 dialer-options dial-string dial-number
```

2. Configure the dialer pool for the LTE physical interface:

```
user@host# set interfaces cl-1/1/0 dialer-options pool dialer-pool-number
```



**NOTE:** The *dialer-pool-number* is always 1 as there is only one LTE interface on the NFX150.

3. Configure the profile.

```
user@host# run request modem wireless create-profile profile-id profile-id cl-1/1/0 slot
sim-slot-number access-point-name l3vpn.corp authentication-method none
```



**NOTE:** *sim-slot-number* is the slot on the LTE expansion module in which the SIM card is inserted.

4. Verify that the profile is configured successfully:

```
user@host# run show modem wireless profiles cl-1/1/0 slot 1
```

5. Activate the SIM card:

```
user@host# set interfaces cl-1/1/0 act-sim sim-slot-number
```

6. Select the profile and configure the radio access type for the SIM card:

```
user@host# set interfaces cl-1/1/0 cellular-options sim sim-slot-number select-profile profile-id
profile-id
user@host# set interfaces cl-1/1/0 cellular-options sim sim-slot-number radio-access
automatic
```



**NOTE:** If a SIM card is installed in the second slot, then select the profile and configure the radio access type for the SIM card in the second slot as well.

7. Configure the Ethernet interface as the primary interface, which connects to the wireless network. Configure the dl0 interface as the backup interface.

```
user@host# set interfaces ge-1/0/2 unit 0 family inet address 192.168.2.1/24
user@host# set interfaces ge-1/0/2 unit 0 backup-options interface dl0.0
```

8. Verify the status of the wireless network and dialer interface:

```
user@host# run show modem wireless network
user@host# run show interfaces dl0.0
```

## Upgrading the Modem Firmware on NFX Devices Through Over-the-Air (OTA)

Over-the-Air (OTA) firmware upgrade enables automatic and timely upgrade of modem firmware when new firmware versions are available. The OTA upgrade can be enabled or disabled on the LTE module. OTA is disabled by default.



**NOTE:** When upgrading the software on the NFX devices, the LTE firmware is also upgraded if the software contains a newer firmware version.

1. Enable OTA upgrade on the LTE module:

```
user@host > request modem wireless fota cl-1/1/0 enable
```

```
Set FOTA on modem succeeded
```

2. Initiate the firmware upgrade:

```
user@host > request modem wireless upgrade cl-1/1/0
```

```
Launch FOTA upgrade succeeded
```

3. Verify the firmware upgrade status:

```
user@host > show modem wireless firmware cl-1/1/0
```

```
LTE mPIM firmware details
  Product name: Junos LTE mPIM
  Serial number: D23F4349-10FA-41AA-A538-03648DE
  Hardware version: AcceleratedConcepts/porter
  Firmware version: 17.11.13
  MAC: 00:00:5e:00:53:82
  System uptime: 4632 seconds
Wireless modem firmware details
  Modem firmware version:
9999999_9904609_SWI9X30C_02.24.05.06_00_GENERIC_002.026_000
```

```

Modem Firmware build date: 19/05/2017
Card type: MC7455
Modem manufacturer: Sierra Wireless, Inc
Hardware version: 1.0
Power & Temperature: Normal 3368 mV, Normal 29.00 C
OTA status
  State: Enabled
  New firmware available: No
Number of SIM: 1
Slot of active: 1
Status of SIM 1
  SIM state: SIM present
  Modem PIN security status: Disabled
  SIM status: SIM Okay
  SIM user operation needed: No Op
  Retries remaining: 3

```

4. Check the LTE module connection status:

```
user@host > show modem wireless network cl-1/1/0
```

```

LTE Connection details
  Connected time: 2880
  IP: 10.12.219.210
  Gateway: 10.12.219.209
  DNS: 123.123.123.123
  IPv6: ::
  Gatewayv6: ::
  DNSv6: ::
  Input bps: 0
  Output bps: 0
  Bytes Received: 1952
  Bytes Transferred: 2164
  Packets Received: 10
  Packets Transferred: 20
Wireless Modem Network Info
  Current Modem Status: Connected
  Current Service Status: Normal
  Current Service Type: PS
  Current Service Mode: LTE
  Current Band: B3
  Network: UNICOM
  Mobile Country Code (MCC): 460
  Mobile Network Code (MNC): 1
  Location Area Code (LAC): 65534
  Routing Area Code (RAC): 0
  Cell Identification: 239907605
  Access Point Name (APN): 3gnet
  Public Land Mobile Network (PLMN): CHN-UNICOM
  Physical Cell ID (PCI): 452
  International Mobile Subscriber Identification (IMSI): *****
  International Mobile Equipment Identification (IMEI/MEID): *****
  Integrate Circuit Card Identity (ICCID): 89860117811046631207
  Reference Signal Receiving Power (RSRP): -71
  Reference Signal Receiving Quality (RSRQ): -8
  Signal to Interference-plus-Noise Ratio (SiNR): 19
  Signal Noise Ratio (SNR): 22
  Energy per Chip to Interference (ECIO): 0

```

**Related Documentation** • *Configuring the LTE Module on NFX Devices*



# Maintaining Components

- [Maintaining Transceivers on the NFX150 on page 97](#)
- [Maintaining Fiber-Optic Cables on NFX150 Devices on page 101](#)
- [Removing the NFX150 Device from a Rack or Cabinet on page 104](#)

## Maintaining Transceivers on the NFX150

---

- [Installing a Transceiver in an NFX150 Device on page 97](#)
- [Removing a Transceiver from an NFX150 Device on page 99](#)

### Installing a Transceiver in an NFX150 Device

The transceivers for the NFX150 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.

Before you begin installing a transceiver in an NFX150 device, ensure that you have taken the necessary precautions for safe handling of lasers (see [“Laser and LED Safety Guidelines and Warnings for the NFX150 Devices” on page 129](#)).

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

To install a transceiver in a NFX150 device:



**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.



**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.



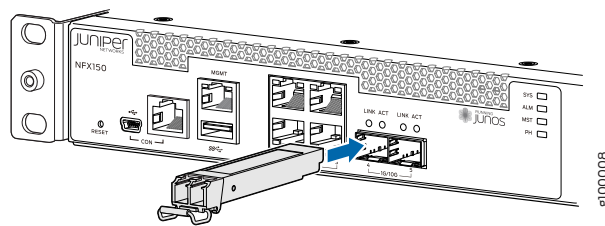
**CAUTION:** Before you slide the transceiver into the port, ensure that the transceiver is aligned correctly. Misalignment might cause the pins to bend, making the transceiver unusable. See [Figure 36 on page 81](#) for the correct orientation for your device.

5. Slide the transceiver in gently until it is fully seated. See [Figure 36 on page 81](#) for an example of inserting an SFP or SFP+ transceiver.
6. Remove the rubber safety cap when you are ready to connect the cable to the transceiver.

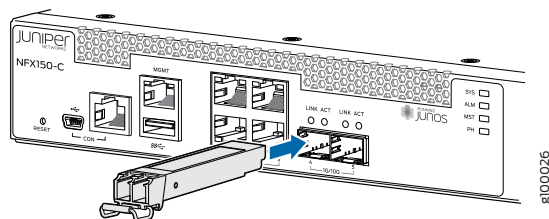


**WARNING:** Do not look directly into a fiber-optic transceiver or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.

*Figure 42: Installing a Transceiver in an NFX150-S1 Device*



*Figure 43: Installing a Transceiver in an NFX150-C-S1 Device*



## Removing a Transceiver from an NFX150 Device

The transceivers for the NFX150 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.

Before you begin removing a transceiver from the NFX150 device, ensure that you have taken the necessary precautions for safe handling of lasers (see [“Laser and LED Safety Guidelines and Warnings for the NFX150 Devices”](#) on page 129).

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

To remove a transceiver from the NFX150 device:

1. Place the antistatic bag or antistatic mat on a flat, stable surface.
2. Label the cable connected to the transceiver so that you can reconnect it correctly.



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



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



**CAUTION:** Do not bend fiber-optic cables beyond their minimum bend radius. 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 an NFX150 Device”](#) on page 101). 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.

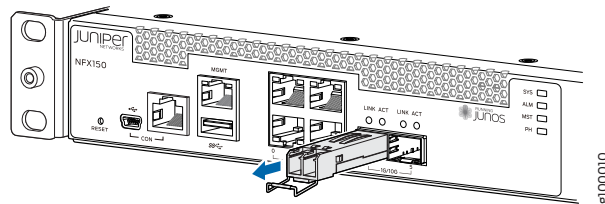
5. Grasp the transceiver ejector lever and gently slide the transceiver approximately 0.5 in. (1.3 cm) straight out of the port (see [Figure 44 on page 100](#)).



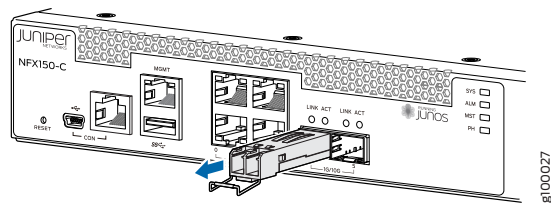
**CAUTION:** To avoid electrostatic discharge (ESD) damage to the transceiver, do not touch the connector pins at the end of the transceiver.

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.

*Figure 44: Removing a Transceiver from an NFX150-S1 Device*



*Figure 45: Removing a Transceiver from an NFX150-C-S1 Device*



**See Also** • [Installing a Transceiver in an NFX150 Device on page 80](#)

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## Maintaining Fiber-Optic Cables on NFX150 Devices

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- [Maintaining Fiber-Optic Cables in an NFX150 Device on page 101](#)
- [Disconnecting a Fiber-Optic Cable from an NFX150 Device on page 101](#)
- [Connecting a Fiber-Optic Cable to an NFX150 Device on page 102](#)

### Maintaining Fiber-Optic Cables in an NFX150 Device

To maintain fiber-optic cables in NFX150 devices:

- 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<sup>®</sup> Fiber Cleaner. Follow the directions in the cleaning kit you use.

- See Also**
- [Disconnecting a Fiber-Optic Cable from an NFX150 Device on page 101](#)
  - [Maintaining Fiber-Optic Cables in an NFX150 Device on page 101](#)

### Disconnecting a Fiber-Optic Cable from an NFX150 Device

Before you disconnect a fiber-optic cable from an optical transceiver installed in an NFX150 device, ensure that you have taken the necessary precautions for safe handling of lasers (see “[Laser and LED Safety Guidelines and Warnings for the NFX150 Devices](#)” on page 129).

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

To disconnect a fiber-optic cable from an optical transceiver installed in the NFX150 device:

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.



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



**WARNING:** Do not 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.



**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.

- See Also**
- [Installing a Transceiver in an NFX150 Device on page 80](#)
  - [Maintaining Fiber-Optic Cables in an NFX150 Device on page 101](#)

## Connecting a Fiber-Optic Cable to an NFX150 Device

You can connect fiber-optic cables to the field-replaceable unit (FRU) optical transceivers installed in NFX150 devices.

Before you connect a fiber-optic cable to an optical transceiver installed in an NFX150 device, ensure that you have taken the necessary precautions for safe handling of lasers (see “[Laser and LED Safety Guidelines and Warnings for the NFX150 Devices](#)” on page 129).

To connect a fiber-optic cable to an optical transceiver installed in an NFX150 device:



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



**WARNING:** Do not 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 (see [Figure 38 on page 83](#)).
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.

*Figure 46: Inserting a Fiber-Optic Cable into a Transceiver on an NFX150-S1 Device*

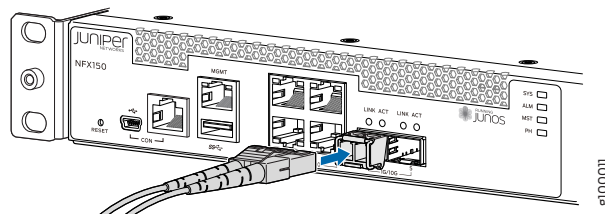
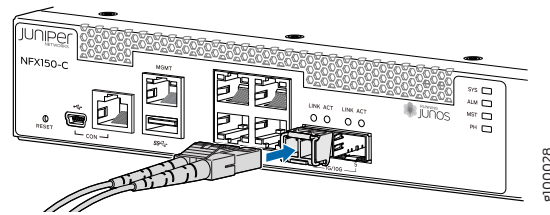


Figure 47: Inserting a Fiber-Optic Cable into a Transceiver on an NFX150-C-S1 Device



- See Also**
- [Disconnecting a Fiber-Optic Cable from an NFX150 Device on page 101](#)
  - [Maintaining Fiber-Optic Cables in an NFX150 Device on page 101](#)

## Removing the NFX150 Device from a Rack or Cabinet

- [Powering off an NFX150 Device on page 104](#)
- [Removing an NFX150 Device from a Rack or Cabinet on page 106](#)

### Powering off an NFX150 Device

To power off the NFX150 device, follow the procedure in this topic.

Before you power off the switch:

- Ensure that you understand how to prevent electrostatic discharge damage. See [“Prevention of Electrostatic Discharge Damage” on page 142](#).
- 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 switch:

- An electrostatic discharge (ESD) grounding strap
- An external management device such as a PC
- A cable to connect the external management device to the console port (CON) or management port (MGMT) on the device

To power off the device:

1. Connect the management device (such as a PC) to the console (CON) port or the management (MGMT) port on the device:
  - For connecting a management device to the console port, see [“Connecting an NFX150 Device to a Management Console” on page 78](#).
  - For connecting a management device to the management port, see [“Connecting an NFX150 Device to a Network for Out-of-Band Management” on page 77](#)
2. From the PC connected to the device, issue the following operational mode CLI command:



```
user@switch> request system halt
```

This command shuts down the device gracefully and preserves system state information. A message displays on the console confirming that the operating system has halted.

You will see the following output (or something similar, depending on the hardware being shut down):

```
user@switch> request system halt
warning: This command will halt all the members.
If planning to halt only one member use the member option
Halt the system ? [yes,no] (no) yes

*** FINAL System shutdown message from user@switch ***
System going down IMMEDIATELY

Shutdown NOW!
[pid 14102]
message sent

{master:0}
user@switch> Waiting (max 300 seconds) for system process `vnlru' to stop...done
Waiting (max 300 seconds) for system process `vnlru_mem' to stop...done
Waiting (max 300 seconds) for system process `bufdaemon' to stop...done
Waiting (max 300 seconds) for system process `syncer' to stop...
Syncing disks, vnodes remaining...3 3 1 2 2 0 0 0 0 done

syncing disks... All buffers synced.
Uptime: 38d18h0m6s
recorded reboot as normal shutdown

The operating system has halted.
Please press any key to reboot
```



**CAUTION:** The final output of any version of this command is the The operating system has halted. Please press any key to reboot. message. Wait for at least 60 seconds after seeing this message and before following the instructions in Steps 3 and 4 to power off the device.



**CAUTION:** Ensure that you have halted your system safely before turning off the power supply.

3. Wrap and fasten one end of the ESD grounding strap around your wrist and connect the other end to a site ESD point.
4. Set the power switch to OFF (O) position.

- See Also** • [Connecting AC Power to an NFX150 Device on page 75](#)

## Removing an NFX150 Device from a Rack or Cabinet

If you need to relocate an installed NFX150 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 at the top of the rack first and proceed to remove the rest of the devices from top to bottom.



**CAUTION:** At least two people must be available to lift a device chassis out of a rack—one person to unscrew the mounting screws from the brackets and the second person to hold the chassis.

Before removing the device from a rack:

- Ensure that the rack or cabinet is stable and secured to the building.
- Ensure that there is enough space to place the removed device in its new location and along the path to the new location.
- Read “[General Safety Guidelines and Warnings](#)” on page 117, with particular attention to “[Chassis Lifting Guidelines for NFX150 Devices](#)” on page 123.
- Ensure that the device has been safely powered off and that you have unplugged (disconnected) the power cords.
- Ensure that you have disconnected any cables or wires attached to the device.

Ensure that you have the following parts and tools available to remove the device:

- A Phillips (+) screwdriver, number 2 or number 3, depending on the size of your rack mounting screws.
- A labeled bag to hold the removed screws.

To remove an NFX150 device from a rack:

1. Use the appropriate Phillips (+) screwdriver to remove the mounting screws that attach the chassis front-mounting brackets to the rack.
2. Place the removed screws in a labeled bag. You will need them when you reinstall the chassis.
3. Lift the chassis from the rack and carefully move the chassis to its new location.

- See Also** • [General Safety Guidelines and Warnings on page 117](#)

- [Chassis Lifting Guidelines for NFX150 Devices on page 123](#)



## CHAPTER 5

# Troubleshooting Hardware

- [Understanding Alarm Types and Severity Levels on NFX150 Devices on page 109](#)

## Understanding Alarm Types and Severity Levels on NFX150 Devices

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Alarms alert you to conditions that might prevent normal operation of the NFX150 device. [Table 38 on page 109](#) provides a list of alarm terms and definitions that may help you in monitoring the device.

*Table 38: Alarm Terms and Definitions*

Term	Definition
Alarm	Signal alerting you to conditions that might prevent normal operation. LEDs are the alarm indicators on the device. Blinking amber LEDs indicate yellow alarm conditions for chassis components.
Alarm condition	Failure event that triggers an alarm.
Alarm severity levels	Seriousness of the alarm. The level of severity can be either major (red) or minor (yellow). <ul style="list-style-type: none"><li>• 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.<ul style="list-style-type: none"><li>• One or more hardware components have failed.</li><li>• One or more hardware components have exceeded temperature thresholds.</li><li>• An alarm condition configured on an interface has triggered a critical warning.</li></ul></li><li>• 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. For example, a missing rescue configuration generates a yellow system alarm.</li></ul>
Alarm types	Alarms include the following types: <ul style="list-style-type: none"><li>• Chassis alarm—Predefined alarm triggered by a physical condition on the device such as a power supply failure or excessive component temperature.</li><li>• Interface alarm—Alarm you configure to alert you when an interface link is down. Applies to <b>ethernet</b>, <b>fibre-channel</b>, and <b>management-ethernet</b> interfaces. You can configure a red (major) or yellow (minor) alarm for the link-down condition, or have the condition ignored.</li><li>• 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.</li></ul>

**Related Documentation** • [NFX150 Device Hardware Overview on page 19](#)

## CHAPTER 6

# Contacting Customer Support and Returning the Chassis or Components

- [Returning the NFX150 Chassis or Components on page 111](#)

## Returning the NFX150 Chassis or Components

- [Contacting Customer Support to Obtain a Return Materials Authorization for an NFX150 Device on page 111](#)
- [Returning a NFX150 Device or Component for Repair or Replacement on page 112](#)
- [Locating the Serial Number on an NFX150 Device on page 113](#)
- [Packing an NFX150 Device or Component for Shipping on page 114](#)

## Contacting Customer Support to Obtain a Return Materials Authorization for an NFX150 Device

If you are returning a NFX150 device or component to Juniper Networks for repair or replacement, 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 case 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 [“Locating the Serial Number on an NFX150 Device” on page 113](#).

Before you request an RMA from JTAC, be prepared to provide the following information:

- Your existing case number, if you have one
- Serial number of the component
- Your name, organization name, telephone number, fax number, and shipping address
- Details of the failure or problem
- Type of activity being performed on the 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:

- Case Manager at CSC: <https://www.juniper.net/cm/>
- 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 11-digit case number followed by the pound (#) key for an existing case, or press the star (\*) key to be routed to the next available support engineer.

The support representative validates your request and issues an RMA number for return of the component.

- See Also**
- [Returning a NFX150 Device or Component for Repair or Replacement on page 112](#)

## Returning a NFX150 Device or Component for Repair or Replacement

If you need to return a NFX150 device or component to Juniper Networks for repair or replacement, follow this procedure:

1. Determine the serial number of the device or component. For instructions, see “[Locating the Serial Number on an NFX150 Device](#)” on page 113.
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 an NFX150 Device](#)” on page 111.



NOTE: Do not return any device or 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 NFX150 device or component for shipping as described in “[Packing an NFX150 Device or Component for Shipping](#)” on page 114.

For more information about return and repair policies, see the customer support page at <https://www.juniper.net/support/guidelines.html>.

- See Also**
- [NFX150 Device Hardware Overview on page 19](#)



## Locating the Serial Number on an NFX150 Device

If you are returning a device to Juniper Networks for repair or replacement, you must locate the serial number of the device. 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 device is operational and you can access the CLI, you can list serial numbers for the device with a CLI command.

- [Listing the Device and Components Details with the CLI on page 113](#)
- [Locating the Chassis Serial Number ID Label on an NFX150 Device on page 113](#)

### Listing the Device and Components Details with the CLI

To list the device and device components and their serial numbers, enter the following CLI command:

The following output lists the device components and serial numbers for a NFX150 device:

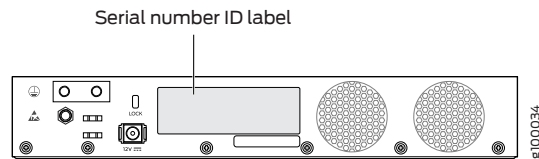
```
user@switch> show chassis hardware
Hardware inventory:
Item          Version  Part number  Serial number  Description
CChassis
Pseudo CB 0
Routing Engine 0
FPC 0         REV 02    650-065559   DC4115AN0025   RE-NFX150-ATT-S2
  CPU         BUILTIN   BUILTIN      FPC CPU
  PIC 0       REV 02    BUILTIN      BUILTIN        10x10/100/1000 Base-T-2x1G
  SFP-
    Xcvr 12    REV 01    740-031980   ARN2FUA        SFP+-10G-SR
    Xcvr 13    REV 01    740-031980   AN40MW2        SFP+-10G-SR
Power Supply 0
Fan Tray 0
Back Airflow - AFO
Fan Tray 1
Back Airflow - AFO
fan-ctrl-0 0, Front to
fan-ctrl-0 1, Front to
```

For information about the **show chassis hardware** command, see the *Junos OS System Basics and Services Command Reference* at <https://www.juniper.net/documentation/software/junos/index.html>.

### Locating the Chassis Serial Number ID Label on an NFX150 Device

The serial number ID label is located on the back of the chassis on an NFX150 device. See [Figure 48 on page 114](#).

Figure 48: Location of the Serial Number ID Label on an NFX150 Device



- See Also**
- [Contacting Customer Support to Obtain a Return Materials Authorization for an NFX150 Device on page 111](#)

## Packing an NFX150 Device or Component for Shipping

If you are returning a NFX150 device or component to Juniper Networks for repair or replacement, pack the item as described in this topic.

Before you pack a NFX150 device or component:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See [“Prevention of Electrostatic Discharge Damage” on page 142](#).
- 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 an NFX150 Device” on page 111](#).

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 NFX150 Device for Shipping on page 114](#)
- [Packing NFX150 Device Components for Shipping on page 115](#)

### Packing a NFX150 Device for Shipping

To pack a NFX150 device for shipping:

1. Power down the NFX150 device and remove the power cables. See [“Powering off an NFX150 Device” on page 104](#).
2. Remove the cables that connect the device to all external devices.
3. Remove all field-replaceable units (FRUs) from the NFX150 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 NFX150 Devices” on page 123](#)) and place the device in an antistatic bag.
6. Place the device in the shipping carton.
7. Place the packing foam on top and around the device.
8. If you are returning accessories or FRUs with the device, pack them as instructed in [“Packing an NFX150 Device or Component for Shipping” on page 114](#).
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 NFX150 Device Components for Shipping**

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**CAUTION:** Do not stack the NFX150 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 NFX150 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.

**See Also** • [Returning a NFX150 Device or Component for Repair or Replacement on page 112](#)



## CHAPTER 7

# Safety and Compliance Information

- General Safety Guidelines and Warnings on page 117
- Definitions of Safety Warning Levels on page 119
- Qualified Personnel Warning on page 120
- Warning Statement for Norway and Sweden on page 121
- Fire Safety Requirements on page 122
- Installation Instructions Warning on page 123
- Chassis Lifting Guidelines for NFX150 Devices on page 123
- Restricted Access Warning on page 124
- Ramp Warning on page 125
- Rack-Mounting and Cabinet-Mounting Warnings on page 126
- Laser and LED Safety Guidelines and Warnings for the NFX150 Devices on page 129
- Radiation from Open Port Apertures Warning on page 134
- Maintenance and Operational Safety Guidelines and Warnings on page 135
- General Electrical Safety Guidelines and Warnings on page 140
- Action to Take After an Electrical Accident on page 141
- Prevention of Electrostatic Discharge Damage on page 142
- AC Power Electrical Safety Guidelines on page 143
- AC Power Disconnection Warning on page 144
- TN Power Warning on page 145

## General Safety Guidelines and Warnings

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

- Perform only the procedures explicitly described in the hardware documentation for this device. Make sure that only authorized service personnel perform other system services.
- Keep the area around the device clear and free from dust before, during, and after installation.

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

**Related Documentation**

- [AC Power Electrical Safety Guidelines on page 143](#)
- *PTX5000 AC Power Electrical Safety Guidelines*
- *PTX5000 AC Power Electrical Safety Warnings*
- [General Electrical Safety Guidelines and Warnings on page 140](#)
- [Maintenance and Operational Safety Guidelines and Warnings on page 135](#)
- [Installation Instructions Warning on page 123](#)
- *Grounded Equipment Warning*

## 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.



**WARNING:** This symbol alerts you to the risk of personal injury from a laser.



**WARNING:** This symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents.

**Waarschuwing** Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijke letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van standaard maatregelen om ongelukken te voorkomen.

**Varoitus** Tämä varoitusmerkki merkitsee vaaraa. Olet tilanteessa, joka voi johtaa ruumiinvammaan. Ennen kuin työskentelet minkään laitteiston parissa, ota selvää sähkökytkentöihin liittyvistä vaaroista ja tavanomaisista onnettomuuksien ehkäisykeinoista.

**Attention** Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant causer des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers posés par les circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents.

**Warnung** Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu einer Körperverletzung führen könnte. Bevor Sie mit der Arbeit an irgendeinem Gerät beginnen, seien Sie sich der mit elektrischen Stromkreisen verbundenen Gefahren und der Standardpraktiken zur Vermeidung von Unfällen bewußt.

**Avvertenza** Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di lavorare su qualsiasi

apparecchiatura, occorre conoscere i pericoli relativi ai circuiti elettrici ed essere al corrente delle pratiche standard per la prevenzione di incidenti.

**Advarsel** Dette varselsymbolet betyr fare. Du befinner deg i en situasjon som kan føre til personskade. Før du utfører arbeid på utstyr, må du være 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 varningsymbol signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanligt förfarande för att förebygga skador.

#### Related Documentation

- [General Safety Guidelines and Warnings on page 117](#)
- [Installation Instructions Warning on page 123](#)
- [Maintenance and Operational Safety Guidelines and Warnings on page 135](#)
- [Grounded Equipment Warning](#)
- [Laser and LED Safety Guidelines and Warnings](#)
- [Laser and LED Safety Guidelines and Warnings for the ACX5000 Router](#)
- [Laser and LED Safety Guidelines and Warnings for the QFX Series](#)
- [Laser and LED Safety Guidelines and Warnings for the PTX10000 Series](#)
- [Warning Statement for Norway and Sweden on page 121](#)

## 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.

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

**Warnung** Gerät nur von geschultem, qualifiziertem Personal installieren oder auswechseln lassen.

**Avvertenza** Solo personale addestrato e qualificato deve essere autorizzato ad installare o sostituire questo apparecchio.

**Advarsel** Kun kvalifisert personell med riktig opplæring bør montere eller bytte ut dette utstyret.

**Aviso** Este equipamento deverá ser instalado ou substituído apenas por pessoal devidamente treinado e qualificado.

**¡Atención!** Estos equipos deben ser instalados y reemplazados exclusivamente por personal técnico adecuadamente preparado y capacitado.

**Varning!** Denna utrustning ska endast installeras och bytas ut av utbildad och kvalificerad personal.

#### Related Documentation

- [General Safety Guidelines and Warnings on page 117](#)
- [General Electrical Safety Guidelines and Warnings on page 140](#)
- [AC Power Electrical Safety Guidelines on page 143](#)
- [PTX5000 AC Power Electrical Safety Guidelines](#)
- [PTX5000 AC Power Electrical Safety Warnings](#)
- [DC Power Electrical Safety Guidelines](#)
- [PTX1000 DC Power Electrical Safety Guidelines](#)
- [PTX3000 DC Power Electrical Safety Guidelines](#)
- [PTX5000 DC Power Electrical Safety Guidelines](#)

## Warning Statement for Norway and Sweden



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

**Advarsel** Apparatet skal kobles til en jordet stikkontakt.

**Varning!** Apparaten skall anslutas till jordat nätuttag.

**Related Documentation** • [General Safety Guidelines and Warnings on page 117](#)

## Fire Safety Requirements

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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.

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We recommend that you dispose of any irreparably damaged equipment in an environmentally responsible manner.

- Related Documentation**
- [General Safety Guidelines and Warnings on page 117](#)
  - [General Electrical Safety Guidelines and Warnings on page 140](#)
  - [Action to Take After an Electrical Accident on page 141](#)

## Installation Instructions Warning

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**WARNING:** Read the installation instructions before you connect the device to a power source.

**Waarschuwing** Raadpleeg de installatie-aanwijzingen voordat u het systeem met de voeding verbindt.

**Varoitus** Lue asennusohjeet ennen järjestelmän yhdistämistä virtalähteeseen.

**Attention** Avant de brancher le système sur la source d'alimentation, consulter les directives d'installation.

**Warnung** Lesen Sie die Installationsanweisungen, bevor Sie das System an die Stromquelle anschließen.

**Avvertenza** Consultare le istruzioni di installazione prima di collegare il sistema all'alimentatore.

**Advarsel** Les installasjonsinstruksjonene før systemet kobles til strømkilden.

**Aviso** Leia as instruções de instalação antes de ligar o sistema à sua fonte de energia.

**¡Atención!** Ver las instrucciones de instalación antes de conectar el sistema a la red de alimentación.

**Varning!** Läs installationsanvisningarna innan du kopplar systemet till dess strömförsörjningsenhet.

- Related Documentation**
- [General Safety Guidelines and Warnings on page 117](#)
  - [Laser and LED Safety Guidelines and Warnings](#)
  - [Laser and LED Safety Guidelines and Warnings for the ACX5000 Router](#)
  - [Grounded Equipment Warning](#)

## Chassis Lifting Guidelines for NFX150 Devices

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The weight of an NFX150 device is approximately 9.4 lb (4.3 kg). Observe the following guidelines for lifting and moving an NFX150 device:

- Before installing the device, verify that the intended site meets the specified power, environmental, and clearance requirements.
- Before lifting or moving the switch, disconnect all external cables.

**Related  
Documentation**

- [General Safety Guidelines and Warnings on page 117](#)
- [Installation Instructions Warning on page 123](#)

## 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.

**Attention** 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

sikkerhedsanordning, 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.

**iAtención!** 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.

#### Related Documentation

- [General Safety Guidelines and Warnings on page 117](#)
- [General Electrical Safety Guidelines and Warnings on page 140](#)
- [Installation Instructions Warning on page 123](#)
- [Grounded Equipment Warning](#)

## 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.

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

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

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

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

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

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

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

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**Related  
Documentation**

- [General Safety Guidelines and Warnings on page 117](#)
- [Installation Instructions Warning on page 123](#)
- [Grounded Equipment Warning](#)

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## Rack-Mounting and Cabinet-Mounting Warnings

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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.

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

- The device must be installed in a rack that is secured to the building structure.
- The device should be mounted at the bottom of the rack if it is the only unit in the rack.
- When mounting the device on a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.
- If the rack is provided with stabilizing equipment, install the stabilizers before mounting or servicing the device in the rack.

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

- De Juniper Networks switch moet in een stellage worden geïnstalleerd die aan een bouwsel is verankerd.
- Dit toestel dient onderaan in het rek gemonteerd te worden als het toestel het enige in het rek is.
- Wanneer u dit toestel in een gedeeltelijk gevuld rek monteert, dient u het rek van onderen naar boven te laden met het zwaarste onderdeel onderaan in het rek.
- Als het rek voorzien is van stabiliseringshulpmiddelen, dient u de stabilisatoren te monteren voordat u het toestel in het rek monteert of het daar een servicebeurt geeft.

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

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

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

- Le rack sur lequel est monté le Juniper Networks switch doit être fixé à la structure du bâtiment.
- Si cette unité constitue la seule unité montée en casier, elle doit être placée dans le bas.
- Si cette unité est montée dans un casier partiellement rempli, charger le casier de bas en haut en plaçant l'élément le plus lourd dans le bas.
- Si le casier est équipé de dispositifs stabilisateurs, installer les stabilisateurs avant de monter ou de réparer l'unité en casier.

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

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

**Avvertenza** Per evitare infortuni fisici durante il montaggio o la manutenzione di questa unità in un supporto, occorre osservare speciali precauzioni per

garantire che il sistema rimanga stabile. Le seguenti direttive vengono fornite per garantire la sicurezza personale:

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

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

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

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

- O Juniper Networks switch deverá ser instalado numa prateleira fixa à estrutura do 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, o posteriormente durante su mantenimiento, se debe poner mucho**



cuidado en que el sistema quede bien estable. Para garantizar su seguridad, proceda según las siguientes instrucciones:

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

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

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

**Related Documentation**

- [General Safety Guidelines and Warnings on page 117](#)
- [Installation Instructions Warning on page 123](#)
- [Grounded Equipment Warning](#)

## Laser and LED Safety Guidelines and Warnings for the NFX150 Devices

NFX150 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.

Observe the following guidelines and warnings:

- [General Laser Safety Guidelines on page 130](#)
- [Class 1M Laser Product Warning on page 130](#)

- [Class 1M Laser Radiation Warning on page 130](#)
- [Class 1 Laser Product Warning on page 131](#)
- [Class 1 LED Product Warning on page 131](#)
- [Laser Beam Warning on page 131](#)
- [Unterminated Fiber-Optic Cable Warning on page 132](#)

## General Laser Safety Guidelines

When working around ports that support optical transceivers, observe the following safety guidelines to prevent eye injury:

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



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

## Class 1M Laser Product Warning



**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



**WARNING:** Class 1M laser radiation when open. Do not view directly with optical instruments.

## Class 1 Laser Product Warning

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**WARNING:** Class 1 laser product.

**Waarschuwing** Klasse-1 laser produkt.

**Varoitus** Luokan 1 lasertuote.

**Attention** Produit laser de classe I.

**Warnung** Laserprodukt der Klasse 1.

**Avvertenza** Prodotto laser di Classe 1.

**Advarsel** Laserprodukt av klasse 1.

**Aviso** Produto laser de classe 1.

**¡Atención!** Producto láser Clase I.

**Varning!** Laserprodukt av klass 1.

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## Class 1 LED Product Warning

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**WARNING:** Class 1 LED product.

**Waarschuwing** Klasse 1 LED-product.

**Varoitus** Luokan 1 valodiodituote.

**Attention** Alarme de produit LED Class I.

**Warnung** Class 1 LED-Produktwarnung.

**Avvertenza** Avvertenza prodotto LED di Classe 1.

**Advarsel** LED-produkt i klasse 1.

**Aviso** Produto de classe 1 com LED.

**¡Atención!** Aviso sobre producto LED de Clase 1.

**Varning!** Lysdiodprodukt av klass 1.

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## Laser Beam Warning

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

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

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

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

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

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

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

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

**iAtención!** No mirar fijamente el haz ni observarlo directamente con instrumentos ópticos.

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

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## Unterminated Fiber-Optic Cable Warning

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**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, vergrootglas 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. Augenhilfen, 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 emitte 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. lupor, förstoringsglas och mikroskop) från ett avstånd på 100 mm kan skada ögonen.

**Related Documentation**

- [General Safety Guidelines and Warnings on page 117](#)
- [Radiation from Open Port Apertures Warning on page 134](#)
- [Installation Instructions Warning on page 123](#)
- [Grounded Equipment Warning](#)

## Radiation from Open Port Apertures Warning



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

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

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

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

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

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

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

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

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

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

### Related Documentation

- [General Safety Guidelines and Warnings on page 117](#)
- [Laser and LED Safety Guidelines and Warnings](#)
- [Laser and LED Safety Guidelines and Warnings for the ACX5000 Router](#)
- [Installation Instructions Warning on page 123](#)

- *Grounded Equipment Warning*

## Maintenance and Operational Safety Guidelines and Warnings

While performing the maintenance activities for devices, observe the following guidelines and warnings:

- [Battery Handling Warning on page 135](#)
- [Jewelry Removal Warning on page 136](#)
- [Lightning Activity Warning on page 137](#)
- [Operating Temperature Warning on page 138](#)
- [Product Disposal Warning on page 139](#)

### 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 suosittama. Hävitä käytetyt akut valmistajan ohjeiden mukaan.

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

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

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

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

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

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

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

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## Jewelry Removal Warning



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

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

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

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

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

**Avvertenza** Prima di intervenire su apparecchiature collegate alle linee di alimentazione, togliersi qualsiasi monile (inclusi anelli, collane, braccialetti ed orologi). Gli oggetti metallici si riscaldano quando sono collegati tra punti



di alimentazione e massa: possono causare ustioni gravi oppure il metallo può saldarsi ai terminali.

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

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

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

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

## Lightning Activity Warning



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

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

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

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

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

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

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

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

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

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

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## Operating Temperature Warning

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**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.

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

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

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

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

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

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

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

## Product Disposal Warning



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

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

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

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

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

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

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

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

**iAtención!** El desecho final de este producto debe realizarse según todas las leyes y regulaciones nacionales

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

- Related Documentation**
- [General Safety Guidelines and Warnings on page 117](#)
  - [General Electrical Safety Guidelines and Warnings on page 140](#)
  - [AC Power Electrical Safety Guidelines on page 143](#)
  - *PTX5000 AC Power Electrical Safety Guidelines*
  - *PTX5000 AC Power Electrical Safety Warnings*
  - *DC Power Electrical Safety Guidelines*
  - *PTX1000 DC Power Electrical Safety Guidelines*
  - *PTX3000 DC Power Electrical Safety Guidelines*
  - *PTX5000 DC Power Electrical Safety Guidelines*
  - *Laser and LED Safety Guidelines and Warnings*
  - *Laser and LED Safety Guidelines and Warnings for the ACX5000 Router*
  - [Installation Instructions Warning on page 123](#)
  - *Grounded Equipment Warning*

## General Electrical Safety Guidelines and Warnings

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



**CAUTION:** Before removing or installing components of a device, 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.

- Install the device in compliance with the following local, national, and international electrical codes:
  - United States—National Fire Protection Association (NFPA 70), United States National Electrical Code.
  - Other countries—International Electromechanical Commission (IEC) 60364, Part 1 through Part 7.

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

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

#### Related Documentation

- [General Safety Guidelines and Warnings on page 117](#)
- [AC Power Electrical Safety Guidelines on page 143](#)
- *PTX5000 AC Power Electrical Safety Guidelines*
- *PTX5000 AC Power Electrical Safety Warnings*
- *DC Power Electrical Safety Guidelines*
- *PTX1000 DC Power Electrical Safety Guidelines*
- *PTX3000 DC Power Electrical Safety Guidelines*
- *PTX5000 DC Power Electrical Safety Guidelines*

## Action to Take After an Electrical Accident

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

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

- Related Documentation**
- [General Safety Guidelines and Warnings on page 117](#)
  - [General Electrical Safety Guidelines and Warnings on page 140](#)
  - [AC Power Electrical Safety Guidelines on page 143](#)
  - *PTX5000 AC Power Electrical Safety Guidelines*
  - *PTX5000 AC Power Electrical Safety Warnings*
  - *DC Power Electrical Safety Guidelines*
  - *PTX1000 DC Power Electrical Safety Guidelines*
  - *PTX3000 DC Power Electrical Safety Guidelines*
  - *PTX5000 DC Power Electrical Safety Guidelines*

## 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 49 on page 143](#)) in one hand and touch the exposed, bare metal of the device with the other hand immediately before inserting the component into the device.



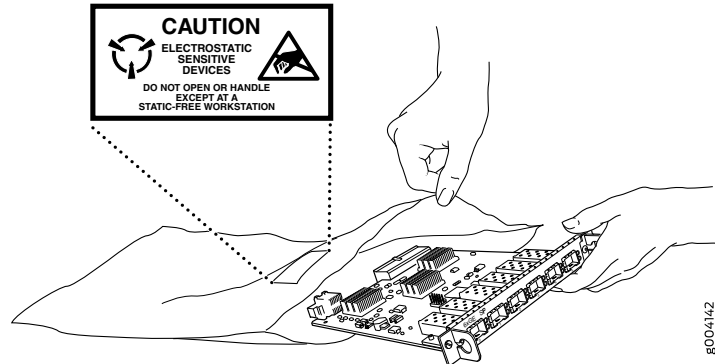
**WARNING:** For safety, periodically check the resistance value of the ESD grounding strap. The measurement must be in the range 1 through 10 Mohms.

- When handling any component that is subject to ESD damage and that is removed from the device, make sure the equipment end of your ESD 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 49 on page 143](#)). If you are returning a component, place it in an antistatic bag before packing it.

Figure 49: Placing a Component into an Antistatic Bag



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

#### Related Documentation

- [General Safety Guidelines and Warnings on page 117](#)

## AC Power Electrical Safety Guidelines



**CAUTION:** For devices with AC power supplies, an external surge protective device (SPD) must be used at the AC power source.

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

- Note the following warnings printed on the device:
  - “**CAUTION:** THIS UNIT HAS MORE THAN ONE POWER SUPPLY CORD. DISCONNECT ALL POWER SUPPLY CORDS BEFORE SERVICING TO AVOID ELECTRIC SHOCK.”
  - “**ATTENTION:** CET APPAREIL COMPORTE PLUS D'UN CORDON D'ALIMENTATION. AFIN DE PRÉVENIR LES CHOCS ÉLECTRIQUES, DÉBRANCHER TOUT CORDON D'ALIMENTATION AVANT DE FAIRE LE DÉPANNAGE.”
- AC-powered devices are shipped with a three-wire electrical cord with a grounding-type plug that fits only a grounding-type power outlet. Do not circumvent this safety feature. Equipment grounding must comply with local and national electrical codes.
- You must provide an external certified circuit breaker (for two-pole or four-pole based on your requirement) 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。

g017253

- Related Documentation**
- [General Safety Guidelines and Warnings on page 117](#)
  - [General Electrical Safety Guidelines and Warnings on page 140](#)
  - [Multiple Power Supplies Disconnection Warning](#)

## 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.

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

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

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



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

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

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

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

**Related Documentation**

- [General Safety Guidelines and Warnings on page 117](#)
- [General Electrical Safety Guidelines and Warnings on page 140](#)
- [AC Power Electrical Safety Guidelines on page 143](#)
- [PTX5000 AC Power Electrical Safety Guidelines](#)
- [PTX5000 AC Power Electrical Safety Warnings](#)

## 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.

**Attention** Ce dispositif a été conçu pour fonctionner avec des systèmes d'alimentation TN.

**Warnung** Das Gerät ist für die Verwendung mit TN-Stromsystemen ausgelegt.

**Avvertenza** Il dispositivo è stato progettato per l'uso con sistemi di alimentazione TN.

**Advarsel** Utstyret er utfomet til bruk med TN-strømsystemer.

**Aviso** O dispositivo foi criado para operar com sistemas de corrente TN.

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

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

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- Related Documentation**
- [General Safety Guidelines and Warnings on page 117](#)
  - [General Electrical Safety Guidelines and Warnings on page 140](#)
  - *Grounded Equipment Warning*
  - *Multiple Power Supplies Disconnection Warning*

## CHAPTER 8

# Agency Approvals and Compliance Statements

- [Agency Approvals for NFX150 Devices on page 147](#)
- [Compliance Statements for EMC Requirements for NFX150 Devices on page 148](#)

### Agency Approvals for NFX150 Devices

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The NFX150 hardware devices comply with the following standards:

- Safety
  - CAN/CSA-C22.2 No. 60950-1 Information Technology Equipment
  - UL 60950-1 Information Technology Equipment
  - EN 60950-1 Information Technology Equipment
  - IEC 60950-1 Information Technology Equipment
  - EN 60825-1 Safety of Laser Products - Part 1: Equipment classification and requirements
- EMC
  - FCC 47CFR Part 15 Class A (USA)
  - EN 55032 Class A Emissions (Europe)
  - ICES-003 Class A (Canada)
  - VCCI Class A (Japan)
  - AS/NZS CISPR 32 Class A (Australia/New Zealand)
  - CISPR 22 Class A
  - CISPR 32 Class A
  - KN 32 (South Korea)
  - KN 35 (South Korea)
  - EN 55024 (Europe)
  - EN 300386 (Europe)

- EN 61000-3-2 Power Line Harmonics
- EN 61000-3-3 Voltage Fluctuations and Flicker
- EN 61000-4-2 ESD
- EN 61000-4-3 Radiated Immunity
- EN 61000-4-4 EFT
- EN 61000-4-5 Surge
- EN 61000-4-6 Low Frequency Common Immunity
- EN 61000-4-11 Voltage Dips and Sags

**Related Documentation** • [Compliance Statements for EMC Requirements for NFX150 Devices on page 148](#)

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## Compliance Statements for EMC Requirements for NFX150 Devices

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This topic describes the EMC requirements for the NFX150 hardware devices for:

- [Canada on page 148](#)
- [European Community on page 149](#)
- [Israel on page 149](#)
- [Japan on page 149](#)
- [Korea on page 150](#)
- [United States on page 150](#)
- [FCC Part 15 Statement on page 150](#)

### Canada

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

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

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

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

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

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



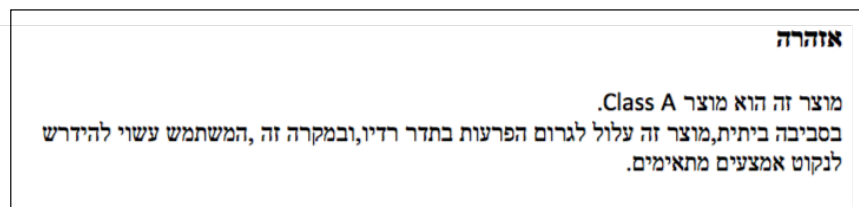
**CAUTION:** Users should not attempt to make electrical ground connections by themselves, but should contact the appropriate inspection authority or an electrician, as appropriate.

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

## European Community

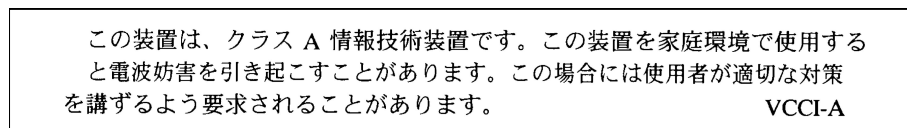
This is a Class A device. In a domestic environment this device might cause radio interference, in which case the user needs to take adequate measures.

## Israel



Translation from Hebrew—Warning: This product is Class A. In residential environments, the product may cause radio interference, and in such a situation, the user may be required to take adequate measures.

## Japan



The preceding translates as follows:

This is a Class A device. In a domestic environment this device might cause radio interference, in which case the user needs to take adequate measures.

VCCI-A

## Korea

이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

Korean Class A Warning 9040913

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.

- Related Documentation**
- [Agency Approvals for NFX150 Devices on page 147](#)

