

# ACX4000 Universal Metro Router Hardware Guide

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Juniper Networks, Inc.  
1133 Innovation Way  
Sunnyvale, California 94089  
USA  
408-745-2000  
[www.juniper.net](http://www.juniper.net)

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*ACX4000 Universal Metro Router Hardware Guide*  
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# About This Guide

Use this guide to install hardware and perform initial software configuration, routine maintenance, and troubleshooting for the ACX4000 Universal Metro router. After completing the installation and basic configuration procedures covered in this guide, refer to the Junos OS documentation for information about further software configuration.

## RELATED DOCUMENTATION

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[ACX4000 Router Quick Start](#)

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[Junos OS for ACX Series Universal Metro Routers](#)

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[ACX4000 Interface Module Reference](#)

# 1

CHAPTER

## Overview

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# ACX4000 System Overview

## IN THIS SECTION

- [ACX4000 Universal Metro Router Overview | 2](#)
- [ACX4000 Routers Hardware and CLI Terminology Mapping | 4](#)
- [Packet Flow on ACX Series Routers | 7](#)
- [Protocols and Applications Supported by ACX Series Routers | 8](#)

## ACX4000 Universal Metro Router Overview

### IN THIS SECTION

- [Benefits of the ACX4000 Router | 2](#)
- [Chassis Description | 3](#)

The ACX4000 Universal Metro Router is principally designed to provide superior management for rapid provisioning to the access network. The ACX Series routers support rich Gigabit Ethernet and 10-Gigabit Ethernet capabilities for uplink, along with support for legacy interfaces and Gigabit Ethernet interfaces for radio and NodeB connectivity in a compact form factor that is environmentally hardened and passively cooled. Seamless, end-to-end MPLS can be used to address legacy and emerging requirements to provide the foundation for a converged network that utilizes the same mobile backhaul infrastructure for business or residential services.

### Benefits of the ACX4000 Router

- **Improved operational efficiency with zero-touch deployment (ZTD)**—The ACX Series routers support a zero-touch deployment (ZTD) model that significantly reduces the time for any new equipment installation and provisioning, resulting in improved operational efficiency.

- **Installation flexibility with an environmentally hardened design**—Most ACX Series routers are temperature hardened and support passive cooling for outdoor deployments in extreme weather conditions.

## Chassis Description

The ACX Series router is a single-board router with a built-in Routing Engine and one Packet Forwarding Engine that has two Flexible PIC Concentrators (shown in the CLI as FPC 0 and FPC 1). Because there is no switching fabric, the single Packet Forwarding Engine takes care of packet forwarding:

- **Routing Engine**—Provides Layer 3 routing services and network management.
- **Packet Forwarding Engine**—Performs Layer 2 and Layer 3 packet switching, route lookups, and packet forwarding.

The ACX Series router is powered by Junos OS, supporting extensive L2 and L3 features, IP/MPLS with traffic engineering, rich network management, fault management, service monitoring and Operation, Administration, and Maintenance (OAM) capabilities, and an open software development kit (SDK) system that allows providers to customize and integrate operations with their own management systems. For a list of related Junos OS documentation, see <https://www.juniper.net/documentation/software/junos/>.

As part of the mobile backhaul, the ACX Series router at the cell site and the MX Series router at the aggregation layer provide comprehensive end-to-end Ethernet, MPLS, and OAM features with the one Junos OS running on both platforms.

The ACX4000 routers are 2.5 rack units (U; that is, 4.375 in., or 11.11 cm) tall. Several routers can be stacked in a single floor-to-ceiling rack for increased port density per unit of floor space.

The chassis is a rigid sheet metal structure that houses all the other router components (see [Figure 1 on page 4](#), and [Figure 2 on page 4](#)). The chassis measures 4.375 in. (11.11 cm) high, 9.5 in. (24.13 cm) deep, and 17.5 in. (44.5 cm) wide. The outer edges of the mounting brackets extend the width to 19 in. (48 cm) (from the front-mounting brackets to the rear of the chassis). The chassis installs in standard 300-mm deep (or larger) enclosed cabinets, 19-in. equipment racks, or telco open-frame racks.

The ACX4000 router contains eight combination Gigabit Ethernet ports, either RJ-45 or SFP ports. Two of the Gigabit Ethernet RJ-45 ports support PoE. The ACX4000 router also supports installation of two additional Gigabit Ethernet SFP transceivers and two 10-Gigabit Ethernet SFP+ transceivers. The router also has two dedicated slots for MICs. For a list of the supported MICs, see the [ACX4000 Universal Metro Router Interface Module Reference](#).

Figure 1: Front Panel of the ACX4000 Router

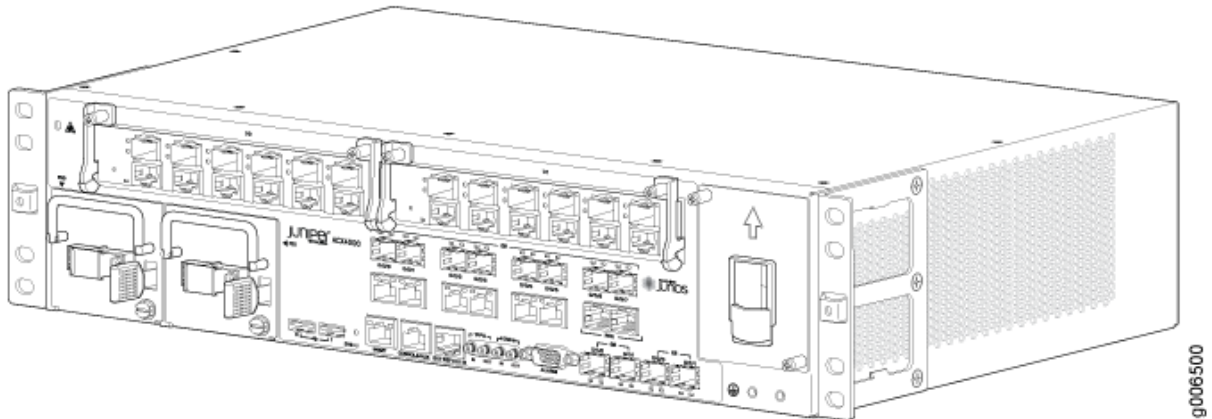


Figure 2: Rear View of the ACX4000 Router



## SEE ALSO

[Chassis Physical Specifications for ACX4000 Routers | 75](#)

## ACX4000 Routers Hardware and CLI Terminology Mapping

Table 1 on page 5 describes the hardware terms used in ACX4000 router documentation and the corresponding terms used in the Junos OS command line interface (CLI). Figure 3 on page 7 shows the port locations of the interfaces.

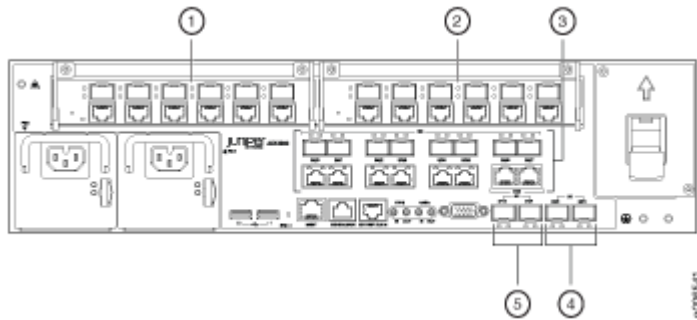
**Table 1: CLI Equivalents of Terms Used in Documentation for ACX4000 Routers**

Hardware Item (as displayed in the CLI)	Description (as displayed in the CLI)	Value (as displayed in the CLI)	Item in Documentation	Additional Information
Chassis	ACX4000	–	Router chassis	<a href="#">"Chassis Physical Specifications for ACX4000 Routers" on page 75</a>
FPC ( <i>n</i> )	Abbreviated name of the Flexible PIC Concentrator (FPC)  ACX4000	Value of <i>n</i> is a value in the range of 0–1.	The router does not have actual FPC devices; see entries for FPC 0 and FPC 1 for the equivalent item on the router.	<a href="#">Interface Naming Conventions Used in the Junos OS Operational Commands</a>
	FPC BUILTIN	FPC 0	Refers to the built-in FPC that houses the built-in network ports.	
	FPC BUILTIN	FPC 1	Slots in which one or two MICs are installed	
PIC ( <i>n</i> )	Abbreviated name of the Modular Interface Cards (MICs) or built-in interfaces	<i>n</i> is a value in the range of 0–2.	The router supports up to two MICs and has built-in interfaces, both represented as PIC in the CLI; see entries for PIC 0 through PIC 2 for the equivalent item on the router.	<a href="#">Interface Naming Conventions Used in the Junos OS Operational Commands</a>
	8x 1GE(LAN) SFP, RJ45	FPC 0, PIC 0	Built-in network ports on the front panel of the router	

Table 1: CLI Equivalents of Terms Used in Documentation for ACX4000 Routers (*Continued*)

Hardware Item (as displayed in the CLI)	Description (as displayed in the CLI)	Value (as displayed in the CLI)	Item in Documentation	Additional Information
	2x 1GE(LAN) SFP	FPC 0, PIC 1	Built-in network ports on the front panel of the router	<a href="#">"ACX4000 Uplink Ports Overview" on page 44</a>
	2x 10GE(LAN) SFP+	FPC 0, PIC 2	Built-in network ports on the front panel of the router	<a href="#">"ACX4000 Uplink Ports Overview" on page 44</a>
	<MIC 0 description>	FPC 1, PIC 0	MIC installed in slot 0	<a href="#">"ACX4000 Modular Interface Card (MIC) Overview" on page 51</a>
	<MIC 1 description>	FPC 1, PIC 1	MIC installed in slot 1	<a href="#">"ACX4000 Modular Interface Card (MIC) Overview" on page 51</a>
Xcvr ( <i>n</i> )	Abbreviated name of the transceiver	<i>n</i> is a value equivalent to the number of the port in which the transceiver is installed.	Optical transceivers	<a href="#">"ACX4000 Modular Interface Card (MIC) Overview" on page 51</a>
PEM ( <i>n</i> )	Power supply	Value of <i>n</i> is a value in the range of 0–1.	AC or DC power supply	<a href="#">"ACX4000 Power Overview" on page 58</a>
Fan Tray ( <i>n</i> )	Fan Tray	Value of <i>n</i> is always 0.	Fan tray module	<a href="#">"ACX4000 Cooling System" on page 56</a>

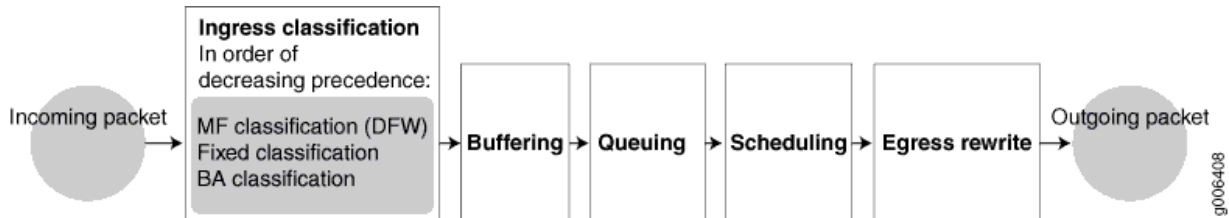
Figure 3: ACX4000 Interface Port Mapping



## Packet Flow on ACX Series Routers

The class-of-service (CoS) architecture for ACX Series routers is in concept similar to that for MX Series routers. The general architecture for ACX Series routers is shown in [Figure 4 on page 7](#).

Figure 4: ACX Series Router Packet Forwarding and Data Flow



Based on the model, ACX Series routers contain a built-in Routing Engine and Packet Forwarding Engine and can contain both T1/E1 and Gigabit Ethernet Ports.

The Packet Forwarding Engine has one or two “pseudo” Flexible PIC Concentrators. Because there is no switching fabric, the single Packet Forwarding Engine takes care of both ingress and egress packet forwarding.

Fixed classification places all packets in the same forwarding class, or the usual multifield (MF) or behavior aggregate (BA) classifications can be used to treat packets differently. BA classification with firewall filters can be used for classification based on IP precedence, DSCP, IEEE, or other bits in the frame or packet header.

However, the ACX Series routers can also employ multiple BA classifiers on the same physical interface. The physical interfaces do not have to employ the same type of BA classifier. For example, a single physical interface can use classifiers based on IP precedence as well as IEEE 802.1p. If the CoS bits of



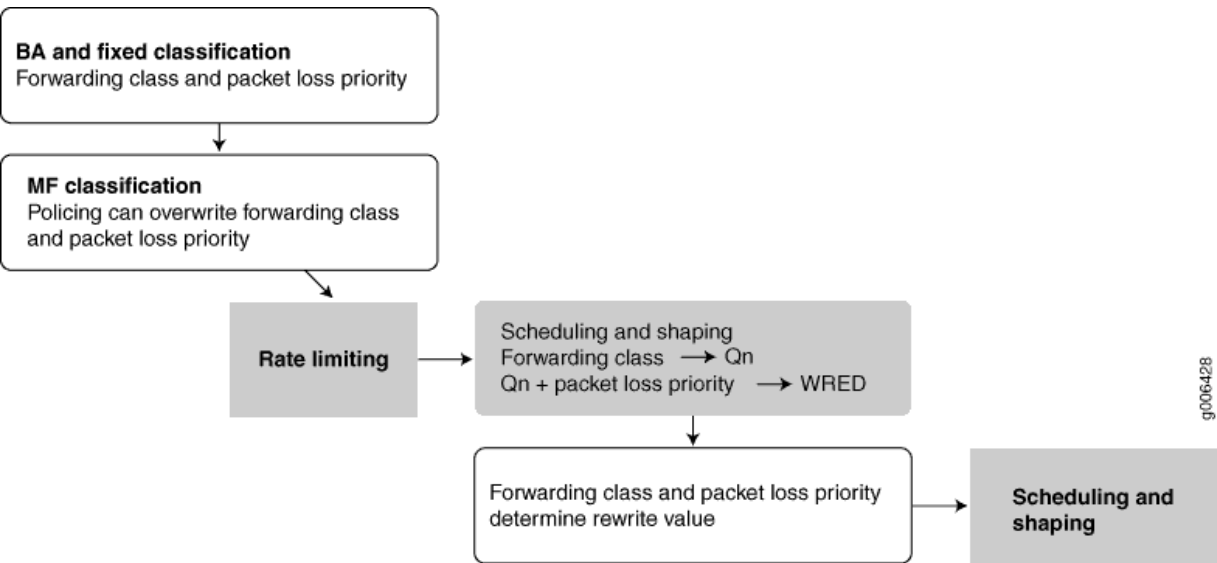
interest are on the inner VLAN tag of a dual-tagged VLAN interface, the classifier can examine either the inner or outer bits. (By default, the classification is done based on the outer VLAN tag.)

Eight queues per egress port support scheduling using the weighted deficit round- robin (WDRR) mechanism, a form of round-robin queue servicing. The supported priority levels are strict-high and default (low). The ACX Series router architecture supports both weighted random early detect (WRED) and weighted tail drop (WTD).

All CoS features are supported at line rate.

The packet pipeline through an ACX Series router is shown in [Figure 5 on page 8](#). Note that the rate limiting is done with an integrated architecture along with all other CoS functions. Scheduling and shaping are supported on the output side.

Figure 5: ACX Series Router Packet Handling



## Protocols and Applications Supported by ACX Series Routers

[Table 2 on page 9](#) contains the first Junos OS Release support for protocols and applications on ACX Series routers. A dash indicates that the protocol or application is not supported.

**NOTE:**

- The [edit logical-systems *logical-system-name*] hierarchy level is not supported on ACX Series routers.
- The ACX Series routers does not support per-family maximum transmission unit (MTU) configuration. The MTU applied to family inet gets applied to other families as well, even though it can be configured though CLI and visible in show interface extensive output. The only way to use higher MTU for a family is to manipulate the MTU, apply at interface or family inet levels, and let it calculate for each family automatically. MTU values are not limited to 1500 but can range between 256 to 9216.

For more information, see the Knowledge Base (KB) article KB28179 at: <https://kb.juniper.net/InfoCenter/index?page=content&id=KB28179>.

**Table 2: Protocols and Applications Supported by ACX Series Routers**

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
<b>Interface and Encapsulation Types</b>										
Ethernet interfaces—1G, 10G	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)	18.2R 1
Ethernet interfaces— 40G	-	-	-	-	-	-	15.1X 54 -D20	15.1X 54 -D20	-	18.2R 1
ATM interfaces (IMA only)	12.2	-	12.2	12.2R 2	-	-	-	-	-	-

**Table 2: Protocols and Applications Supported by ACX Series Routers (Continued)**

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
E1 interfaces	12.2	-	12.2	12.2R 2	-	-	-	-	-	-
T1 interfaces	12.2	-	12.2	12.2R 2	-	-	-	-	-	-
Circuit emulation interfaces (SAToP, CESoP)	12.2	-	12.2	12.2R 2	-	12.3x 51 -D10	-	-	-	-
SONET/SDH interfaces	-	-	-	-	-	12.3x 51 -D10 (requi res a MIC)	-	-	-	-
<b>Layer 3</b>										
Static routes	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoo r)  12.3X 54 -D25 (Outd oor)	18.2R 1

Table 2: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
OSPF	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
IS-IS	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
BGP	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1

Table 2: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
Internet Control Message Protocol (ICMP)	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Address Resolution Protocol (ARP)	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Bidirectional Forwarding Detection (BFD) protocol	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1

Table 2: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
Dynamic Host Configuration Protocol (DHCP)	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
IP fast reroute (FRR) (OSPF, IS-IS)	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Maximum transmission unit (MTU) range (256 to 9192)	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1



Table 2: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
Static label-switched path (LSP)	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
FRR	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Traffic engineering	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1



Table 2: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
E-LINE	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Pseudowire Emulation Edge to Edge (PWE3 [signaled])	12.2	-	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	-	18.2R 1
Static Ethernet PWs	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Layer 2 circuits	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1

Table 2: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
IEE802.1ag CC monitoring on active and standby pseudowires	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)	18.2R 1
VPLS	-	-	-	-	-	-	15.1X 54 -D20	15.1X 54 -D20	-	18.2R 1
<b>Ethernet Layer 2</b>										
Ethernet in the first mile (EFM 802.3ah)	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)	18.2R 1

Table 2: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
802.1ag connectivity fault management (CFM)	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor) 12.3X 54 -D25 (Outdoor)	18.2R 1
IEEE802.1ag interface- status type, length, and value (TLV)	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor) 12.3X 54 -D25 (Outdoor)	18.2R 1
<b>QoS</b>										
<a href="#">Firewall filters (access control lists—ACLs)— family inet</a>	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor) 12.3X 54 -D25 (Outdoor)	18.2R 1

Table 2: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
Standard firewall filter match conditions for MPLS traffic	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Firewall filters—family ccc/any	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Firewall - Port Mirroring	12.2R 1	12.2R 2	12.2R 1	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	17.1R 1	17.1R 1	-	18.2R 1
Policing—per logical interface	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1

**Table 2: Protocols and Applications Supported by ACX Series Routers** *(Continued)*

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
Policing—per physical interface	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Policing—per family	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
TrTCM (color aware, color blind)	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10 12.3X 54 -D15 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1

Table 2: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
SrTCM (color aware, color blind)	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Host protection	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Eight queues per port	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1

Table 2: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
Priority queuing	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Rate control	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Scheduling with two different priorities	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1

Table 2: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
Low-latency queue (LLQ)	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Weighted random early detection (WRED) drop profile (DP)	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Classification—DSCP	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1



Table 2: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
Classification—MPLS EXP	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Classification—IEEE 802.1p	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Rewrite—DSCP	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1



Table 2: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
Timing-1588-v2, 1588-2008-backup clock	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	-	-	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Synchronous Ethernet	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	-	-	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Building-integrated timing supply (BITS)	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	-	-	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	-



Table 2: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
Network Time Protocol (NTP)	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
SNMP	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
802.1ag CFM	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1

Table 2: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
802.3ah LFM	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Y.1731 Fault and Performance Management	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
MPLS OAM	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1

Table 2: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
RMON	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Layer 2 traceroute	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
DNS	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1

Table 2: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
TFTP for software downloads	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Port mirroring (local port mirroring)	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	-	-	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Interface loopback	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1



**Table 2: Protocols and Applications Supported by ACX Series Routers (Continued)**

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
Ethernet loopback	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	-	-	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	-
Interface byte and packet stats	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Interface queue stats	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1

Table 2: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
Drop packet stats	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Distinguish each 802.1ag connection by VLAN-ID	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Interface passive- monitor-mode	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1

Table 2: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
Multipacket mirror	-	-	-	-	-	-	-	-	12.3X 54 -D20 (Indoor)	-
									12.3X 54 -D25 (Outdoor)	
<b>Security</b>										
TACACS AAA	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)	18.2R 1
									12.3X 54 -D25 (Outdoor)	
RADIUS authentication	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)	18.2R 1
									12.3X 54 -D25 (Outdoor)	



**Table 2: Protocols and Applications Supported by ACX Series Routers (Continued)**

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
ATM over PWE3	12.2	-	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	-	-	-	-
RFC4717 ATM encapsulation: S6.1 ATM N to one cell mode (required as per standard)	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	-	-	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	-
RFC4717: S6.3—ATM AAL5 SDU encapsulation (optional)	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	-	-	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	-
ATM PWE3 control word	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	-	-	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	-

**Table 2: Protocols and Applications Supported by ACX Series Routers (Continued)**

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
ATM PWE3 by means of dynamic labels	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	-	-	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	-
ATM VPI/VCI swapping	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	-	-	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	-
ATM idle/unassigned cell suppression	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	-	-	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	-

**Table 2: Protocols and Applications Supported by ACX Series Routers (Continued)**

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
ATM support for N to 1 PW promiscuous mode: 1 PW per port and 1 PW per VPI	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	-	-	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	-
Cell concatenation (1 to 30 cells per packet)	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	-	-	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	-
Packet/byte counters per VP and VC	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	-	-	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	-

Table 2: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
Inverse multiplexing over ATM (IMA)	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	-	-	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	-
<b>ATM Encapsulation</b>										
AAL5 SDU (n-to-1 cell relay)	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	-	-	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	-
<b>ATM Queuing</b>										
ATM service categories (CBR, nrt-VBR, UBR) to the UNI	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	-	-	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	-



Table 2: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
MAP ATM service categories to PW EXP bits	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	-	-	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	-
Input policing per VC	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	-	-	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	-
VC output shaping	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	-	-	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	-

Table 2: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1 000	ACX1 100	ACX2 000	ACX2 100	ACX2 200	ACX4 000	ACX5 048	ACX5 096	ACX5 00	ACX5 448
Early packet discard	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	-	-	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	-
<b>MIBs</b>										
Standard SNMP MIBs	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1
Juniper Networks enterprise-specific MIBs	12.2	12.2R 2	12.2	12.2R 2	12.3X 54 -D15	12.3x 51 -D10	15.1X 54 -D20	15.1X 54 -D20	12.3X 54 -D20 (Indoor)  12.3X 54 -D25 (Outdoor)	18.2R 1

## SEE ALSO

| [ACX Series Universal Metro Routers](#)

# ACX4000 Chassis

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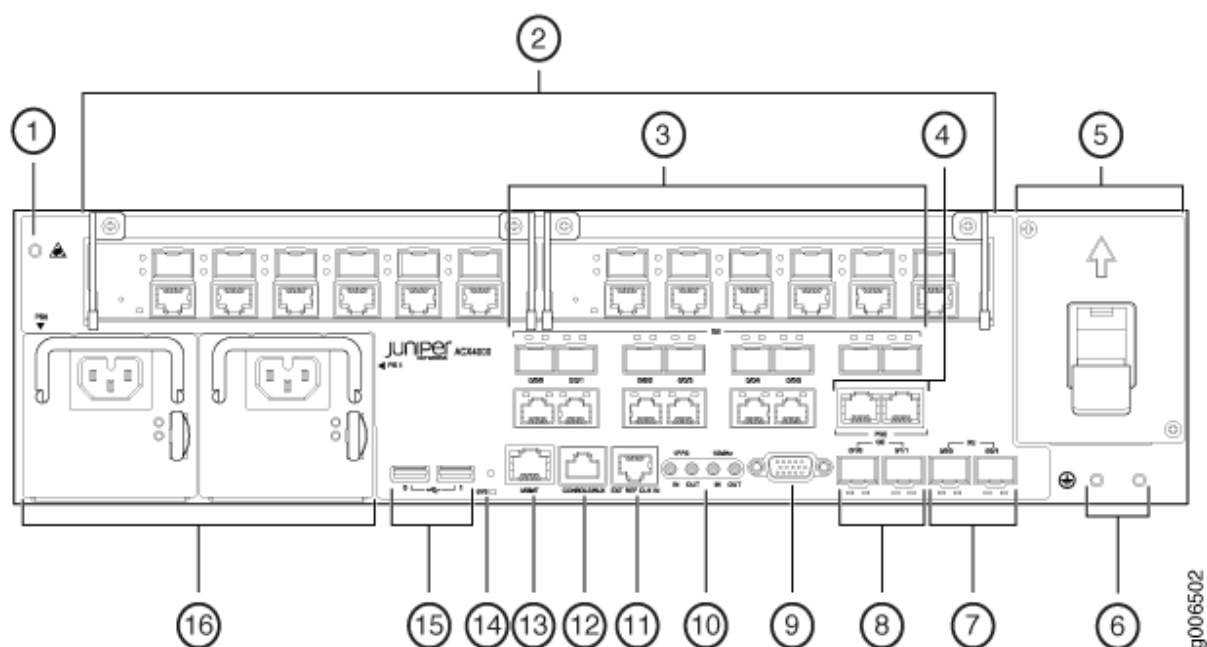
## ACX4000 Front Panel Overview

The front panel of an ACX4000 router consists of the following components:

- Chassis status LED labeled **SYS**
- Two USB ports for upgrading Junos OS
- Management Ethernet port labeled **MGMT**
- Console or auxiliary port labeled **CONSOLE/AUX**
- Alarm console port labeled **ALARM**—accepts a DE-15 alarm cable.
- Alarm console port labeled **ALARM**—accepts a DE-15 alarm cable.
- External Building Integrated Timing System (BITS) timing port labeled **EXT REF CLK IN**
- External clocking ports supporting 1-PPS and 10-MHz input and output
- Network ports and corresponding status LEDs:
  - Combination Gigabit Ethernet ports labeled **0/0/0** through **0/0/7**, either:

- Eight SFP ports
- Six RJ-45 ports
- Two 65W PoE Gigabit Ethernet RJ-45 ports, labeled **POE**, that provide electrical current to devices—such as IP phones, wireless access points, and security cameras—through network cables. These ports comply with IEEE 802.3af (PoE) and IEEE 802.3at (PoE+).
- Two Gigabit Ethernet (**GE**) ports, labeled **0/1/0** and **0/1/1**, that accept SFP transceivers
- Two 10-Gigabit Ethernet (**XE**) ports, labeled **0/2/0** and **0/2/1**, that accept SFP+ transceivers

Figure 6: Front Panel of the ACX4000 Router



1– ESD point	9– Alarm contact ports
2– MIC slots	10– Alarm input ports
3– Combination ports: Gigabit Ethernet RJ-45 ports or Gigabit Ethernet SFP ports	11– External reference clocking port
4– Power over Ethernet (PoE) ports	12– Console or auxiliary port
5– Fan module	13– Management port
6– Grounding terminals	14– System status LED
7– Ten-Gigabit Ethernet SFP+ ports	15– USB ports
8– Gigabit Ethernet SFP ports	16– Power supplies

## ACX4000 Uplink Ports Overview

### IN THIS SECTION

- T1/E1 Ports | 44
- RJ-45 Ports | 45
- PoE Ports | 46
- Gigabit Ethernet Ports | 47
- 10-Gigabit Ethernet Ports | 47

**TIP:** You can find information about the pluggable transceivers supported on your Juniper Networks device by using the Hardware Compatibility Tool. In addition to transceiver and connector type, the optical and cable characteristics—where applicable—are documented for each transceiver. The Hardware Compatibility Tool allows you to search by product, displaying all the transceivers supported on that device, or category, displaying all the transceivers by interface speed or type. The Hardware Compatibility Tool is located at <https://apps.juniper.net/hct/>. The list of supported transceivers for the ACX4000 is located at <https://pathfinder.juniper.net/hct/product/#prd=ACX4000>.

The following ports are supported on ACX4000 routers:

### T1/E1 Ports

Each ACX4000 router has 16 T1/E1 ports located on the front panel. [Table 3 on page 44](#) describes the ports in more detail.

**Table 3: T1/E1 Port Features**

Feature	Description
Line rate	E1: 2.048 Mbps per channel
	T1: 1.544 Mbps per channel

**Table 3: T1/E1 Port Features (Continued)**

Feature	Description
Encapsulation	TDM (SAToP) mode ATM PWE3/ATM IMA Mode
Framing	Superframe (D4) Extended superframe (ESF) Framed clear channel
Diagnostic features	T1/E1 T1 FDL CSU BERT JIT
Cable	Category 5 shielded twisted pair
Connector	100-ohm RJ-48 connector
Port numbering (hardware)	<b>0/0/0 through 0/0/15</b>
Port numbering (software)	T1 framing (default): ct1-0/0/0 through ct1-0/0/15 E1 framing: ce1-0/0/0 through ce1-0/0/15

## RJ-45 Ports

Each ACX4000 router has six Gigabit Ethernet RJ45 ports. [Table 4 on page 46](#) describes the ports in more detail.

**Table 4: RJ-45 Port Features**

Feature	Description
Supported standards	10/100/1000BASE-T
Cable	Category 5
Connector	RJ-45
Port numbering (hardware)	<b>0/1/0</b> through <b>0/1/2</b> and <b>0/1/4</b> through <b>0/1/6</b>
Port numbering (software)	ge-0/1/0 through ge-0/1/2 and ge-0/1/4 through ge-0/1/6

## PoE Ports

Each ACX4000 router has two PoE Gigabit Ethernet ports. These ports allow you to plug in devices that require both network connectivity and electric power such as IP phones, wireless access points, and security cameras. [Table 5 on page 46](#) describes the ports in more detail.

**Table 5: PoE Port Features**

Feature	Description
Supported standards	IEEE 802.3af (PoE) and IEEE 802.3at (PoE+)
Per port power limit	65 W
Cable	Copper Ethernet LAN cable
Connector	RJ-45
Port numbering (hardware)	<b>0/1/3 POE</b> and <b>0/1/7 POE</b>
Port numbering (software)	ge-0/1/3 and ge-0/1/7

## Gigabit Ethernet Ports

The **GE** ports described in [Table 6 on page 47](#) support small form-factor pluggable (SFP) transceivers.

**NOTE:** You can use Gigabit Ethernet transceivers in the **GE** ports, or you can use 10-Gigabit Ethernet transceivers in the **XE** ports. Use one set of ports at a time.

**Table 6: SFP Port Features**

Feature	Description
Supported standards	See the Hardware Compatibility Tool for the specifications of transceivers supported on the ACX4000. The list of supported transceivers for the ACX4000 is located at <a href="https://pathfinder.juniper.net/hct/product/#prd=ACX4000">https://pathfinder.juniper.net/hct/product/#prd=ACX4000</a> .
Cable	
Connector	
Port numbering (hardware)	<b>0/2/0</b> and <b>0/2/1</b>
Port numbering (software)	ge-0/2/0 and ge-0/2/1

## 10-Gigabit Ethernet Ports

The ports labeled **XE** are numbered **0/3/0** and **0/3/1** allow you to install the 10-Gigabit Ethernet transceivers listed in [Table 7 on page 48](#).

The **XE** ports described in [Table 7 on page 48](#) support SFP+ transceivers.

**NOTE:** You can use Gigabit Ethernet transceivers in the **GE** ports, or you can use 10-Gigabit Ethernet transceivers in the **XE** ports. Use one set of ports at a time.



**Table 7: SFP+ Port Features**

Feature	Description
Supported standards	See the Hardware Compatibility Tool for the specifications of transceivers supported on the ACX4000. The list of supported transceivers for the ACX4000 is located at <a href="https://pathfinder.juniper.net/hct/product/#prd=ACX4000">https://pathfinder.juniper.net/hct/product/#prd=ACX4000</a> .
Cable	
Connector	
Port numbering (hardware)	<b>0/3/0</b> and <b>0/3/1</b>
Port numbering (software)	xe-0/3/0 and xe-0/3/1

## ACX4000 Alarm Contact Port Overview

The ACX4000 router has four external alarm contacts (also known as potential free contacts) for connecting the router to external alarm devices. The port labeled **ALARM** uses a 15-pin D-type connector. The external alarm contact has 15 pins that accept a single core wire from external alarm devices. A DE15 alarm cable is required to connect the ACX4000 router to external alarm devices. Use the gauge wire appropriate for the external device that you are connecting.

Whenever a system condition triggers an alarm, the alarm relay contacts are activated, which in turn activates the external alarm devices. The alarm setting is open or closed.

You can connect and configure two output alarms and four input alarms. Two additional output alarms are reserved and are used to indicate major and minor system alarms. Each output and input alarm has two contacts for connecting the router to external alarm devices. Contact 1 of each alarm can be configured as Normally Open [NO] or Normally Closed [NC] through the CLI. Contact 2 of each alarm functions as a reference [REF] or negative potential terminal for Contact 1 of the corresponding alarm and provides a current path for external alarm devices. [Table 8 on page 49](#) describes the functions of the alarm contacts.

**Table 8: Alarm Relay Contact Functions**

Contact Name	Contact Name	Function
Contact 1	Normally Open (NO)	Current is not flowing through Contact 1 and Contact 2 [REF] when operating normally. When the current flows, the closed alarm is generated.
	Normally Closed (NC)	Current is flowing through Contact 1 and Contact 2 [REF] when operating normally. When the current stops flowing, the open alarm is generated.
Contact 2	Reference (REF)	Provides the current path for the external alarm-reporting device and functions as a reference or negative potential terminal for Contact 1.

Figure 7 on page 49 shows an example of a wiring diagram for a simple output alarm-reporting device. In this case the device is a light bulb that illuminates when the device encounters a condition that activates the red alarm LED and relay contacts. The alarm relay contacts can also be used to activate other devices such as bells or buzzers.

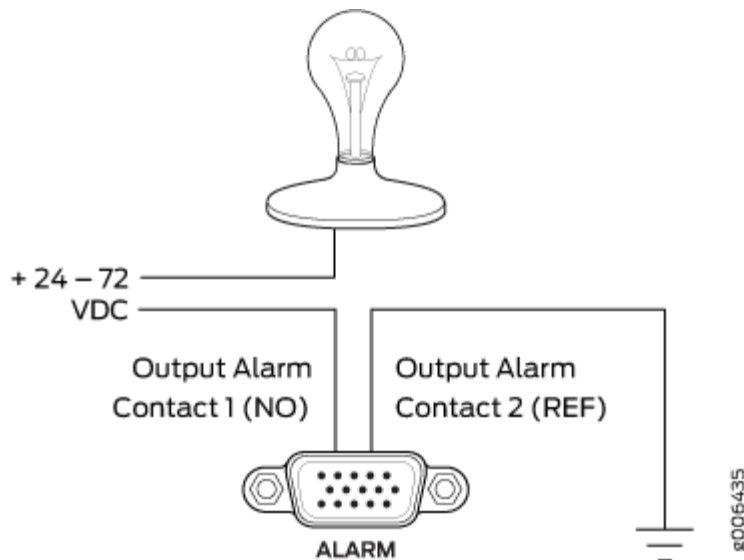
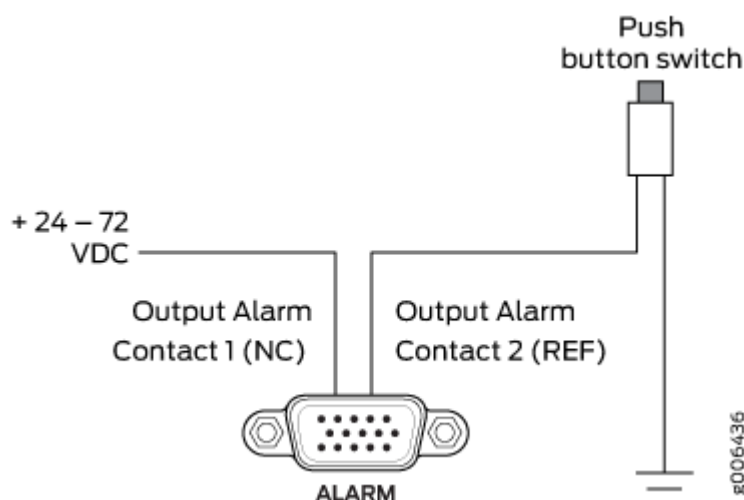
**Figure 7: Sample Output Alarm-Reporting Device**

Figure 8 on page 50 shows an example of a wiring diagram for a simple input alarm-reporting device. In this case the push button switch is an alarm sensor that triggers an input alarm when a door-open condition occurs.

Figure 8: Sample Input Alarm-Reporting Device



## SEE ALSO

[Alarm Contact Port Pinouts for ACX4000 Routers](#) | 87

## ACX4000 Clocking Ports Overview

The clocking ports acquire the clock source and synchronize communication over time-division multiplexing (TDM) interfaces in the router. The clocking ports distribute a synchronized clock signal throughout the router by locking onto a clock signal originating from an internal clock source or by connecting to an external clock source.

The reference clock inputs can be T1/E1 line clocks, Ethernet recovered clocks, IEEE 1588v2 recovered clocks, or xDSL NTU-R timing. Externally available reference clocks are BITS T1/E1 rate clocks, 1 pulse per second (PPS), and 10 MHz. The four SubMiniature B (SMB) connectors on the front panel of the router connect to external clock signal sources. The clocking ports provide the synchronized output clocks from any one of the above reference inputs based on the clock's priority.

Internal clock sources within the ACX4000 router include:

- Four alarm inputs and four alarm output contacts
- One management port
- External Building Integrated Timing System (BITS) timing port
- 10 MHz timing connectors (one input and one output)

- 1 Pulse Per Second (PPS) connectors (one input and one output)
- Time of Day (TOD) RS232 port
- 1.544 MHz/2.048 MHz T1/E1 (RJ48) ports for timing input or output
- SyncE support on RJ45/SFP ports as timing input or output
- Packet (IEEE 1588-2008) 2 timing includes:
  - Timing input when configured as Ordinary Clock (OC) or Boundary Clock (BC)
  - Timing output when configured as BC

#### SEE ALSO

[Connecting the ACX4000 Router to External Clocking Devices | 109](#)

[External Clocking Ports Specifications on the ACX4000 Router](#)

## ACX4000 Modular Interface Card (MIC) Overview

Modular Interface Cards (MICs) install into two slots in the front of the ACX4000 router and provide the physical connections to various network media types. The slots are labeled **1/0** and **1/1**. You can install MICs of different media types on the same router as long as the router supports those MICs. For complete specifications, see the [ACX4000 Universal Metro Router Interface Module Reference](#).

MICs receive incoming packets from the network and transmit outgoing packets to the network. During this process, each MIC performs framing and high-speed signaling for its media type. Before transmitting outgoing data packets through the MIC interfaces, the PFE encapsulates the packets received.

MICs are hot-removable and hot-insertable.

#### SEE ALSO

[Replacing an ACX4000 MIC | 122](#)

[Maintaining the ACX4000 Uplink Ports | 121](#)

# ACX4000 LEDs Overview

IN THIS SECTION

- System LED on the Front Panel | 52
- AC Power Supply LED | 53
- DC Power Supply LED | 53
- T1/E1 Port LEDs | 54
- Ethernet Port LEDs | 54
- PoE Port LEDs | 55
- SFP and SFP+ Port LEDs | 55
- Management and Console Port LEDs on the Front Panel | 56
- MIC LEDs | 56

## System LED on the Front Panel

One bicolor LED labeled **SYS** indicates the status of the router. [Table 9 on page 52](#) describes the system LED in more detail.

Table 9: System LED on the Front Panel

Label	Color	State	Description
SYS	Green	Blinking	Router is transitioning online.
		On steadily	Router is functioning normally.
	Red	Blinking	Router has reported an alarm.
		On steadily	Router has failed.

## AC Power Supply LED

One LED labeled **AC OK** indicates the status of the power supply. [Table 10 on page 53](#) describes the system LED in more detail.

**Table 10: AC Power LED**

Label	Color	State	Description
<b>AC OK</b>	Green	On steadily	Power supply is functioning normally and input voltage is within allowable operating range.
	Red	On steadily	Power supply is receiving input voltage below the allowable operating range but the redundant power supply is functioning normally.
	—	Off	Power supply is receiving input voltage below the allowable operating range and is not part of a redundant configuration.

## DC Power Supply LED

One LED labeled **DC OK** indicates the status of the power supply. [Table 11 on page 53](#) describes the system LED in more detail.

**Table 11: DC Power LED**

Label	Color	State	Description
<b>DC OK</b>	Green	On steadily	Power supply is functioning normally and input voltage is within allowable operating range.
	Red	On steadily	Power supply is receiving input voltage below the allowable operating range but the redundant power supply is functioning normally.
	—	Off	Power supply is receiving input voltage below the allowable operating range and is not part of a redundant configuration.

## T1/E1 Port LEDs

The front panel has sixteen T1/E1 ports, each with one pair of port LEDs. [Table 12 on page 54](#) describes the LEDs in more detail.

**Table 12: T1/E1 Port LEDs**

Name	Location	Color	Description
Link	Left	Green	Online with no alarms or failures.
		Yellow	Online with alarms for remote failures.
		–	Not enabled.
Link (local alarms)	Right	Red	Active with a local alarm; router has detected a failure.

## Ethernet Port LEDs

The front panel has six Gigabit Ethernet RJ45 ports, each with one pair of port LEDs. [Table 13 on page 54](#) describes the LEDs in more detail.

**Table 13: Ethernet Port LEDs**

Name	Location	Color	State	Description
Activity	Right	Green	Blinking	The port is receiving data.
		–	Off	The port is not receiving data.
Link	Left	Yellow	On	Link is online.
		–	Off	No link.

## PoE Port LEDs

The front panel has two PoE Gigabit Ethernet ports, each with one pair of port LEDs. [Table 14 on page 55](#) describes the LEDs in more detail.

**Table 14: PoE Port LEDs**

Name	Location	Color	State	Description
Activity	Right	Green	Blinking	The port is receiving data.
		–	Off	The port is not receiving data.
Link	Left	Yellow	On	Link is online.
		–	Off	No link.

## SFP and SFP+ Port LEDs

The front panel has two Gigabit Ethernet SFP ports and two 10-Gigabit Ethernet SFP+ ports, each with one pair of port LEDs. [Table 15 on page 55](#) describes the LEDs in more detail.

**Table 15: SFP and SFP+ Link LEDs**

Name	Location	Color	State	Description
Activity	Right	Green	Blinking	The port is receiving data.
		–	Off	The port is not receiving data.
Link	Left	Yellow	On	Link is online.
		–	Off	No link.



## Management and Console Port LEDs on the Front Panel

Two RJ45 ports labeled **MGMT** and **CONSOLE/AUX** each have a pair of LEDs that display the status of the port. [Table 16 on page 56](#) describes the LEDs in more detail.

**Table 16: Management and Console LEDs**

Name	Location	Color	State	Description
Link	Left	Green	On	Link is online.
		–	Off	No link.
Activity	Right	Yellow	Blinking	The port is receiving data.
		–	Off	The port is not receiving data.

## MIC LEDs

Each hot-removable and hot-insertable MIC has LEDs located on the faceplate. For more information about LEDs on the MIC faceplate, see the “LEDs” section for each MIC in the [ACX4000 Universal Metro Router Interface Module Reference](#).

### SEE ALSO

| [Troubleshooting Resources for ACX4000 Routers](#) | 149

# ACX4000 Cooling System

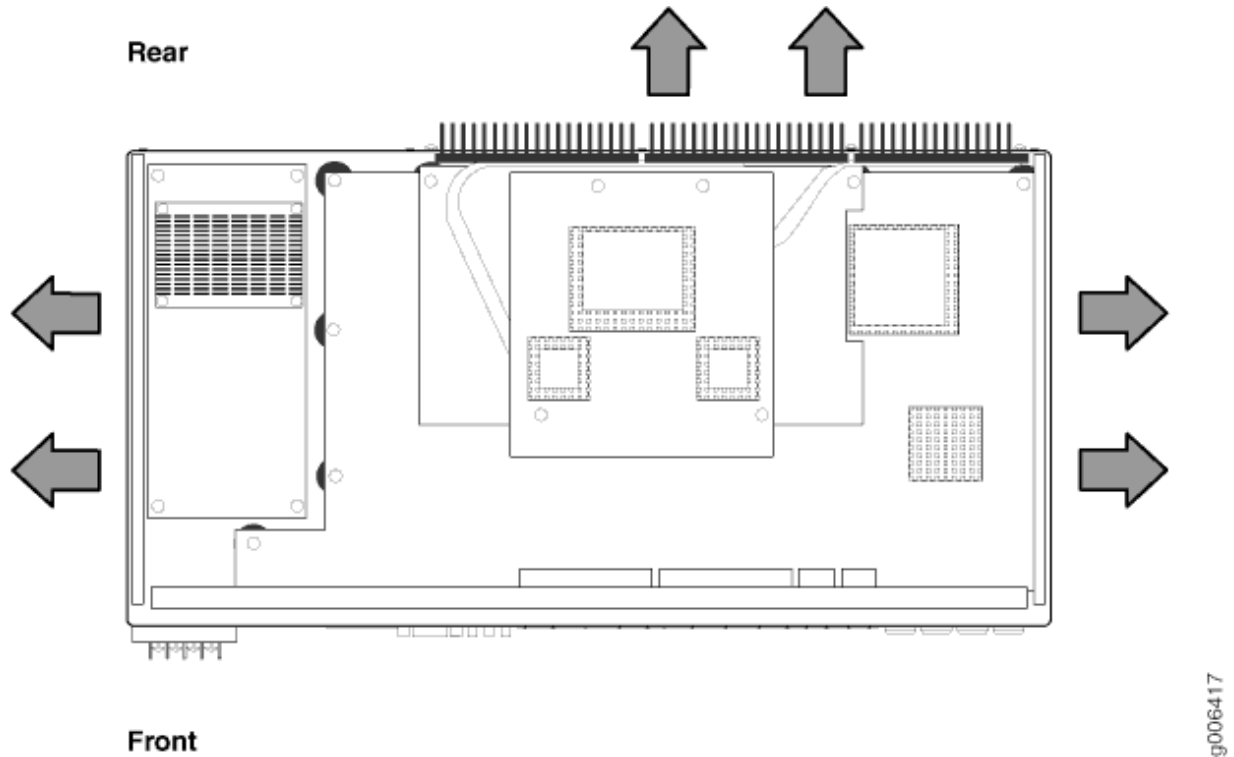
The cooling system consists of the following components:

- Fan tray
- Air filter

The cooling system components work together to keep all router components within the acceptable temperature range (see [Figure 9 on page 57](#)).

Temperature sensors in the chassis monitor the temperature within the chassis. If the temperature inside the chassis rises above the threshold, the router shuts down automatically.

**Figure 9: Cooling System and Airflow in an ACX4000 Router**



#### RELATED DOCUMENTATION

[Rack Requirements for ACX4000 Routers | 80](#)

[Cabinet Requirements for ACX4000 Routers | 78](#)

[Clearance Requirements for Airflow and Hardware Maintenance on ACX4000 Routers | 74](#)

[ACX4000 Router Environmental Specifications | 76](#)

# ACX4000 Power System

## IN THIS SECTION

- [ACX4000 Power Overview | 58](#)
- [ACX4000 Power Consumption | 60](#)
- [ACX4000 AC Power Specifications | 61](#)
- [ACX4000 AC Power Cord Specifications | 62](#)
- [ACX4000 DC Power Specifications | 64](#)
- [ACX4000 DC Power Cable and Lug Specifications | 65](#)
- [ACX4000 Router Grounding Specifications | 66](#)

## ACX4000 Power Overview

### IN THIS SECTION

- [AC Power Supplies | 59](#)
- [DC Power Supplies | 60](#)

The ACX4000 router uses either AC or DC power supplies (see [Figure 10 on page 59](#) and [Figure 11 on page 60](#)). The power supplies are located in the front of the chassis and offer 1+1 redundancy. The power supply slots are labeled **PS 0** and **PS 1**. Each power supply has a handle, an ejection tab, and a status LED.



**CAUTION:** The router cannot be powered from AC and DC power supplies simultaneously.

When two power supplies are present, they share power almost equally within a fully populated system. If one power supply in a redundant configuration fails or is removed, the remaining power supply assumes the entire electrical load without interruption. A single power supply provides the maximum

configuration with full power for as long as the router is operational. A second power supply can be installed for redundancy. Each power supply is cooled by its own internal cooling system.

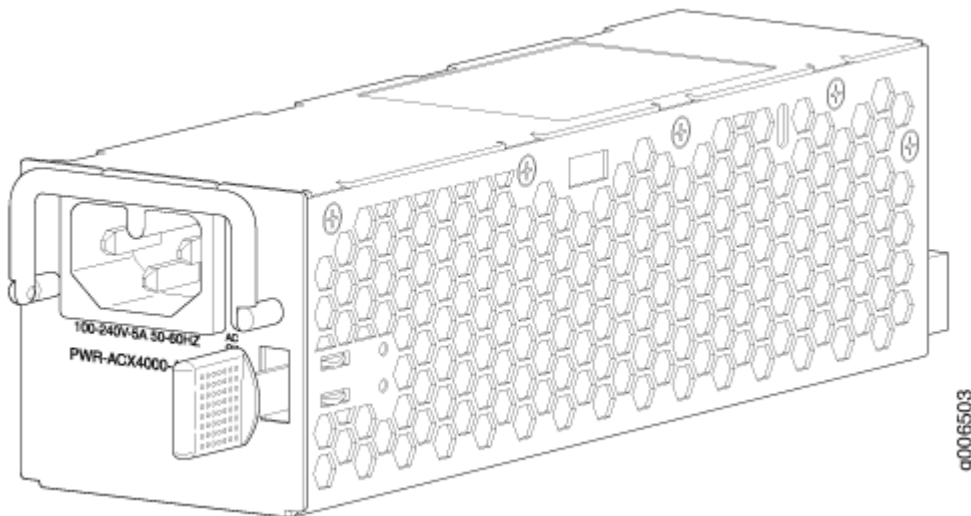
Redundant power supplies are hot-removable and hot-insertable. When you remove a power supply from a router that uses only one power supply, the router might shut down depending on your configuration.

## AC Power Supplies

Each AC power supply weighs approximately 2.6 lb (1.18 kg) and consists of a handle, an ejection tab, an AC appliance inlet, a fan, and an LED to monitor the status of the power supply. [Figure 10 on page 59](#) shows the power supply.

Each inlet requires a dedicated AC power feed and a dedicated customer site circuit breaker. We recommend that you use a dedicated customer site circuit breaker rated for 17 A (100 VAC), or as required by local code.

**Figure 10: AC Power Supply**

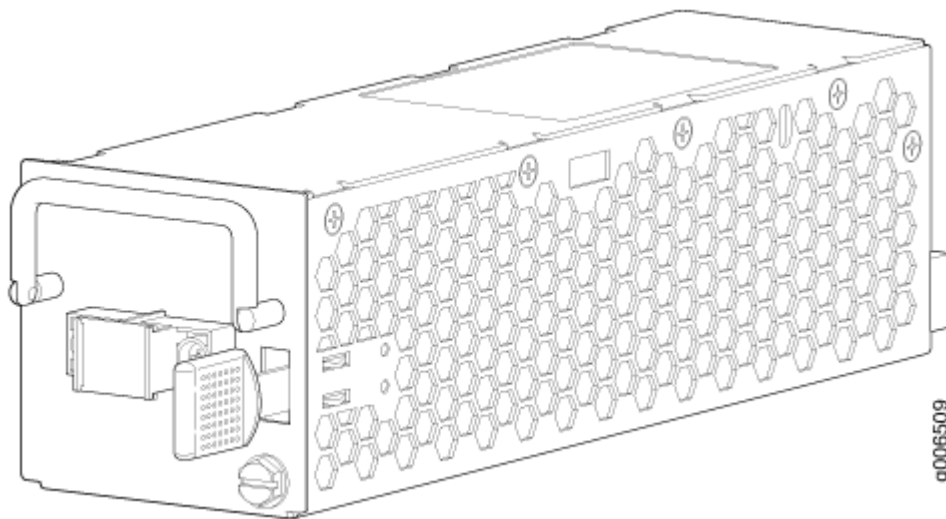


**WARNING:** The router is pluggable type A equipment installed in a restricted-access location. It has a separate protective earthing terminal (sized for SAE 10-32 ground screws) provided on the chassis in addition to the grounding pin of the power supply cord. This separate protective earthing terminal must be permanently connected to earth.

## DC Power Supplies

Each DC power supply has a handle, an ejection lever, a status LED, and a terminal block that provides a single DC input (24, -48, or -60 VDC and return) that requires a dedicated customer site circuit breaker. We recommend that you provide at least 17 A @ 24 VDC and use a facility circuit breaker rated for 16.5 A minimum, or as required by local code. [Figure 11 on page 60](#) shows the power supply.

**Figure 11: DC Power Supply**



### SEE ALSO

[Connecting AC Power Cords to the ACX4000 Router | 102](#)

[Connecting DC Power Cables to the ACX4000 Router | 104](#)

## ACX4000 Power Consumption

The power supply in an ACX4000 router is built along the front panel of the chassis, with a DC power terminal on the front to connect power to the router.

[Table 17 on page 61](#) lists the power consumed by the ACX4000 router.

Table 17: Power Consumed by ACX4000 Routers

Description	Value
Maximum consumed by the router	96 W
Maximum consumed by the router when no PoE power is drawn	96.6 W
Number of PoE ports available	2
Maximum PoE power available	65 W per port

SEE ALSO

| [ACX4000 Power Overview](#) | 58

ACX4000 AC Power Specifications

Table 18 on page 61 lists the AC power system electrical specifications.

Table 18: AC Power System Electrical Specifications

Item	Specification
AC input voltage	Operating range: 90 to 264 VAC
AC input line frequency	47 to 63 Hz (nominal)
AC system current rating	4.5 A maximum per inlet at 100 VAC
AC system input power	435 W

**Table 18: AC Power System Electrical Specifications (Continued)**

Item	Specification
Maximum AC power supply output power	200 W @ 12V power rail 170 W @ 54V (PoE) power rail

**NOTE:** We recommend that you provide 4.5 A maximum per inlet at 100 VAC and use a facility circuit breaker rated for 4 A minimum. Doing so enables you to operate the router in any configuration without upgrading the power infrastructure, and allows the router to function at full capacity using multiple power supplies.

## ACX4000 AC Power Cord Specifications

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

You can order detachable AC power cords, each approximately 8 ft (2.5 m) long that supply AC power to the router. The C15 appliance coupler end of the cord, as described by International Electrotechnical Commission (IEC) standard 60320, inserts into the AC appliance inlet coupler. The plug end of the power cord fits into the power source receptacle that is standard for your geographic location.

[Table 19 on page 62](#) provides specifications on the AC power cord provided for each country or region.

**Table 19: AC Power Cord Specifications**

Country	Model Number	Electrical Specification	Plug Type	Design Standard
Australia	CBL-GP-C15-AU	250 VAC, 10 A, 50 Hz	SAA/3	AS/NZZS 3112-2000
China	CBL-GP-C15-CH	250 VAC, 10 A, 50 Hz	PRC/3	GB2099, GB1002

Table 19: AC Power Cord Specifications (Continued)

Country	Model Number	Electrical Specification	Plug Type	Design Standard
Europe (except Italy, Switzerland, and United Kingdom)	CBL-GP-C15-EU	250 VAC, 10 A, 50 Hz	VIIG	CEE (7) VII
Italy	CBL-GP-C15-IT	250 VAC, 10 A, 50 Hz	I/3G	CEI 23-16
Japan	CBL-GP-C15-JP	125 VAC, 15 A, 50 Hz or 60 Hz	498GJ	JIS 8303
Korea	CBL-GP-C15-KR	250 VAC, 10 A, 50 Hz	VIIG	CEE (7) VII
Switzerland	CBL-GP-C15-SZ	250 VAC, 10 A, 50 Hz	12G	SEV 1011 / 6534-2
North America	CBL-GP-C15-US	125 VAC, 13 A, 60 Hz	498G	NEMA 5-15
United Kingdom	CBL-GP-C15-UK	250 VAC, 10 A, 50 Hz	BS89/13	BS 1363/A



**WARNING:** The AC power cord for the router is intended for use with the router only and not for any other use.



**WARNING:** The attached power cable is only for this product. Do not use the cable for another product. Translation in Japanese follows:

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。

9477263

**NOTE:** In North America, AC power cords must not exceed approximately 14.75 ft (4.5 m) 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). You can order AC power cords that are in compliance.



**CAUTION:** Power cords and cables must not block access to device components or drape where people could trip on them.

## ACX4000 DC Power Specifications

The power supply in ACX4000 routers is built in along the front left panel of the chassis with DC power terminals to connect power to the router.

The ACX4000 router supports a wide range of voltage ranges as shown in [Table 20 on page 64](#).

**Table 20: DC Power Electrical Specifications**

Item	Specification
DC input voltages	<ul style="list-style-type: none"><li>• 18 to 30 VDC</li><li>• -39 to -56 VDC</li><li>• -39 to -72 VDC</li></ul>
DC input currents	<ul style="list-style-type: none"><li>• 16.1 A @ 24 VDC</li><li>• 8.03 A @ -48 VDC</li><li>• 6.42 A @ -60 VDC</li></ul>
Power supply output	385 W
PoE output	65 W per port at 54 V

**NOTE:** We recommend that you provide at least 17 A @ 24 VDC and use a facility circuit breaker rated for 16.5 A minimum. Doing so enables you to operate the router in any configuration without upgrading the power infrastructure, and allows the router to function at full capacity using multiple power supplies.

## SEE ALSO

[ACX4000 DC Power Electrical Safety Guidelines | 189](#)

[DC Power Copper Conductors Warning | 190](#)

[DC Power Disconnection Warning | 191](#)

[DC Power Grounding Requirements and Warning | 192](#)

[DC Power Wiring Sequence Warning | 193](#)

[DC Power Wiring Terminations Warning | 195](#)

## ACX4000 DC Power Cable and Lug Specifications

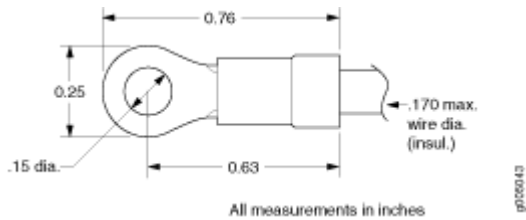
### IN THIS SECTION

- [DC Power Cable Lug Specifications | 65](#)
- [DC Power Cable Specifications | 66](#)

## DC Power Cable Lug Specifications

Use cable lugs with the specifications shown in [Figure 12 on page 66](#) to attach each DC power cable to the DC power supply.

Figure 12: DC Power Cable Lug



**CAUTION:** Before you install the router, a licensed electrician must attach a cable lug to the grounding and power cables that you supply. A cable with an incorrectly attached lug can damage the router.

## DC Power Cable Specifications

You must supply two DC power cables for each DC power supply that meet the following specifications: 14-AWG (2.08 mm<sup>2</sup>), minimum 60° C wire, or as required by the local code.

### SEE ALSO

[ACX4000 DC Power Electrical Safety Guidelines | 189](#)

[DC Power Copper Conductors Warning | 190](#)

[DC Power Disconnection Warning | 191](#)

[DC Power Grounding Requirements and Warning | 192](#)

[DC Power Wiring Sequence Warning | 193](#)

[DC Power Wiring Terminations Warning | 195](#)

## ACX4000 Router Grounding Specifications

### IN THIS SECTION

- [Grounding Points Specifications | 67](#)
- [Grounding Cable Lug Specifications | 68](#)
- [Grounding Cable Specifications | 69](#)

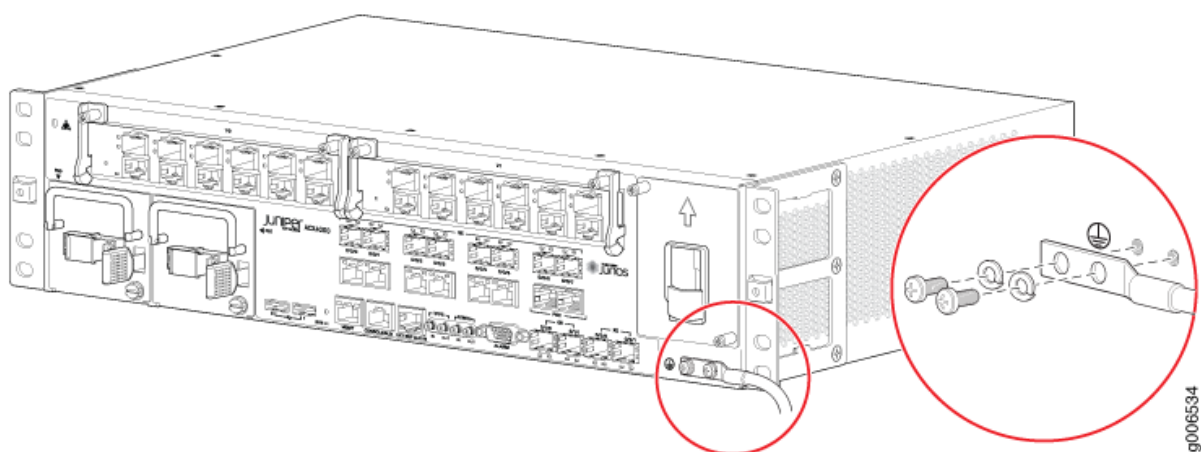
## Grounding Points Specifications

To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, the router must be adequately grounded before power is connected. To ground AC-powered and DC-powered routers, you must connect a grounding cable to earth ground and then attach it to the chassis grounding points using two paint-piercing washers and two screws (not provided) (see [Figure 13 on page 67](#)).

Two threaded holes are provided on the front of the router chassis for connecting the router to earth ground. The grounding points fit 0.5-inch-long SAE 10-32 screws (American). The grounding points are spaced at 0.625-in. (15.86-mm) centers.

You must install the ACX4000 in a restricted-access location and ensure that the chassis is always properly grounded. The ACX4000 has a two-hole protective grounding terminal provided on the chassis. See [Figure 13 on page 67](#). We recommend that you use this protective grounding terminal as the preferred method for grounding the chassis regardless of the power supply configuration. However, if additional grounding methods are available, you can also use those methods. For example, you can use the grounding wire in the AC power cord or use the grounding terminal or lug on a DC power supply. This tested system meets or exceeds all applicable EMC regulatory requirements with the two-hole protective grounding terminal.

**Figure 13: Grounding Points on the ACX4000 Routers**



**NOTE:** All bare grounding connection points to the router must be cleaned and coated with an antioxidant solution before grounding the router.

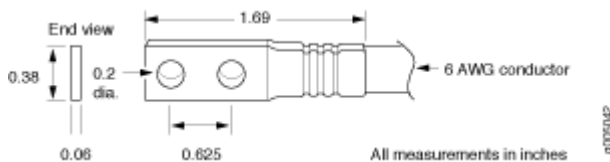
**NOTE:** All surfaces on the router that are unplated must be brought to a bright finish and treated with an antioxidant solution before connecting the router.

**NOTE:** All nonconductive surfaces on the router must be removed from all threads and connection points to ensure electrical continuity.

## Grounding Cable Lug Specifications

The grounding cable lug is used to secure the grounding cable to the grounding points on the ACX chassis. The grounding cable lug attaches to the grounding cable (see [Figure 14 on page 68](#)) and is secured to the router by two 0.5-inch-long SAE 10–32 screws. We recommend using paint-piercing washers between the grounding lug and the screws. The grounding cable lug, screws, and washers are not supplied with the router.

**Figure 14: Grounding Cable Lug**



**CAUTION:** Before you install the router, a licensed electrician must attach a cable lug to the grounding and power cables that you supply. A cable with an incorrectly attached lug can damage the router.



**CAUTION:** The maximum torque rating of the grounding screws on the router is 4.34 lb-in. (0.49 Nm). The grounding screws may be damaged if excessive torque is applied. Use only a torque-controlled driver to tighten screws. Use an appropriately sized driver, with a maximum torque capacity of 5 lb-in. or less. Ensure that the driver is undamaged and properly calibrated and that you have been trained in its use. You may wish to use a driver that is designed to prevent overtorque when the preset torque level is achieved.

## Grounding Cable Specifications

You must provide one grounding cable that meets the following specifications: 6-AWG (4.11 mm<sup>2</sup>), minimum 90°C wire, or as required by the local code.

### SEE ALSO

[Connecting the ACX4000 Router to Earth Ground | 101](#)

[Prevention of Electrostatic Discharge Damage | 186](#)

# 2

CHAPTER

## Site Planning, Preparation, and Specifications

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Site Preparation Checklist for ACX4000 Routers | 71

ACX4000 Site Guidelines and Requirements | 72

ACX4000 Network Cable and Transceiver Planning | 82

ACX4000 Alarm, Management, and Clocking Cable Specifications and Pinouts | 87

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# Site Preparation Checklist for ACX4000 Routers

To prepare a site for router installation:

1. Verify that environmental factors such as temperature and humidity do not exceed router tolerances. See ["ACX4000 Router Environmental Specifications" on page 76](#).
2. Verify that the site and installation plan meets all safety guidelines and requirements. See ["General Safety Guidelines and Warnings" on page 161](#).
3. Measure distance between external power sources and the router installation site. See ["ACX4000 AC Power Cord Specifications" on page 62](#).
4. Locate sites for connection of system grounding. See ["ACX4000 Router Grounding Specifications" on page 66](#).
5. Calculate the power consumption and requirements. See:
  - ["ACX4000 Power Consumption" on page 60](#)
  - ["ACX4000 AC Power Specifications" on page 61](#)
  - ["ACX4000 DC Power Specifications" on page 64](#)
6. Verify that the plan for power installation meets all electrical safety guidelines. See:
  - ["General Electrical Safety Guidelines and Warnings" on page 184](#)
  - ["AC Power Electrical Safety Guidelines" on page 187](#)
  - ["AC Power Disconnection Warning" on page 188](#)
  - ["ACX4000 DC Power Electrical Safety Guidelines" on page 189](#)
  - ["DC Power Disconnection Warning" on page 191](#)
  - ["DC Power Grounding Requirements and Warning" on page 192](#)
  - ["DC Power Wiring Sequence Warning" on page 193](#)
  - ["DC Power Wiring Terminations Warning" on page 195](#)
7. Verify that your rack meets the minimum requirements for the installation of the router. See ["Rack Requirements for ACX4000 Routers" on page 80](#).
8. Plan the location of the rack, including required space for airflow and maintenance. See ["Clearance Requirements for Airflow and Hardware Maintenance on ACX4000 Routers" on page 74](#).
9. Plan to secure the rack to the floor and building structure. See ["Rack Requirements for ACX4000 Routers" on page 80](#).
10. Acquire cables and connectors:
  - Determine the number of cables needed based on your planned configuration.



- Review the maximum distance allowed for each cable. Choose the length of cable based on the distance between the hardware components being connected.

See the [ACX4000 Universal Metro Router Interface Module Reference](#).

11. Plan the cable routing and management. See "[Maintaining Cables That Connect to ACX4000 Network Ports](#)" on page 119.

## RELATED DOCUMENTATION

| [Installing and Connecting an ACX4000 Router Overview](#) | 94

# ACX4000 Site Guidelines and Requirements

## IN THIS SECTION

- [General Site Guidelines](#) | 72
- [Site Electrical Wiring Guidelines](#) | 73
- [Clearance Requirements for Airflow and Hardware Maintenance on ACX4000 Routers](#) | 74
- [Chassis Physical Specifications for ACX4000 Routers](#) | 75
- [ACX4000 Router Environmental Specifications](#) | 76
- [Cabinet Requirements for ACX4000 Routers](#) | 78
- [Rack Requirements for ACX4000 Routers](#) | 80

## General Site Guidelines

Efficient device operation requires proper site planning and maintenance. It also requires proper layout of the equipment, rack or cabinet, 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. Ensure 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.

## Site Electrical Wiring Guidelines

Table 21 on page 73 describes the factors you must consider while planning the electrical wiring at your site.



**WARNING:** You must provide a properly grounded and shielded environment and use electrical surge-suppression devices.

**Avertissement** Vous devez établir un environnement protégé et convenablement mis à la terre et utiliser des dispositifs de parasurtension.

**Table 21: 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>

**Table 21: Site Electrical Wiring Guidelines (Continued)**

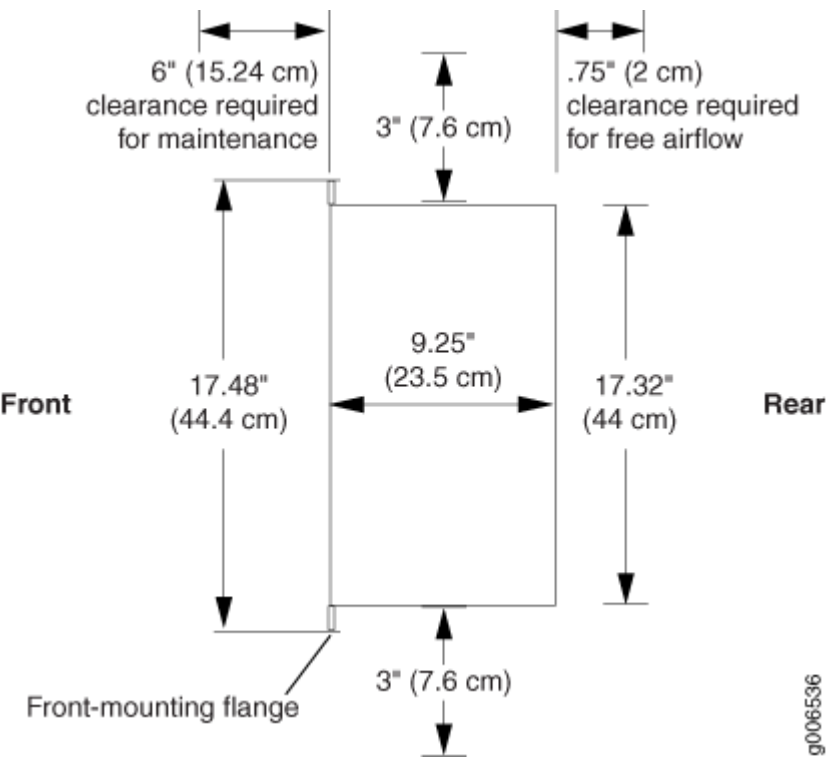
Site Wiring Factor	Guidelines
Electromagnetic compatibility	<p>If your site is susceptible to problems with electromagnetic compatibility (EMC), particularly from lightning or radio transmitters, seek expert advice.</p> <p>Strong sources of electromagnetic interference (EMI) can cause:</p> <ul style="list-style-type: 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 on ACX4000 Routers

When planning the installation site, allow sufficient clearance around the rack (see [Figure 15 on page 75](#)):

- For service personnel to remove and install hardware components, allow at least 2.16 in. (5.5 cm) in front of the router.
- The rack or cabinet must have an adequate supply of cooling air.
- Ensure that the cabinet allows the chassis hot exhaust air to exit from the cabinet without recirculating into the router.
- When deploying the router in harsh environments where the router may operate between 131° F (55° C) and 149° F (65° C), allow a 1-rack unit (U) gap above and below the router.
- Minimum 1 meter/second airflow in any direction

Figure 15: ACX4000 Chassis Dimensions and Clearance Requirements



SEE ALSO

| [Installing and Connecting an ACX4000 Router Overview](#) | 94

Chassis Physical Specifications for ACX4000 Routers

The ACX4000 router is a rigid sheet-metal structure that houses the hardware components. [Table 22 on page 75](#) summarizes the physical specifications of the ACX4000 router.

Table 22: Physical Specifications of the ACX4000 Router Chassis

Description	Value
Height	4.375 in. (11.11 cm)

**Table 22: Physical Specifications of the ACX4000 Router Chassis** *(Continued)*

Description	Value
Width	<ul style="list-style-type: none"> <li>• 17.5 in. (44.5 cm)</li> <li>• 19.2 in. (48.7 cm) with mounting brackets attached</li> </ul>
Depth	9.5 in. (24.13 cm)
Weight	16.98 lb (7.69 kg)

## ACX4000 Router Environmental Specifications

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

Ensure that these environmental guidelines are followed:

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

**NOTE:** Depending on the ambient temperature, it may take up to 5 minutes for the router to heat up to the operating temperature.

[Table 23 on page 76](#) provides the required environmental conditions for normal router operation.

**Table 23: Router Environmental Specifications**

Description	Value
Altitude	No performance degradation to 10,000 ft (3048 m)

**Table 23: Router Environmental Specifications** *(Continued)*

Description	Value
Relative humidity	Normal operation ensured in relative humidity range of 5% to 90%, noncondensing
Temperature	<ul style="list-style-type: none"> <li>• Harsh environment: -40°F (-40°C) to 149°F (65°C)</li> <li>• Central office environment: 23°F (-5°C) to 131°F (55°C)</li> </ul>
Commercial grade SFP/SFP+ temperature	<ul style="list-style-type: none"> <li>• Harsh environment: -40°F (-40°C) to 122°F (50°C)</li> <li>• Central office environment: -40°F (-40°C) to 104°F (40°C)</li> </ul>
Seismic	Designed to meet Telcordia Technologies Zone 4 earthquake requirements
Configuration	<ul style="list-style-type: none"> <li>• Harsh environment: <ul style="list-style-type: none"> <li>• PoE Power: 65W each port (max spec)</li> <li>• 1GB ports: Full traffic</li> <li>• 10GB ports: Full traffic 1G ports</li> <li>• T1/E1 ports: Full traffic</li> <li>• SFP/SFP+: Extended temperature grade or industrial grade</li> </ul> </li> <li>• Central office environment: <ul style="list-style-type: none"> <li>• PoE Power: 30W each port (max spec)</li> <li>• 1GB ports: Full traffic</li> <li>• 10GB ports: Full traffic 1G ports</li> <li>• T1/E1 ports: Full traffic</li> <li>• SFP/SFP+: Extended temperature grade or industrial grade</li> </ul> </li> </ul>

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

## Cabinet Requirements for ACX4000 Routers

You can mount the router in a cabinet that contains a 19-in. (48.3 cm) rack.

Cabinet requirements consist of:

- Cabinet size
- Clearance requirements
- Cabinet airflow requirements

Table 24 on page 78 provides the cabinet requirements and specifications for the router.

**Table 24: Cabinet Requirements and Specifications for the ACX4000 Router**

Cabinet Requirement	Guidelines
Cabinet size	<ul style="list-style-type: none"><li>• You can mount the router in a cabinet that contains a 19-in. (48.3 cm) 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.eia.org">http://www.eia.org</a>).</li></ul> <p><b>NOTE:</b> The rack must meet the strength requirements to support the weight of the router.</p> <ul style="list-style-type: none"><li>• The minimum cabinet size must be able to accommodate the maximum external dimensions of the router.</li></ul>

Table 24: Cabinet Requirements and Specifications for the ACX4000 Router *(Continued)*

Cabinet Requirement	Guidelines
Cabinet clearance	<ul style="list-style-type: none"> <li>• The outer edges of the mounting brackets extend the width of the chassis to 19 in. (48.3 cm).</li> <li>• The minimum total clearance inside the cabinet is 30 in. (76.2 cm) between the inside of the front door and the inside of the rear door.</li> </ul>
Cabinet airflow requirements	<p>When you mount the router in a cabinet, ensure that ventilation through the cabinet is sufficient to prevent overheating.</p> <ul style="list-style-type: none"> <li>• Ensure an adequate cool air supply to dissipate the thermal output of the router or routers.</li> <li>• Ensure that the cabinet allows the chassis hot exhaust air to exit the cabinet without recirculating into the router. 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 router in the cabinet in a way that maximizes the open space on the side of the chassis that has the hot air exhaust. This space maximizes the clearance for critical airflow.</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 router and cabinet.</li> <li>• A cabinet larger than the minimum required provides better airflow and reduces the chance of overheating.</li> </ul>



SEE ALSO

| [Installing and Connecting an ACX4000 Router Overview](#) | 94

Rack Requirements for ACX4000 Routers

You can mount the router 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 25 on page 80](#) provides the rack requirements and specifications for the router.

Table 25: Rack Requirements and Specifications for the Router

Rack Requirement	Guidelines
Rack type	<p>Use a two-post rack or a four-post rack. You can mount the router 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.eia.org">http://www.eia.org</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 router can be mounted in any rack that provides holes spaced at that distance.</p>

Table 25: Rack Requirements and Specifications for the Router *(Continued)*

Rack Requirement	Guidelines
Rack size and strength	<ul style="list-style-type: none"> <li>• Ensure that the rack complies with this standard: <ul style="list-style-type: none"> <li>• A 19-in. (48.3 cm) 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.eia.org">http://www.eia.org</a>).</li> </ul> </li> <li>• Ensure that the rack rails are spaced widely enough to accommodate the router chassis' external dimensions . The outer edges of the front-mounting brackets extend the width of the chassis to 19.2 in. (48.7 cm).</li> <li>• The rack must be strong enough to support the weight of the router.</li> <li>• Ensure that the spacing of rails and adjacent racks allows for the proper clearance around the router 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 to the wall or floor brackets for maximum stability.</li> </ul>

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

## SEE ALSO

| [Installing and Connecting an ACX4000 Router Overview](#) | 94

# ACX4000 Network Cable and Transceiver Planning

## IN THIS SECTION

- Determining Transceiver Support and Specifications | 82
- Calculating Power Budget and Power Margin for Fiber-Optic Cables | 83
- Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion | 86

## Determining Transceiver Support and Specifications

You can find information about the pluggable transceivers supported on your Juniper Networks device by using the Hardware Compatibility Tool. In addition to transceiver and connector type, the optical and cable characteristics—where applicable—are documented for each transceiver. The Hardware Compatibility Tool allows you to search by product, displaying all the transceivers supported on that device, or category, displaying all the transceivers by interface speed or type. The Hardware Compatibility Tool is located at <https://apps.juniper.net/hct/>.

Some transceivers support additional monitoring using the operational mode CLI command `show interfaces diagnostics optics`. Use the Hardware Compatibility Tool to determine if your transceiver supports monitoring. See the Junos OS documentation for your device for a description of the monitoring fields.



**CAUTION:** The Juniper Networks Technical Assistance Center (JTAC) provides complete support for Juniper-supplied optical modules and cables. However, JTAC does not provide support for third-party optical modules and cables that are not qualified or supplied by Juniper Networks. If you face a problem running a Juniper device that uses third-party optical modules or cables, JTAC may help you diagnose host-related issues if the observed issue is not, in the opinion of JTAC, related to the use of the third-party optical modules or cables. Your JTAC engineer will likely request that you check the third-party optical module or cable and, if required, replace it with an equivalent Juniper-qualified component.

Use of third-party optical modules with high-power consumption (for example, coherent ZR or ZR+) can potentially cause thermal damage to or reduce the lifespan of the host equipment. Any damage to the host equipment due to the use of third-party

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

## SEE ALSO

[show interfaces diagnostics optics \(Gigabit Ethernet, 10-Gigabit Ethernet, 40-Gigabit Ethernet, 100-Gigabit Ethernet, and Virtual Chassis Port\)](#)

[show interfaces diagnostics optics \(SONET\)](#)

[show interfaces diagnostics optics](#)

[show interfaces diagnostics optics](#)

[show interfaces diagnostics optics](#)

## Calculating Power Budget and Power Margin for Fiber-Optic Cables

### IN THIS SECTION

- [How to Calculate Power Budget for Fiber-Optic Cables | 83](#)
- [How to Calculate Power Margin for Fiber-Optic Cables | 84](#)

Use the information in this topic and the specifications for your optical interface to calculate the power budget and power margin for fiber-optic cables.

**TIP:** You can use the [Hardware Compatibility Tool](#) to find information about the pluggable transceivers supported on your Juniper Networks device.

To calculate the power budget and power margin, perform the following tasks:

### How to Calculate Power Budget for Fiber-Optic Cables

To ensure that fiber-optic connections have sufficient power for correct operation, you need to calculate the link's power budget, which is the maximum amount of power it 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 of power budget ( $P_B$ ), you assume minimum transmitter power ( $P_T$ ) and minimum receiver sensitivity ( $P_R$ ):

$$P_B = P_T - P_R$$

The following hypothetical power budget equation uses values measured in decibels (dB) and decibels referred to one milliwatt (dBm):

$$P_B = P_T - P_R$$

$$P_B = -15 \text{ dBm} - (-28 \text{ dBm})$$

$$P_B = 13 \text{ dB}$$

## How to Calculate Power Margin for Fiber-Optic Cables

After calculating a link's power budget, you can calculate the power margin ( $P_M$ ), which represents the amount of power available after subtracting attenuation or link loss (LL) from the power budget ( $P_B$ ). A worst-case estimate of  $P_M$  assumes maximum LL:

$$P_M = P_B - LL$$

$P_M$  greater than zero indicates that the power budget is sufficient to operate the receiver.

Factors that can cause link loss include higher-order mode losses, modal and chromatic dispersion, connectors, splices, and fiber attenuation. [Table 26 on page 84](#) lists an estimated amount of loss for the factors used in the following sample calculations. For information about the actual amount of signal loss caused by equipment and other factors, refer to vendor documentation.

**Table 26: Estimated Values for Factors Causing Link Loss**

Link-Loss Factor	Estimated Link-Loss Value
Higher-order mode losses	Single mode—None Multimode—0.5 dB
Modal and chromatic dispersion	Single mode—None Multimode—None, if product of bandwidth and distance is less than 500 MHz-km
Faulty connector	0.5 dB

**Table 26: Estimated Values for Factors Causing Link Loss (Continued)**

Link-Loss Factor	Estimated Link-Loss Value
Splice	0.5 dB
Fiber attenuation	Single mode—0.5 dB/km Multimode—1 dB/km

The following sample calculation for a 2-km-long multimode link with a power budget ( $P_B$ ) of 13 dB uses the estimated values from [Table 26 on page 84](#). This example calculates link loss (LL) as the sum of fiber attenuation (2 km @ 1 dB/km, or 2 dB) and loss for five connectors (0.5 dB per connector, or 2.5 dB) and two splices (0.5 dB per splice, or 1 dB) as well as higher-order mode losses (0.5 dB). The power margin ( $P_M$ ) is calculated as follows:

$$P_M = P_B - LL$$

$$P_M = 13 \text{ dB} - 2 \text{ km (1 dB/km)} - 5 (0.5 \text{ dB}) - 2 (0.5 \text{ dB}) - 0.5 \text{ dB}$$

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

$$P_M = 7 \text{ dB}$$

The following sample calculation for an 8-km-long single-mode link with a power budget ( $P_B$ ) of 13 dB uses the estimated values from [Table 26 on page 84](#). This example calculates link loss (LL) as the sum of fiber attenuation (8 km @ 0.5 dB/km, or 4 dB) and loss for seven connectors (0.5 dB per connector, or 3.5 dB). The power margin ( $P_M$ ) is calculated as follows:

$$P_M = P_B - LL$$

$$P_M = 13 \text{ dB} - 8 \text{ km (0.5 dB/km)} - 7(0.5 \text{ dB})$$

$$P_M = 13 \text{ dB} - 4 \text{ dB} - 3.5 \text{ dB}$$

$$P_M = 5.5 \text{ dB}$$

In both examples, the calculated power margin is greater than zero, indicating that the link has sufficient power for transmission and does not exceed the maximum receiver input power.

## Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion

### IN THIS SECTION

- [Signal Loss in Multimode and Single-Mode Fiber-Optic Cable | 86](#)
- [Attenuation and Dispersion in Fiber-Optic Cable | 86](#)

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

Multimode fiber is large enough in diameter to allow rays of light to reflect internally (bounce off the walls of the fiber). Interfaces with multimode optics typically use LEDs as light sources. However, LEDs are not coherent 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, higher-order mode loss results. Together these factors limit the transmission distance of multimode fiber compared with single-mode fiber.

Single-mode fiber is so small in diameter that rays of light can 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 with multimode fiber, single-mode fiber has higher bandwidth and can carry signals for longer distances.

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

### Attenuation and Dispersion in Fiber-Optic Cable

Correct functioning of an optical data link depends on modulated light reaching the receiver with enough power to be demodulated correctly. *Attenuation* is the reduction in power of the light signal as it is transmitted. Attenuation is caused by passive media components such as cables, cable splices, and connectors. 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 have enough light available to overcome attenuation.

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

- Chromatic dispersion—Spreading of the signal over time, resulting from the different speeds of light rays.

- Modal dispersion—Spreading of the signal over time, resulting from 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 rather than modal dispersion limits 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 less than 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.

## ACX4000 Alarm, Management, and Clocking Cable Specifications and Pinouts

### IN THIS SECTION

- [Alarm Contact Port Pinouts for ACX4000 Routers | 87](#)
- [Management Port Connector Pinout Information for ACX Series Routers | 90](#)
- [Console or Auxiliary Port Connector Pinout on ACX Series Routers | 90](#)
- [USB Port Specifications for an ACX Series Router | 91](#)

### Alarm Contact Port Pinouts for ACX4000 Routers

You can independently configure alarm input ports (0 to 3) to operate in Normally Open or Normally Closed mode, and to trigger a red alarm condition or a yellow alarm condition, or to ignore alarm conditions.

You can independently configure alarm output ports (0 and 1) can be configured to relay alarm information when the system condition goes to a red or yellow alarm condition and when the alarm



output port is configured to trigger based on alarm input condition. Alarm output ports (2 and 3) are used to indicate major and minor system alarms and are normally in open mode.

Table 27 on page 88 shows the alarm contact connector pinouts.

**Table 27: Alarm Contact Connector Pinouts**

Pin Number	Signal Definition	Direction	CLI Port Mapping	Function
1	ALARM_IN0_NO/NC	Input	Input Alarm Port 0	External alarm input 0 (if voltage on this pin is between 24V to 72V with reference to Pin 6, alarm input 0 is in closed condition)
2	ALARM_IN1_REF	Input	Input Alarm Port 1	External alarm input 1 (Reference for Pin 7)
3	ALARM_IN2_NO/NC	Input	Input Alarm Port 2	External alarm input 2 (if voltage on this pin is between 24V to 72V with reference to Pin 8, alarm input 2 is in closed condition)
4	ALARM_IN3_NO/NC	Input	Input Alarm Port 3	External alarm input 3 (if voltage on this pin is between 24V to 72V with reference to Pin 8, alarm input 3 is in closed condition)
5	ALARM_OUT3_REF	Output	Reserved for Minor alarm	External alarm output 3 (this pin is connected to Pin 10 in closed condition)
6	ALARM_IN0_REF	Input	Input Alarm Port 0	External alarm input 0 (Reference for Pin 1)
7	ALARM_IN1_NO/NC	Input	Input Alarm Port 1	External alarm input 1 (if voltage on this pin is between 24V to 72V with reference to Pin 2, alarm input 1 is closed)

**Table 27: Alarm Contact Connector Pinouts** *(Continued)*

Pin Number	Signal Definition	Direction	CLI Port Mapping	Function
8	ALARM_IN2_IN3_REF	Input	Input Alarm Port 2 and Input Alarm Port 3	Common contact for external alarm input 3 and 4 (Reference for Pin 3 and Pin 4)
9	ALARM_OUT2_REF	Output	Reserved for Major alarm	External alarm output 2 (this pin is connected to Pin 15 in closed condition)
10	ALARM_OUT3_NO/NC	Output	Reserved for Minor alarm	External alarm output 3 (this pin is connected to Pin 5 in closed condition)
11	ALARM_OUT0_NO/NC	Output	Output Alarm Port 0	External alarm output 0 (this pin is connected to Pin 12 in closed condition)
12	ALARM_OUT0_REF	Output	Output Alarm Port 0	External alarm output 0 (this pin is connected to Pin 11 in closed condition)
13	ALARM_OUT1_NO/NC	Output	Output Alarm Port 1	External alarm output 1 (this pin is connected to Pin 14 in closed condition)
14	ALARM_OUT1_REF	Output	Output Alarm Port 1	External alarm output 1 (this pin is connected to Pin 13 in closed condition)
15	ALARM_OUT2_NO/NC	Output	Reserved for Major alarm	External alarm output 2 (this pin is connected to Pin 9 in closed condition)

## Management Port Connector Pinout Information for ACX Series Routers

The management port—labeled **MGMT**—on an ACX Series router uses an RJ-45 connector to connect to a management device for out-of-band management.

The port uses an autosensing RJ-45 connector to support a 10/100BASE-T connection. Two LEDs indicate link activity on the port and the administrative status of the port.

[Table 28 on page 90](#) provides the pinout information for the RJ-45 connector for the management port.

**Table 28: Management Port Connector Pinout Information**

Pin	Description	Direction
1	TRD[0]-	In/Out
2	TRD[0]+	In/Out
3	TRD[1]-	In/Out
4	TRD[1]+	In/Out
5	TRD[2]-	In/Out
6	TRD[2]+	In/Out
7	TRD[3]-	In/Out
8	TRD[3]+	In/Out

## Console or Auxiliary Port Connector Pinout on ACX Series Routers

The port labeled **CONSOLE/AUX** on the front panel is an asynchronous serial interface that accept an RJ-45 connector. Use a cable with the pinouts described in [Table 29 on page 91](#) to connect the Routing Engine to an auxiliary or console management device.

**NOTE:** You must use a shielded twisted pair (STP) cable for both outdoor and indoor deployments.

**Table 29: Connector Pinout for the Console/Auxiliary Port**

Pin	Signal	Description	CPU	Direction
1	RTS	Request to Send	Routing Engine	Out
2	TXD	Transmit Data	1588 CPU	Out
3	TXD	Transmit Data	Routing Engine	Out
4	Ground	Signal Ground	–	–
5	Ground	Signal Ground	–	–
6	RXD	Receive Data	Routing Engine	In
7	RXD	Receive Data	1588 CPU	In
8	CTS	Clear to Send	Routing Engine	In

## USB Port Specifications for an ACX Series Router

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

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



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

All USB flash drives used on ACX Series routers must meet the following requirements:

- USB 2.0 or later
- Formatted with a FAT32 or MS-DOS file system

# 3

CHAPTER

## Initial Installation and Configuration

---

Installing and Connecting an ACX4000 Router Overview | 94

Unpacking and Mounting the ACX4000 Router | 95

Connecting the ACX4000 to Power | 100

Connecting the ACX4000 to External Devices | 106

Initially Configuring the ACX4000 Router | 112

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# Installing and Connecting an ACX4000 Router

## Overview

To install and connect an ACX4000 router:

1. Review all safety guidelines and warnings for the router. See ["General Safety Guidelines and Warnings" on page 161](#).
2. Prepare the installation site for the router. See ["Site Preparation Checklist for ACX4000 Routers" on page 71](#).
3. Unpack the router and verify the parts received. See ["Unpacking an ACX4000 Router" on page 95](#).
4. Install the router in a rack. See ["Installing the ACX4000 Router in the Rack" on page 98](#).
5. Ground the router. See ["Connecting the ACX4000 Router to Earth Ground" on page 101](#).
6. Connect the router to external devices. See:
  - ["Connecting the ACX4000 Router to Management Devices" on page 107](#)
  - ["Connecting the ACX4000 Router to an External Alarm-Reporting Device" on page 111](#)
  - ["Connecting the ACX4000 Router to External Clocking Devices" on page 109](#)
7. Connect power to the router:
  - AC-powered models—See ["Connecting AC Power Cords to the ACX4000 Router" on page 102](#).
  - DC-powered models—See ["Connecting DC Power Cables to the ACX4000 Router" on page 104](#).
8. Perform initial configuration of the router by following instructions in ["Initially Configuring the ACX4000 Router" on page 112](#)

### RELATED DOCUMENTATION

| [General Site Guidelines](#) | 72

# Unpacking and Mounting the ACX4000 Router

## IN THIS SECTION

- [Unpacking an ACX4000 Router | 95](#)
- [Parts Inventory \(Packing List\) for an ACX4000 Router | 96](#)
- [Installing the ACX4000 Mounting Brackets | 97](#)
- [Installing the ACX4000 Router in the Rack | 98](#)

## Unpacking an ACX4000 Router

The ACX4000 routers are shipped in a cardboard carton, secured with foam packing material. The carton also contains an accessory box.



**CAUTION:** ACX4000 routers are maximally protected inside the shipping carton. Do not unpack the routers until you are ready to begin installation.

To unpack the router and prepare for installation, you need the following tools:

- Blank panels to cover any slots not occupied by a component

To unpack the router:

1. Move the shipping carton to a staging area as close to the installation site as possible, but where you have enough room to remove the system components.
2. Position the carton so that the arrows are pointing up.
3. Open the top flaps on the shipping carton.
4. Remove the accessory box and verify the contents in it against the parts inventory on the label attached to the carton.
5. Pull out the packing material holding the router in place.
6. Verify the chassis components received against the packing list included with the router. An inventory of parts provided with the router is provided in "[Parts Inventory \(Packing List\) for an ACX4000 Router](#)" on page 96.
7. Save the shipping carton and packing materials in case you need to move or ship the router later.



SEE ALSO

ACX4000 Universal Metro Router Overview   2
Site Preparation Checklist for ACX4000 Routers   71

Parts Inventory (Packing List) for an ACX4000 Router

The ACX4000 routers are shipped in a cardboard carton, secured with foam packing material. The carton also contains an accessory box.

The router shipment includes a packing list. Check the parts you receive in the router shipping carton against the items on the packing list. The packing list specifies the part number and description of each part in your order. The parts shipped depend on the 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 30 on page 96 lists the parts and their quantities in the packing list.

Table 30: Parts List for an ACX4000 Router

Component	Quantity
Router with built-in power supply	1
Mounting brackets	2
Mounting screws to attach the mounting brackets to the router chassis	8
SFP dust cover	4
Quick Start installation instructions	1
Juniper Networks Product Warranty	1
End User License Agreement	1

**NOTE:** We no longer include a DB-9 to RJ-45 cable or a DB-9 to RJ-45 adapter with a CAT5E copper cable as part of the device package. If you require a console cable, you can order it separately with the part number JNP-CBL-RJ45-DB9 (DB-9 to RJ-45 adapter with a CAT5E copper cable).

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

## SEE ALSO

[ACX4000 Universal Metro Router Overview | 2](#)

[Unpacking an ACX4000 Router | 95](#)

## Installing the ACX4000 Mounting Brackets

To attach the mounting brackets, you need the following tools:

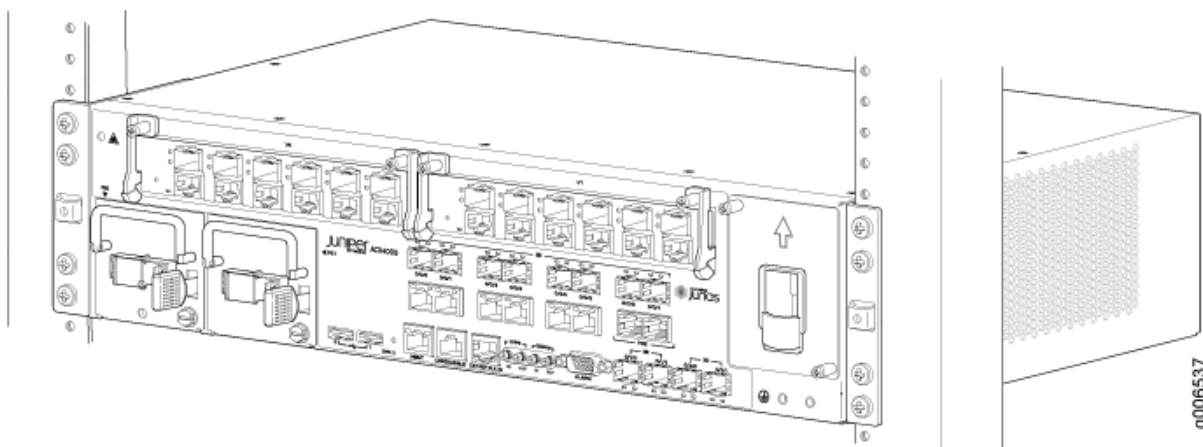
- Phillips (+) screwdriver, number 2

Two mounting brackets for front mounting ship with the router (see [Figure 16 on page 98](#)).

To attach both mounting brackets to either the front or rear of the chassis:

1. Align the bracket with the two sets of mounting holes.
2. Insert the four screws at the top and bottom of the bracket and tighten each partially.
3. Tighten the four screws completely.
4. Repeat the procedure for the other bracket.

Figure 16: Installing the Mounting Brackets to the Front of the ACX4000 Router



#### SEE ALSO

[Installing and Connecting an ACX4000 Router Overview | 94](#)

[Installing the ACX4000 Router in the Rack | 98](#)

## Installing the ACX4000 Router in the Rack

**NOTE:** The router can be installed horizontally in a rack or cabinet. For additional installation options, contact JTAC.

To install the router in the rack (see [Figure 17 on page 100](#)):



**CAUTION:** Before front mounting the router in a rack, have a qualified technician verify that the rack is strong enough to support the router's weight and is adequately supported at the installation site.

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



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

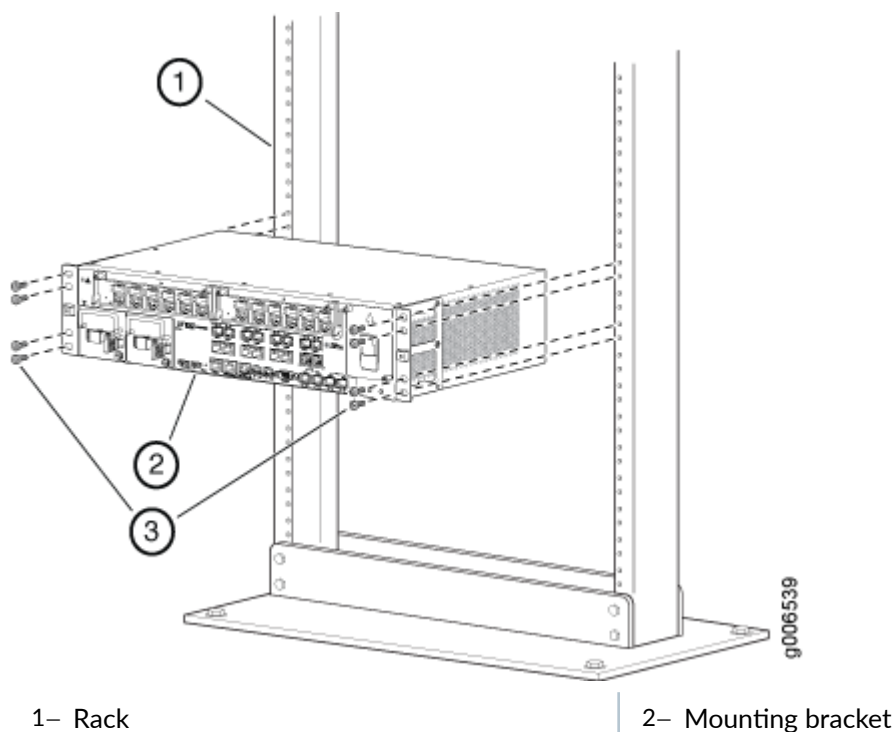
1. Ensure that the rack is in its permanent location and is secured to the building. Ensure that the installation site allows adequate clearance for both airflow and maintenance.
2. Position the router in front of the rack or cabinet.
3. Hold onto the bottom of the chassis and carefully lift it so that the mounting brackets contact the rack rails.



**WARNING:** To prevent injury, keep your back straight and lift with your legs, not your back. Avoid twisting your body as you lift. Balance the load evenly and be sure that your footing is solid.

4. Align the mounting brackets with the holes in the rack rails.
5. Install a mounting screw into each of the open mounting holes aligned with the rack, starting from the bottom.
6. Visually inspect the alignment of the router. If the router is installed properly in the rack, all the mounting screws on one side of the rack should be aligned with the mounting screws on the opposite side, and the router should be level.

Figure 17: Install the Front-Mounted Router in the Rack



#### SEE ALSO

[Site Preparation Checklist for ACX4000 Routers | 71](#)

[Installing and Connecting an ACX4000 Router Overview | 94](#)

[Installing the ACX4000 Mounting Brackets | 97](#)

[Connecting the ACX4000 Router to Earth Ground | 101](#)

## Connecting the ACX4000 to Power

#### IN THIS SECTION

- [Connecting the ACX4000 Router to Earth Ground | 101](#)
- [Connecting AC Power Cords to the ACX4000 Router | 102](#)
- [Connecting DC Power Cables to the ACX4000 Router | 104](#)

## Connecting the ACX4000 Router to Earth Ground

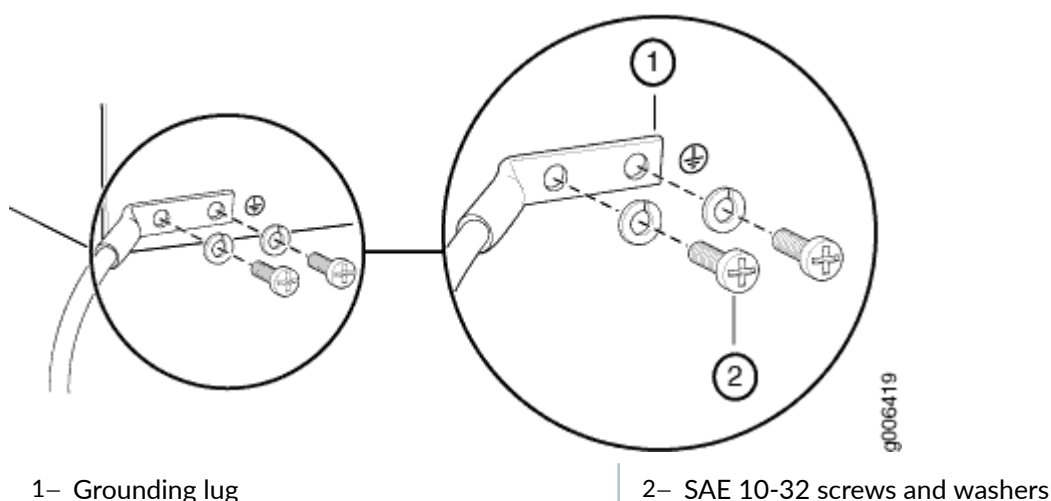
To ground the router, you need the following tools:

- Phillips (+) screwdriver, number 2
- ESD grounding wrist strap
- Two SAE 10-32 screws and flat washers (not provided)
- Grounding lug, Panduit LCD6-14BH-L or equivalent (not provided)
- Grounding cable, minimum 14 AWG (2 mm<sup>2</sup>) 90° C wire (not provided)

You ground the router by connecting a grounding cable to earth ground and then attaching it to the chassis grounding points. To ground the router:

1. Verify that a licensed electrician has attached the cable lug provided with the router to the grounding cable.
2. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an approved site ESD grounding point. See the instructions for your site.
3. Ensure that all grounding surfaces are clean and brought to a bright finish before grounding connections are made.
4. Connect the grounding cable to a proper earth ground.
5. Detach the ESD grounding strap from the site ESD grounding point.
6. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an ESD grounding point.
7. Place the grounding cable lug over the grounding points on the front of the chassis (see [Figure 18 on page 102](#)).
8. Secure the grounding cable lug with the washers and screws. The holes are sized for SAE 10-32 screws.
9. Dress the grounding cable and verify that it does not touch or block access to router components, and that it does not drape where people could trip on it.

**Figure 18: Grounding Points on the ACX4000 Router**



## SEE ALSO

[Installing and Connecting an ACX4000 Router Overview | 94](#)

[Connecting DC Power Cables to the ACX4000 Router | 104](#)

[Connecting AC Power Cords to the ACX4000 Router | 102](#)

[Prevention of Electrostatic Discharge Damage | 186](#)

## Connecting AC Power Cords to the ACX4000 Router

To connect AC power to the router, you need the following tools:

- ESD grounding wrist strap
- AC power cords

To connect AC power to the router:

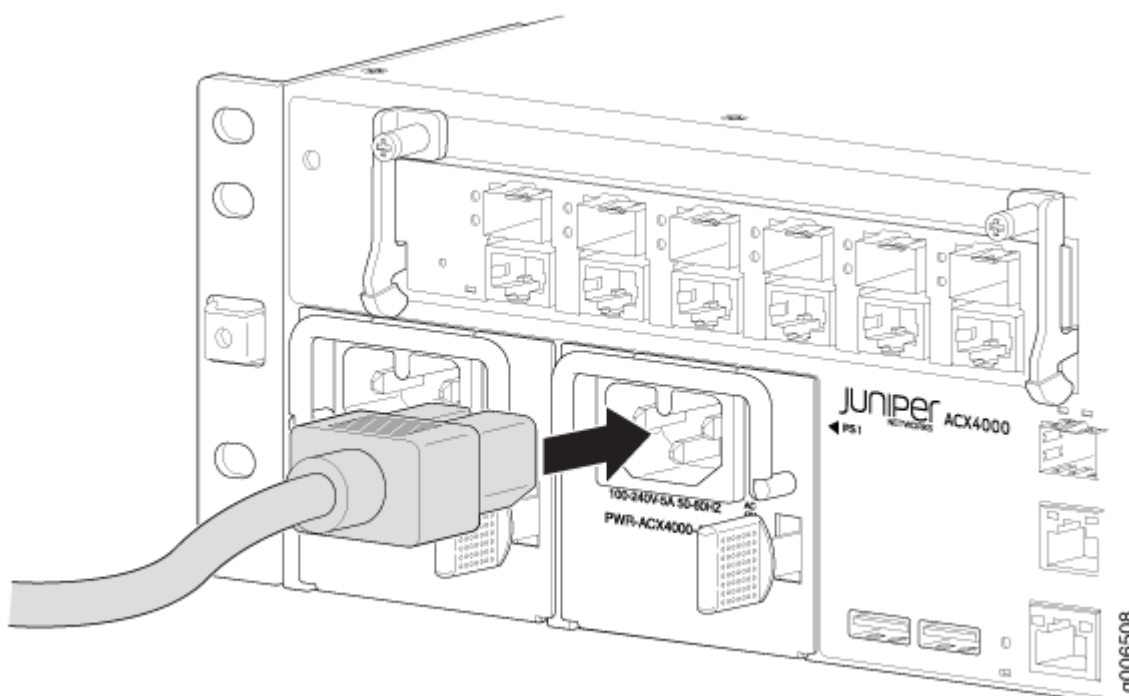
1. Locate the power cords, which should have a plug appropriate for your geographical location. See the .
2. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an ESD grounding point.
3. Insert the appliance coupler end of the power cord into the appliance inlet on the power supply.
4. Insert the power cord plug into an external AC power source receptacle.

**NOTE:** Each power supply must be connected to a dedicated AC power feed and a dedicated customer site circuit breaker. We recommend that you use a dedicated customer site circuit breaker rated for 2 A (100 VAC) or 1 A (240 VAC), or as required by local code.

5. Dress the power cord appropriately. Verify that the power cord does not block the air exhaust and access to router components, or drape where people could trip on it.
6. Repeat Step 1 through Step 5 for the remaining power supply.
7. Observe the system LED on the router. If an AC power supply is functioning normally, the system LED lights green steadily.

If the system LED is not lit, the power supply is not functioning normally. Repeat the cabling procedures.

**Figure 19: Connecting AC Power to the Router**



## SEE ALSO

[ACX4000 AC Power Specifications](#) | 61



## Connecting DC Power Cables to the ACX4000 Router

To connect power to the router, you need the following tools:

- Phillips (+) screwdriver, number 2
- ESD grounding wrist strap
- M3 screws and flat washers
- DC power source cables, minimum 14 AWG or as required by local code (not provided)
- Ring lugs, Molex 190700067 or equivalent (not provided)

The DC power supply has four terminals on the front panel, covered by a clear plastic cover.



**WARNING:** You must ground the router before connecting the DC power cables.

To connect the power cables:

1. Switch off the dedicated customer site circuit breakers. Ensure that the voltage across the DC power source cable leads is 0 V and that there is no chance that the cable leads might become active during installation.
2. Remove the clear plastic cover protecting the terminal on the faceplate.
3. Verify that the DC power cables are correctly labeled before making connections to the power supply. In a typical power distribution scheme where the return is connected to chassis ground at the battery plant, you can use a multimeter to verify the resistance of the -48V and return DC cables to chassis ground:

For -48V and -60V:

- a. The cable with very large resistance (indicating an open circuit) to chassis ground is the DC input cable (-).
- b. The cable with very low resistance (indicating a closed circuit) to chassis ground is the return cable (+).

For +24V:

- a. The cable with very low resistance (indicating a closed circuit) to chassis ground is the DC input cable (-).
  - b. The cable with very large resistance (indicating an open circuit) to chassis ground is the return cable (+).
4. Remove the screws and flat washers from the terminals.

5. Secure each power cable lug to the terminal with the flat washers and screw (see [Figure 20 on page 106](#)). Apply between 8 lb-in. (0.9 Nm) and 9 lb-in. (1.02 Nm) of torque to each screw. Do not overtighten the screw. (Use a number 2 Phillips screwdriver.)

- a. Secure the positive DC source power cable lug to the return (+) terminal.
- b. Secure the negative DC source power cable lug to the input (-) terminal.



**CAUTION:** Ensure that each power cable lug seats flush against the surface of the terminal block as you are tightening the screws. Ensure that each screw is properly threaded into the terminal. Applying installation torque to the screw when improperly threaded may result in damage to the terminal.



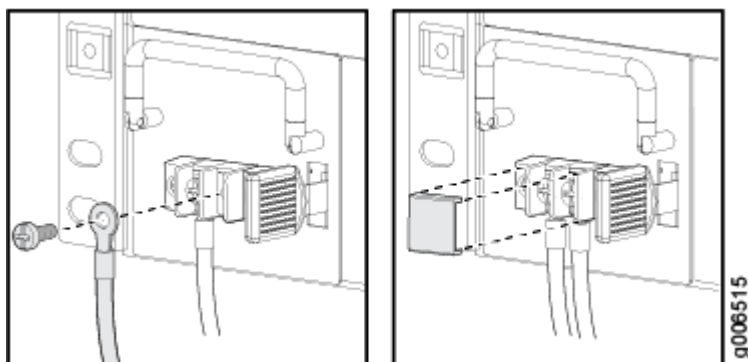
**CAUTION:** The maximum torque rating of the terminal screws on the DC power supply is 9 lb-in. (1.02 Nm). The terminal screws may be damaged if excessive torque is applied. Use only a torque-controlled driver to tighten screws on the DC power supply terminals. Use an appropriately-sized driver, with a maximum torque capacity of 9 lb-in. or less. Ensure that the driver is undamaged and properly calibrated and that you have been trained in its use. You may wish to use a driver that is designed to prevent overtorque when the preset torque level is achieved.

6. Replace the clear plastic cover over the terminals on the faceplate.
7. Connect each DC power cable to the appropriate external DC power source.

**NOTE:** For information about connecting to external DC power sources, see the instructions for your site.

8. Switch on the external circuit breakers to provide voltage to the DC power source cable leads. Observe the system LED on front of the router. If the DC power cable is correctly installed and functioning normally, the system LED lights green steadily. If the status LED indicates that the power supply is not functioning normally, repeat the installation and cabling procedures.

**Figure 20: Connecting DC Power to the Router**



#### SEE ALSO

[ACX4000 Power Overview | 58](#)

[Installing and Connecting an ACX4000 Router Overview | 94](#)

[Connecting the ACX4000 Router to Earth Ground | 101](#)

[ACX4000 DC Power Specifications | 64](#)

## Connecting the ACX4000 to External Devices

#### IN THIS SECTION

- [Connecting the ACX4000 Router to Management Devices | 107](#)
- [Connecting the ACX4000 Router to External Clocking Devices | 109](#)
- [Connecting the ACX4000 Router to an External Alarm-Reporting Device | 111](#)

## Connecting the ACX4000 Router to Management Devices

### IN THIS SECTION

- [Connecting the Router to a Network for Out-of-Band Management | 107](#)
- [Connecting the Router to a Management Console or Auxiliary Device | 108](#)

To connect external devices and cables to the router, you need the following tools:

- RJ-45 Ethernet cable and RJ-45 to DB-9 serial port adapter (not provided)
- Management host, such as a PC, with an Ethernet port (not provided)

**NOTE:** We no longer include a DB-9 to RJ-45 cable or a DB-9 to RJ-45 adapter with a CAT5E copper cable as part of the device package. If you require a console cable, you can order it separately with the part number JNP-CBL-RJ45-DB9 (DB-9 to RJ-45 adapter with a CAT5E copper cable).

### Connecting the Router to a Network for Out-of-Band Management

To connect to the **MGMT** port on the ACX4000 router:

1. Turn off the power to the management device.
2. Plug one end of the Ethernet cable into the **MGMT** port on the router. (Figure 1 shows the connector. Figure 2 shows the port.)
3. Plug the other end of the cable into the network device.

**Figure 21: Ethernet Cable Connector**

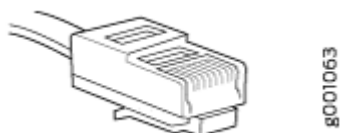
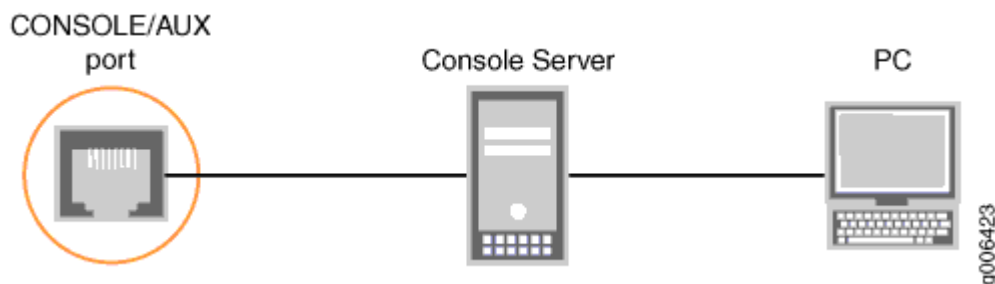


Figure 22: Ethernet Port



### Connecting the Router to a Management Console or Auxiliary Device

You can connect a console, laptop, modem, or other auxiliary device by connecting a serial cable to the port on the front panel labeled **CONSOLE/AUX**. This port accepts a serial cable with an RJ-45 connector.

**NOTE:** We no longer include a DB-9 to RJ-45 cable or a DB-9 to RJ-45 adapter with a CAT5E copper cable as part of the device package. If you require a console cable, you can order it separately with the part number JNP-CBL-RJ45-DB9 (DB-9 to RJ-45 adapter with a CAT5E copper cable).

To connect a management console or auxiliary device:

1. Turn off the power to the console or auxiliary device.
2. Plug the RJ-45 end of the serial cable into the **AUX** port or **CONSOLE** port on the front panel (Figure 23 on page 109 shows the connector. Figure 24 on page 109 shows the ports.)
3. Plug the DB-9 socket end into the device's serial port.

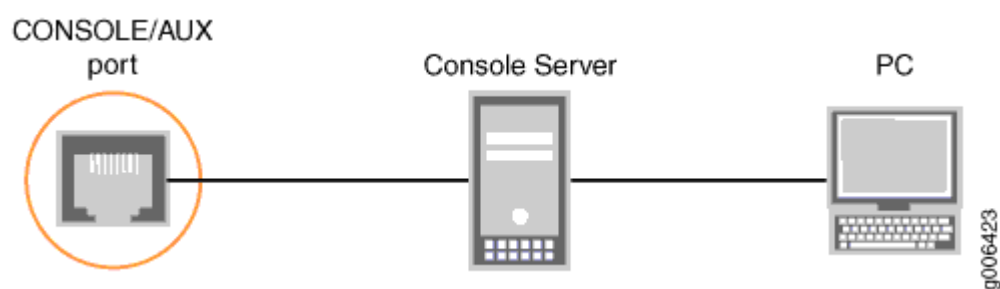
**NOTE:** For console devices, configure the serial port to the following values:

- Baud rate—9600
- Parity—N
- Data bits—8
- Stop bits—1
- Flow control—none

Figure 23: Routing Engine Console and Auxiliary Cable Connector



Figure 24: Auxiliary and Console Connections



## RELATED DOCUMENTATION

[Installing and Connecting an ACX4000 Router Overview | 94](#)

[General Site Guidelines | 72](#)

[Console or Auxiliary Port Connector Pinout on ACX Series Routers | 90](#)

[Management Port Connector Pinout Information for ACX Series Routers | 90](#)

[Initially Configuring the ACX4000 Router | 112](#)

## Connecting the ACX4000 Router to External Clocking Devices

### IN THIS SECTION

- [Connecting 1PPS and 10MHz Timing Devices to the ACX4000 Router | 110](#)
- [Connecting a T1 or E1 External Clocking Device to the ACX4000 Router | 110](#)

The ACX4000 router supports external clock synchronization for Synchronous Ethernet, T1 or E1 line timing sources, and external inputs.

## Connecting 1PPS and 10MHz Timing Devices to the ACX4000 Router

The ACX4000 router has four BNC connectors that support 1PPS and 10MHz timing devices.

**NOTE:** Ensure a cable of 3m or less in length is used for the 10 MHz and 1PPS connectors.

To connect the BNC co-axial cable to the external clocking input port:

1. Connect one end of the BNC co-axial cable to either the 1PPS BNC connector or the 10 MHz BNC connector on the router.
2. Connect the other end of the BNC co-axial cable to the 10 MHz or 1PPS source network equipment.

**NOTE:** Ensure that the 10MHz / 1PPS sources are 50 ohms LVCMOS / LVTTTL (3.3v) compatible.

## Connecting a T1 or E1 External Clocking Device to the ACX4000 Router

The ACX4000 router contains an external building-integrated timing system (BITS) timing port labeled **EXT REF CLK IN** on the front panel of the router.

To connect the router to a BITS T1/E1 external clocking device:

1. Attach an electrostatic discharge (ESD) grounding trap on your bare wrist, and connect the strap to one of the ESD points on the chassis.
2. Plug one end of the RJ-45 cable into the internal clock port on the craft interface.
3. Plug the other end of the RJ-45 cable into the T1 or E1 external clocking device.
4. Verify that the LEDs for the external clock input is lit steadily green.
5. Configure the port. See [Configuring External Clock Synchronization for ACX Series Routers](#).
6. Issue the `show chassis synchronization` command to check the status of the port.

```
user@host> show chassis synchronization
Clock Synchronization Status :
  Clock module on CB 0
    Current state           : master
    Current clock state     : internal
    Selected for            : 13 days, 23 hours, 15 minutes, 17 seconds
    Selected since          : 2012-10-29 18:28:35 EDT
```

```

Deviation (in ppm)      : +0.00
Last deviation (in ppm): +0.00
Clock Synchronization Status :
Clock module on CB 1
Current state           : backup
Current clock state     : locked to master CB
Selected for           : 13 days, 23 hours, 14 minutes, 23 seconds
Selected since         : 2012-10-29 18:29:29 EDT

```

## Connecting the ACX4000 Router to an External Alarm-Reporting Device

To connect the router to external alarm-reporting devices, attach wires to the **ALARM** relay contacts on the front panel of the router. A system condition that triggers the red or yellow alarm on the router also activates the corresponding alarm relay contact.

The terminal blocks that plug into the alarm relay contacts are supplied with the router. They accept wire of any gauge between 20 AWG and 14 AWG (0.52 and 2.08 mm<sup>2</sup>), which is not provided. Use the gauge of wire appropriate for the external device you are connecting.

To connect an external device to an alarm relay contact:

1. Prepare the required length of wire with gauge between 8 AWG and 14 AWG (0.08 and 2.08 mm<sup>2</sup>).
2. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to one of the ESD points on the chassis.
3. While the terminal block is not plugged into the relay contact, use a 2.5-mm flat-blade screwdriver to loosen the small screws on its side. With the small screws on its side facing left, insert wires into the slots in the front of the block based on the wiring for the external device. Tighten the screws to secure the wire.
4. Orient the terminal block according to the labels to the left of the appropriate relay contact (**NC** means “normally closed, **C** means “common,” and **(NO** means “normally open”).
5. Plug the terminal block into the relay contact and use a 2.5-mm flat-blade screwdriver to tighten the screws on the face of the block.
6. Attach the other end of the wires to the external device.

If attaching a reporting device for the other kind of alarm, repeat the procedure.

### SEE ALSO

[ACX4000 Alarm Contact Port Overview](#) | 48



## Initially Configuring the ACX4000 Router

The ACX4000 router ships with Junos OS preinstalled and ready to be configured when the router is powered on. One 4-GB internal NAND Flash memory device is divided into two partitions (da0s1 and da0s2). One partition is marked as the active partition, and the other partition functions as an alternate partition. The NAND Flash device acts as the hard drive. Two USB ports on the front panel accept USB storage devices (usb0 and usb1) that can also function as alternate boot devices.

When the router boots, it first attempts to start the image on the USB flash memory device. If a USB flash memory device is not inserted into the router or the attempt otherwise fails, the router next tries the active partition on the NAND flash device, and then tries the alternate partition on the NAND flash device.

You configure the router by issuing Junos OS command-line interface (CLI) commands, either on a console device attached to the **CONSOLE/AUX** port on the front panel, or over a telnet connection to a network connected to the Routing Engine **MGMT** port on the front panel.

Gather the following information before configuring the router:

- Name that the router will use on the network
- Domain name that the router will use
- IP address and prefix length information for the Ethernet interface
- IP address of a default router
- IP address of a DNS server
- Password for the root user

This procedure connects the router to the network but does not enable it to forward traffic. For complete information about enabling the router to forward traffic, including examples, see the Junos OS configuration guides.

To configure the software:

1. Verify that the router is powered on.
2. Log in as the “root” user. There is no password.

3. Start the CLI.

```
root# cli
root@>
```

4. Enter configuration mode.

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

5. Configure the name of the router. If the name includes spaces, enclose the name in quotation marks (" ").

```
[edit]
root@# set system host-name host-name
```

6. Create a management console user account.

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

7. Set the user account class to super-user.

```
[edit]
root@# set system login user user-name class super-user
```

8. Configure the router's domain name.

```
[edit]
root@# set system domain-name domain-name
```

9. Configure the IP address and prefix length for the router's Ethernet interface.

```
[edit]
root@# set interfaces fxp0 unit 0 family inet address address/prefix-length
```

10. Configure the IP address of a backup router, which is used only while the routing protocol is not running.

```
[edit]  
root@# set system backup-router address
```

11. Configure the IP address of a DNS server.

```
[edit]  
root@# set system name-server address
```

12. Set the root authentication password by entering either a clear-text password, an encrypted password, or an SSH public key string (DSA or RSA).

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

or

```
[edit]  
root@# set system root-authentication encrypted-password encrypted-password
```

or

```
[edit]  
root@# set system root-authentication ssh-dsa public-key
```

or

```
[edit]  
root@# set system root-authentication ssh-rsa public-key
```

13. (Optional) Configure the static routes to remote subnets with access to the management port. Access to the management port is limited to the local subnet. To access the management port from a remote subnet, you need to add a static route to that subnet within the routing table.

```
[edit]
root@# set routing-options static route remote-subnet next-hop destination-IP retain no-
readvertise
```

14. Configure the telnet service at the [edit system services] hierarchy level.

```
[edit]
root@# set system services telnet
```

15. (Optional) Display the configuration to verify that it is correct.

```
[edit]
root@# show
system {
    host-name host-name;
    domain-name domain-name;
    backup-router address;
    root-authentication {
        authentication-method (password | public-key);
    }
    name-server {
        address;
    }
}
interfaces {
    fxp0 {
        unit 0 {
            family inet {
                address address/prefix-length;
            }
        }
    }
}
}
```

16. Commit the configuration to activate it on the router.

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

17. (Optional) Configure additional properties by adding the necessary configuration statements. Then commit the changes to activate them on the router.

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

18. When you have finished configuring the router, exit configuration mode.

```
[edit]  
root@host# exit  
root@host>
```

## RELATED DOCUMENTATION

---

[ACX4000 Routers Hardware and CLI Terminology Mapping | 4](#)

[ACX4000 Universal Metro Router Overview | 2](#)

# 4

CHAPTER

## Maintaining components

---

[Maintaining ACX4000 Components](#) | 118

---

# Maintaining ACX4000 Components

## IN THIS SECTION

- [Routine Maintenance Procedures for the ACX4000 Router | 118](#)
- [Maintaining Cables That Connect to ACX4000 Network Ports | 119](#)
- [Maintaining the ACX4000 Uplink Ports | 121](#)
- [Replacing an ACX4000 MIC | 122](#)
- [Replacing an ACX4000 Transceiver | 126](#)
- [Replacing an ACX4000 Fiber-Optic Cable | 128](#)
- [Replacing an ACX4000 Management Ethernet Cable | 131](#)
- [Replacing an ACX4000 Console or Auxiliary Cable | 132](#)
- [Replacing an ACX4000 Air Filter | 134](#)
- [Replacing an ACX4000 Fan Tray | 136](#)
- [Replacing an ACX4000 AC Power Supply | 139](#)
- [Replacing an ACX4000 DC Power Supply | 142](#)

## Routine Maintenance Procedures for the ACX4000 Router

### IN THIS SECTION

- [Purpose | 118](#)
- [Action | 119](#)

### Purpose

For optimum router performance, perform preventive maintenance procedures.

## Action

- Inspect the installation site for moisture, loose wires or cables, and excessive dust. Make sure that airflow is unobstructed around the router and into the air intake vents.
- Check the status-reporting devices on the front panel—system LED.

## SEE ALSO

[Maintaining Cables That Connect to ACX4000 Network Ports | 119](#)

[Maintaining the ACX4000 Uplink Ports | 121](#)

# Maintaining Cables That Connect to ACX4000 Network Ports

## IN THIS SECTION

● [Purpose | 119](#)

● [Action | 119](#)

## Purpose

For optimum router performance, verify the condition of the cables that connect to the network ports.

## Action

On a regular basis:

- Use the cable management bracket to support cables and prevent cables from dislodging or developing stress points.
- Place excess cable out of the way in the cable management bracket. Do not allow fastened loops of cable to dangle from the connector or cable management bracket, because this stresses the cable at the fastening point. Putting fasteners on the loops helps to maintain their shape.
- Keep the cable connections clean and free of dust and other particles, which can cause drops in the received power level. Always inspect cables, and clean them if necessary before connecting an interface.



- Label both ends of the cables to identify them.

The following guidelines apply specifically to fiber-optic cables:

- When you unplug a fiber-optic cable, always place a rubber safety plug over the transceiver on the faceplate and on the end of the cable.
- Anchor fiber-optic cables to avoid stress on the connectors. Be sure to secure fiber-optic cables so that they do not support their own weight as they hang to the floor. Never let fiber-optic cable hang free from the connector.
- Avoid bending fiber-optic cable beyond its bend radius. An arc smaller than a few inches can damage the cable and cause problems that are difficult to diagnose.
- Frequent plugging and unplugging of fiber-optic cable into and out of optical instruments can cause damage to the instruments that is expensive to repair. Instead, 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 easy and inexpensive to replace.
- Keep fiber-optic cable connections clean. Small microdeposits of oil and dust in the canal of the transceiver or cable connector could cause loss of light, reducing signal power and possibly causing intermittent problems with the optical connection.

To clean the transceivers, use an appropriate fiber-cleaning device, such as RIFOCS Fiber Optic Adaptor Cleaning Wands (part number 946). Follow the directions for the cleaning kit you use.

After you clean an optical transceiver, make sure that the connector tip of the fiber-optic cable is clean. Use only an approved alcohol-free fiber-optic cable cleaning kit, such as the Opptex Cletop-S Fiber Cleaner. Follow the directions for the cleaning kit you use.

## SEE ALSO

---

[Routine Maintenance Procedures for the ACX4000 Router | 118](#)

---

[Troubleshooting Resources for ACX4000 Routers | 149](#)

---

[Replacing an ACX4000 Fiber-Optic Cable | 128](#)

---

[Replacing an ACX4000 Transceiver | 126](#)

## Maintaining the ACX4000 Uplink Ports

### IN THIS SECTION

- Purpose | 121
- Action | 121

### Purpose

For optimum performance, verify the condition of the uplink ports.

### Action

On a regular basis:

- Check the port LEDs. The meaning of the LED states differs for various uplink ports. For more information, see "[ACX4000 LEDs Overview](#)" on page 52. If the router detects a port failure, the router generates an alarm message to be sent to the Routing Engine.

A green status LED indicates that the port is functioning normally.

- From the CLI, issue the `show chassis fpc pic-status` command.

```
user@host> show chassis fpc pic-status
Slot 0   Online
  PIC 0   Online      16x CHE1T1, RJ48
  PIC 1   Online      8x 1GE(LAN) RJ45
  PIC 2   Online      2x 1GE(LAN) SFP
  PIC 3   Online      2x 10GE(LAN) SFP+
```

### SEE ALSO

| [ACX4000 Routers Hardware and CLI Terminology Mapping](#) | 4

## Replacing an ACX4000 MIC

### IN THIS SECTION

- [Removing an ACX4000 MIC | 122](#)
- [Installing an ACX4000 MIC | 124](#)

### Removing an ACX4000 MIC

MICs are hot-insertable and hot-removable. When you remove a MIC, the router continues to function, although the MIC interfaces being removed no longer function.

In the ACX4000 router, the MICs can be installed in two slots in the front of the router. A MIC weighs less than 2 lb (0.9 kg).

To remove a MIC (see Figure 1):

1. Place an electrostatic bag or antistatic mat on a flat, stable surface to receive the MIC. If the MIC connects to fiber-optic cable, have ready a rubber safety cap for each transceiver and cable.
2. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an ESD grounding point.
3. Take the MIC offline by issuing the following CLI command:

```
user@host> request chassis mic fpc-slot slot-number mic-slot slot-number offline
```

4. Label the cables connected to the MIC so that you can later reconnect each cable to the correct MIC.
5. Disconnect the cables from the MIC. If the MIC uses fiber-optic cable, immediately cover each transceiver and the end of each cable with a rubber safety cap.



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



**CAUTION:** Do not leave a fiber-optic transceiver uncovered, except when you are inserting or removing cable. The safety cap keeps the port clean and protects your eyes from accidental exposure to laser light.

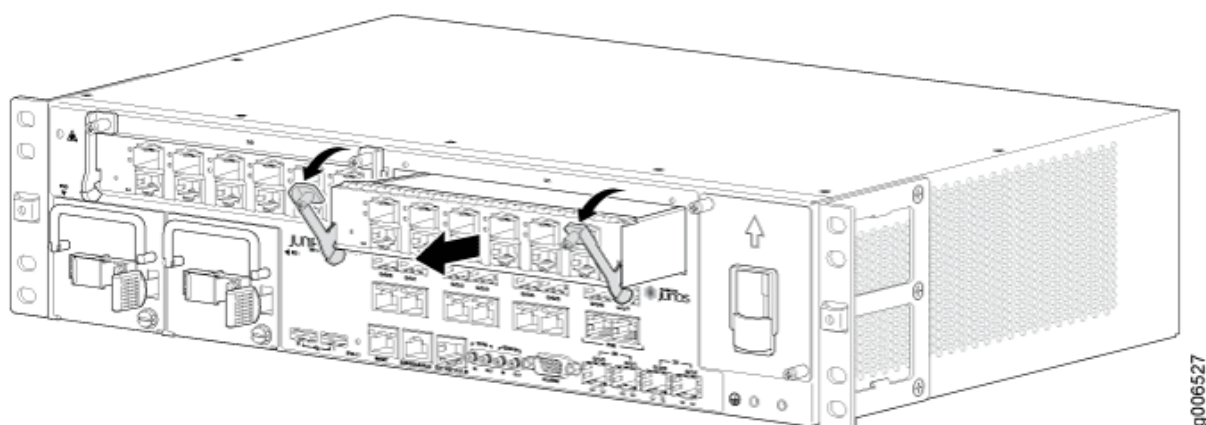
6. Arrange the cable to prevent it from dislodging or developing stress points. Secure the cable so that it is not supporting its own weight as it hangs to the floor. Place excess cable out of the way in a neatly coiled loop.



**CAUTION:** Avoid bending a fiber-optic cable beyond its minimum bend radius. An arc smaller than a few inches in diameter can damage the cable and cause problems that are difficult to diagnose.

7. Loosen the captive screw on each side of the MIC faceplate.
8. Pull the ejector levers on each side of MIC you are removing away from the router. Pulling the ejector levers disconnects the MIC from the chassis.
9. Grasp the handles on the MIC faceplate, and slide the MIC out of the chassis. Place the MIC in the electrostatic bag or on the antistatic mat.
10. If you are not reinstalling a MIC into the emptied MIC slot within a short time, install a blank MIC panel over the slot to maintain proper airflow in the chassis card cage.

**Figure 25: Removing a MIC**



## SEE ALSO

[Maintaining the ACX4000 Uplink Ports](#) | [121](#)

## Installing an ACX4000 MIC

To install a MIC (see Figure 2):

1. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an ESD grounding point.
2. If the MIC uses fiber-optic cable, verify that a rubber safety cap is over each transceiver on the faceplate. Install a cap if necessary.
3. Pull the ejector levers on each side of the MIC slot away from the router.
4. Align the rear of the MIC with the guides located at the corners of the MIC slot.
5. Slide the MIC into the MIC slot until it is firmly seated in the chassis.



**CAUTION:** Slide the MIC straight into the slot to avoid damaging the components on the MIC.

6. Verify that the ejector levers on either side of the MIC are engaged by pushing them toward the router.
7. Tighten the captive screws on either side of the MIC to secure the MIC in the slot.
8. If the MIC uses fiber-optic cable, remove the rubber safety cap from each transceiver and the end of each cable.



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



**CAUTION:** Do not leave a fiber-optic transceiver uncovered, except when you are inserting or removing cable. The safety cap keeps the port clean and protects your eyes from accidental exposure to laser light.

9. Insert the appropriate cables into the cable connectors on the MIC.
10. Arrange each cable to prevent the cable from dislodging or developing stress points. Secure the cable so that it is not supporting its own weight as it hangs to the floor. Place excess cable out of the way in a neatly coiled loop.



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



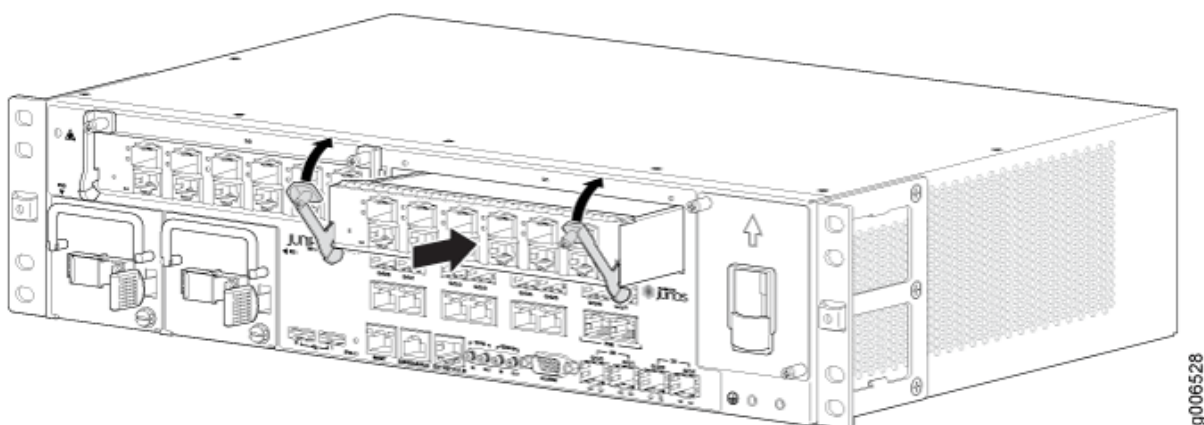
**CAUTION:** Avoid bending a fiber-optic cable beyond its minimum bend radius. An arc smaller than a few inches in diameter can damage the cable and cause problems that are difficult to diagnose.

11. Bring the MIC online by issuing the following CLI command:

```
user@host> request chassis mic fpc-slot slot-number mic-slot slot-number online
```

The normal functioning status LED confirms that the MIC is online. You can also verify correct MIC functioning by issuing the `show chassis fpc pic-status` command described in ["Maintaining the ACX4000 Uplink Ports" on page 121](#).

**Figure 26: Installing a MIC**



## SEE ALSO

[ACX4000 Modular Interface Card \(MIC\) Overview | 51](#)

[Maintaining Cables That Connect to ACX4000 Network Ports | 119](#)

## RELATED DOCUMENTATION

[ACX4000 Modular Interface Card \(MIC\) Overview | 51](#)

[Maintaining Cables That Connect to ACX4000 Network Ports | 119](#)

## Replacing an ACX4000 Transceiver

### IN THIS SECTION

- [Removing an ACX4000 Transceiver | 126](#)
- [Installing an ACX4000 Transceiver | 127](#)

Small form-factor pluggable transceivers (SFPs) are optical transceivers that are installed in the front panel of the ACX4000 router. Transceivers are hot-insertable and hot-removable.

### Removing an ACX4000 Transceiver

Removing a transceiver does not interrupt router functioning, but the removed transceiver no longer receives or transmits data.

To remove a transceiver (see Figure 3):

1. Have ready a replacement transceiver or a transceiver slot plug, an antistatic mat, and a rubber safety cap for the transceiver.
2. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an ESD grounding point.
3. Label the cables connected to the transceiver so that you can reconnect them correctly later.



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

4. Remove the cable connector from the transceiver.
5. Pull the ejector handle out from the transceiver to unlock the transceiver.

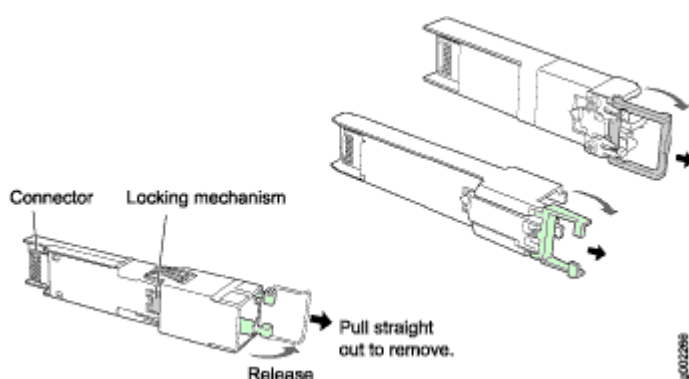


**CAUTION:** Make sure that you open the ejector handle completely until you hear it click. This action prevents damage to the transceiver.

Use needlenose pliers to pull the ejector handle out from the transceiver.

6. Grasp the transceiver ejector handle, and pull the transceiver approximately 0.5 in. (1.3 cm) out of the router.
7. Using your fingers, grasp the body of the transceiver, and pull it the rest of the way out of the router.

**Figure 27: Removing Transceivers**



8. Place a rubber safety cap over the transceiver.
9. Place the removed transceiver on an antistatic mat or in an electrostatic bag.



**CAUTION:** After removing a transceiver from the chassis, wait at least 30 seconds before reinserting it or inserting a transceiver into a different slot.

## SEE ALSO

*Front Panel of an ACX2000 Router*

*Uplink Ports on ACX2000 and ACX2100 Routers*

*Installing a Transceiver in the ACX2000 or ACX2100*

## Installing an ACX4000 Transceiver

To install a transceiver:

1. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an ESD grounding point.



2. Take each transceiver to be installed out of its electrostatic bag, and identify the slot on the component where it will be installed.
3. Verify that each transceiver is covered by a rubber safety cap. If it is not, cover the transceiver with a safety cap.
4. Carefully align the transceiver with the slots in the component. The connectors should face the component.
5. Slide the transceiver until the connector is seated in the component slot. If you are unable to fully insert the transceiver, make sure the connector is facing the right way.
6. Close the ejector handle of the transceiver.
7. Remove the rubber safety cap from the transceiver and the end of the cable. Insert the cable into the transceiver.



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

8. Verify that the status LEDs on the front panel indicate that the transceiver is functioning correctly.

## SEE ALSO

[ACX4000 Front Panel Overview | 42](#)

[ACX4000 Uplink Ports Overview | 44](#)

[ACX4000 LEDs Overview | 52](#)

[Maintaining the ACX4000 Uplink Ports | 121](#)

[Replacing an ACX4000 Transceiver | 126](#)

## Replacing an ACX4000 Fiber-Optic Cable

### IN THIS SECTION

- [Disconnecting an ACX4000 Fiber-Optic Cable | 129](#)
- [Connecting an ACX2000 Fiber-Optic Cable | 130](#)

To replace a fiber-optic cable:

## Disconnecting an ACX4000 Fiber-Optic Cable

ACX Series routers have field-replaceable unit (FRU) optical transceivers to which you can connect fiber-optic cables.

Before you begin disconnecting a fiber-optic cable from an optical transceiver installed in an ACX Series router, ensure that you have taken the necessary precautions for safe handling of lasers (see ["Radiation from Open Port Apertures Warning" on page 174](#) and ["Laser and LED Safety Guidelines and Warnings" on page 175](#)).

Ensure that you have the following parts and tools available:

- A rubber safety cap to cover the transceiver
- A rubber safety cap to cover the fiber-optic cable connector

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

1. Disable the port in which the transceiver is installed by issuing the command:

```
[edit interfaces]  
user@router# set interface-name disable
```



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

2. Carefully unplug the fiber-optic cable connector from the transceiver.
3. Cover the transceiver with a rubber safety cap.



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

4. Cover the fiber-optic cable connector with the rubber safety cap.

## Connecting an ACX2000 Fiber-Optic Cable

Before you begin connecting a fiber-optic cable to an optical transceiver installed in a router, ensure that you have taken the necessary precautions for safe handling of lasers (see ["Radiation from Open Port Apertures Warning" on page 174](#) and ["Laser and LED Safety Guidelines and Warnings" on page 175](#)).

ACX Series routers have field-replaceable unit (FRU) optical transceivers to which you can connect fiber-optic cables.

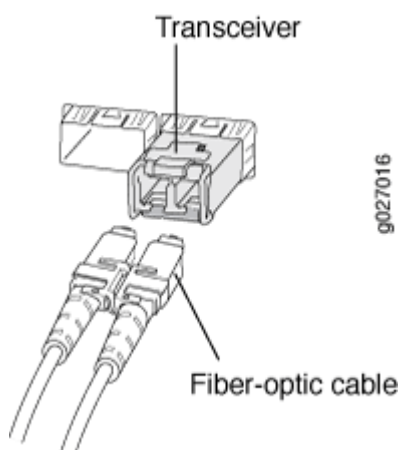
To connect a fiber-optic cable to an optical transceiver installed in an ACX Series router:



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

1. If the fiber-optic cable connector is covered by a rubber safety cap, remove the cap. Save the cap.
2. Remove the rubber safety cap from the optical transceiver. Save the cap.
3. Insert the cable connector into the optical transceiver (see [Figure 28 on page 130](#)).

**Figure 28: Connecting a Fiber-Optic Cable to an Optical Transceiver Installed in an ACX Series Router**



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



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

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

## SEE ALSO

[Maintaining Cables That Connect to ACX4000 Network Ports | 119](#)

[Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion | 86](#)

[Calculating Power Budget and Power Margin for Fiber-Optic Cables | 83](#)

## Replacing an ACX4000 Management Ethernet Cable

### IN THIS SECTION

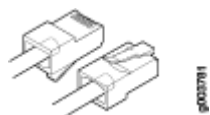
- [Removing an ACX4000 Management Ethernet Cable | 131](#)
- [Installing an ACX4000 Management Ethernet Cable | 132](#)

### Removing an ACX4000 Management Ethernet Cable

To remove a serial cable connected to a management device:

1. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an ESD grounding point.
2. Press the tab on the connector, and pull the connector straight out of the **MGMT** port. Figure 5 shows the connector.
3. Disconnect the cable from the network device.

**Figure 29: Ethernet Cable Connectors**



## SEE ALSO

[Replacing an ACX4000 Management Ethernet Cable | 131](#)

[Management Port Connector Pinout Information for ACX Series Routers | 90](#)

## Installing an ACX4000 Management Ethernet Cable

To install a serial cable connected to a management device:

1. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an ESD grounding point.
2. Plug one end of the replacement cable into the appropriate **MGMT** port.
3. Plug the other end of the cable into the network device.

## SEE ALSO

[Replacing an ACX4000 Management Ethernet Cable | 131](#)

[Management Port Connector Pinout Information for ACX Series Routers | 90](#)

## RELATED DOCUMENTATION

[Management Port Connector Pinout Information for ACX Series Routers | 90](#)

## Replacing an ACX4000 Console or Auxiliary Cable

### IN THIS SECTION

- [Removing an ACX4000 Console or Auxiliary Cable | 132](#)
- [Installing an ACX4000 Console or Auxiliary Cable | 133](#)

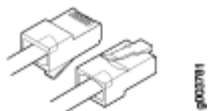
## Removing an ACX4000 Console or Auxiliary Cable

To remove a serial cable connected to a console or auxiliary device:

1. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an ESD grounding point.

2. Press the tab on the connector, and pull the connector straight out of the **CONSOLE/AUX** port.  
Figure 6 shows the connector.
3. Disconnect the cable from the console or auxiliary device.

**Figure 30: Ethernet Cable Connectors**



## SEE ALSO

[Console or Auxiliary Port Connector Pinout on ACX Series Routers | 90](#)

[Replacing an ACX4000 Console or Auxiliary Cable | 132](#)

## Installing an ACX4000 Console or Auxiliary Cable

The **CONSOLE/AUX** port on the front panel of the router accepts an RS-232 (EIA-232) serial cable with RJ-45 connectors.

To connect a cable between the router and the console or auxiliary device:

1. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an ESD grounding point.
2. Connect one end of the replacement cable into the **CONSOLE/AUX** port.
3. Plug the other end of the cable into the device's serial port.

## SEE ALSO

[Console or Auxiliary Port Connector Pinout on ACX Series Routers | 90](#)

[Replacing an ACX4000 Console or Auxiliary Cable | 132](#)

## RELATED DOCUMENTATION

[Console or Auxiliary Port Connector Pinout on ACX Series Routers | 90](#)

## Replacing an ACX4000 Air Filter

### IN THIS SECTION

- [Removing an ACX4000 Air Filter | 134](#)
- [Installing an ACX4000 Air Filter | 135](#)

### Removing an ACX4000 Air Filter



**CAUTION:** Do not run the device for more than a few minutes without the air filter in place.



**CAUTION:** Do not run the device for more than a few minutes without the air filter in place.

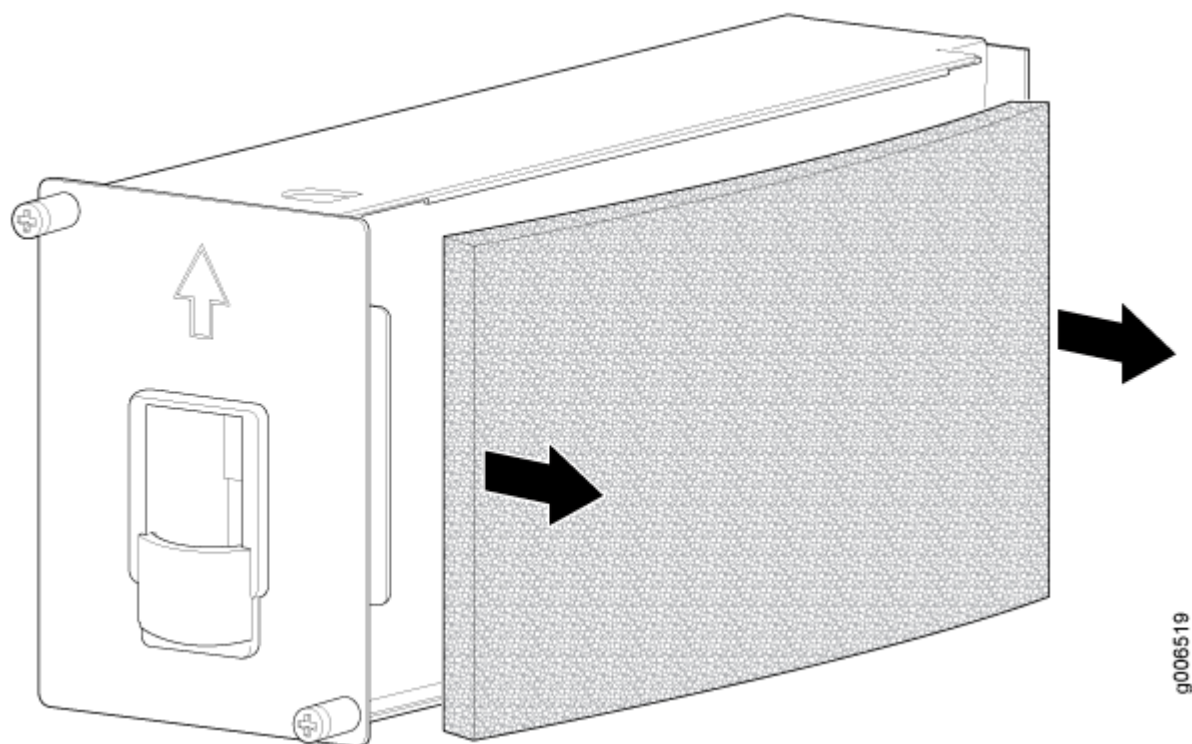


**CAUTION:** Always keep the air filter in place while the device is operating, except during replacement. The fans are very powerful and can pull small bits of wire or other materials into the device if the air filter isn't in place. These materials can damage device components.

The air filter is installed on the right side of the fan tray. To remove the air filter (see Figure 7):

1. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an ESD grounding point.
2. Remove the fan tray as described in ["Replacing an ACX4000 Fan Tray" on page 136](#).
3. Grasp the sides of the air filter, and slide it away from the fan tray faceplate.

**Figure 31: Removing the ACX4000 Air Filter**



#### SEE ALSO

[Replacing an ACX4000 Air Filter](#) | 134

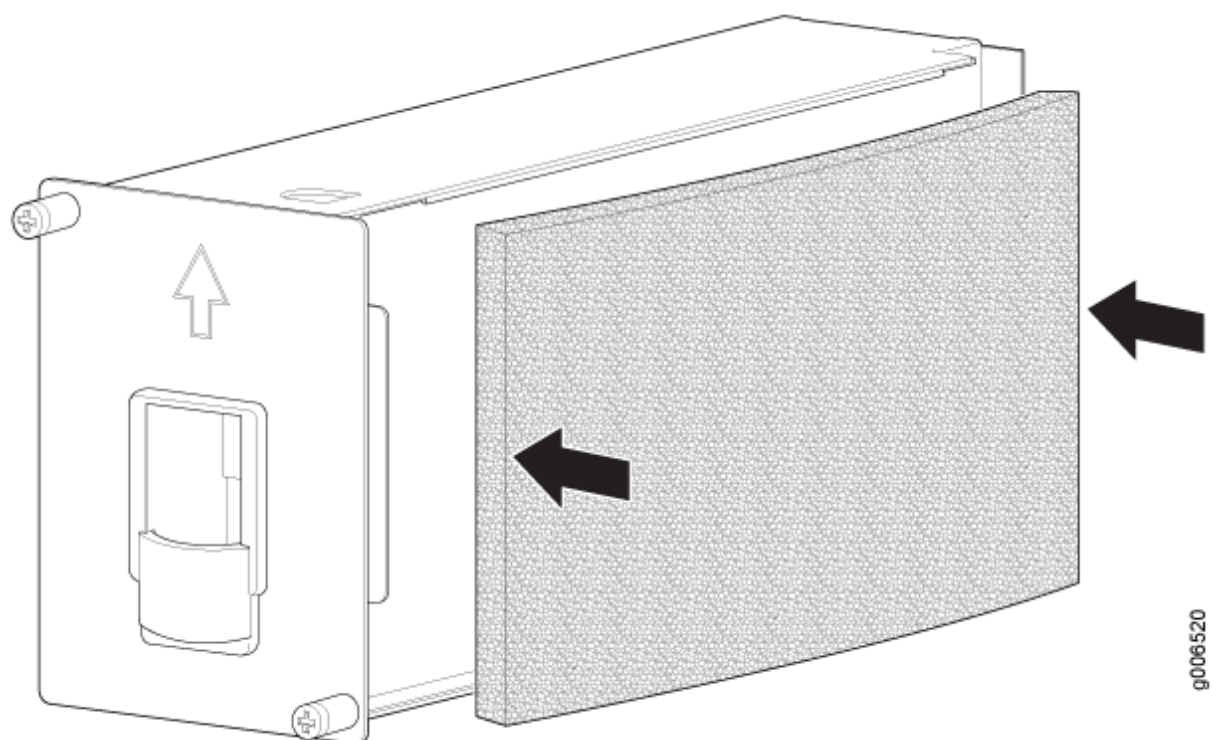
#### Installing an ACX4000 Air Filter

The air filter installs on the right side of the fan tray. To install the air filter (see Figure 8):

1. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an ESD grounding point.
2. Insert the air filter between the tabs on the side of the fan tray, and seat it in place.



Figure 32: Installing the Air Filter



#### SEE ALSO

[Replacing an ACX4000 Air Filter | 134](#)

#### RELATED DOCUMENTATION

[ACX4000 Cooling System | 56](#)

## Replacing an ACX4000 Fan Tray

#### IN THIS SECTION

- [Removing an ACX4000 Fan Tray | 137](#)
- [Installing an ACX4000 Fan Tray | 138](#)

## Removing an ACX4000 Fan Tray

**NOTE:** To prevent overheating, install the replacement fan tray immediately after removing the existing fan tray.

To remove the fan tray (see Figure 9):

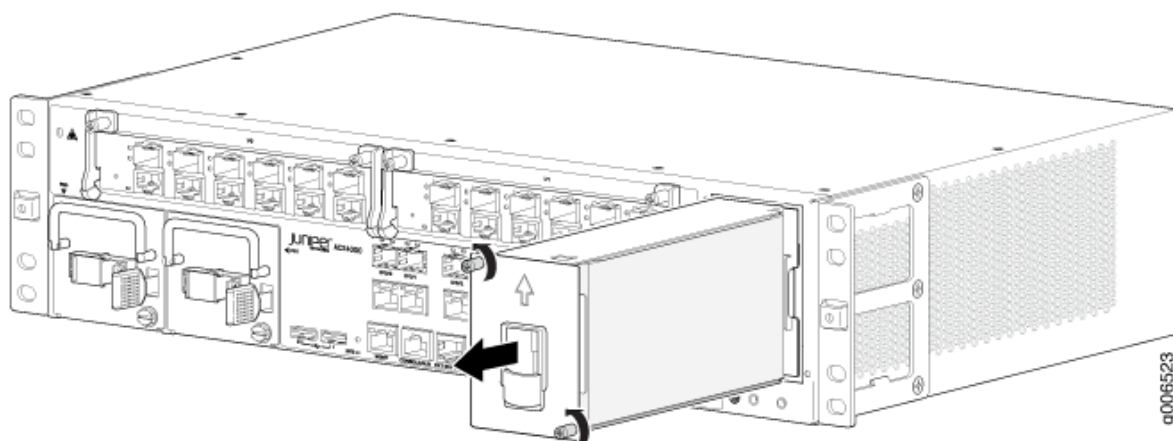
1. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an ESD grounding point.
2. Loosen the captive screws on the corners of the fan tray faceplate.
3. Grasp the fan tray ejector lever, and pull it out to disconnect the fan tray from the chassis.



**WARNING:** To prevent injury, keep tools and your fingers away from the fans as you slide the fan module out of the device. The fans might still be spinning.

4. Place one hand under the fan tray to support it, and pull the fan tray completely out of the chassis.

Figure 33: Removing the Fan Tray



### SEE ALSO

[ACX4000 Cooling System | 56](#)

[Replacing an ACX4000 Air Filter | 134](#)

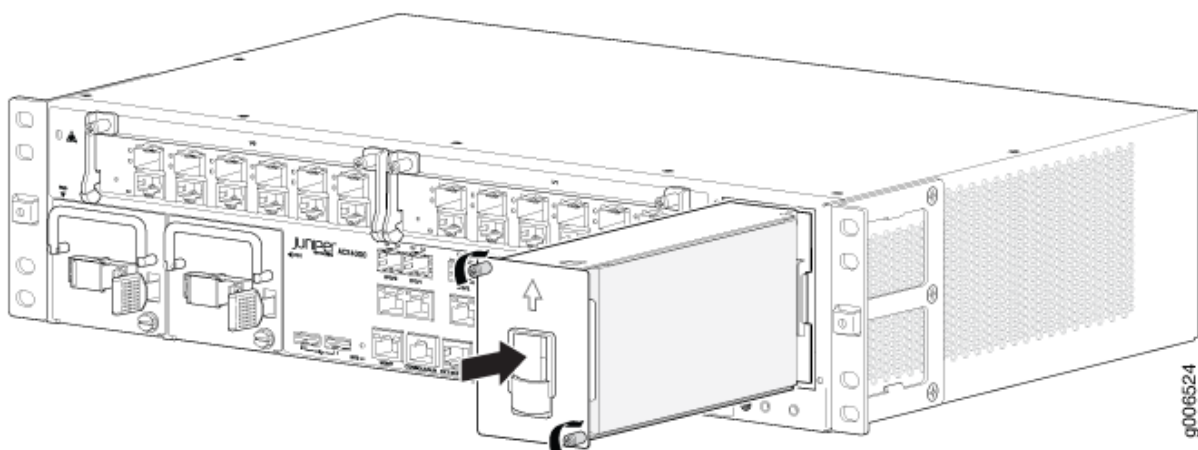
[Replacing an ACX4000 Fan Tray | 136](#)

## Installing an ACX4000 Fan Tray

To install the fan tray (see Figure 10):

1. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an ESD grounding point.
2. Orient the fan tray in the slot so that the arrow is pointing up, and slide the fan tray straight into the chassis.
3. Verify that the ejector lever on the front of the fan tray is engaged by pushing it toward the router.
4. Tighten the captive screws on the fan tray faceplate to secure it in the chassis.

**Figure 34: Installing the Fan Tray**



### SEE ALSO

[ACX4000 Cooling System | 56](#)

[Replacing an ACX4000 Air Filter | 134](#)

[Replacing an ACX4000 Fan Tray | 136](#)

### RELATED DOCUMENTATION

[ACX4000 Cooling System | 56](#)

[Replacing an ACX4000 Air Filter | 134](#)

## Replacing an ACX4000 AC Power Supply

### IN THIS SECTION

- [Removing an ACX4000 AC Power Supply | 139](#)
- [Installing an ACX4000 AC Power Supply | 141](#)

### Removing an ACX4000 AC Power Supply

Before you remove a power supply, be aware of the following:

**NOTE:** The minimum number of power supplies must be present in the router at all times.



**CAUTION:** To maintain proper cooling and prevent thermal shutdown of the operating power supply unit, each power supply slot must contain either a power supply or a blank panel. If you remove a power supply, you must install a replacement power supply or a blank panel shortly after the removal.

**NOTE:** After powering off a power supply, wait at least 60 seconds before turning it back on.

To remove an AC power supply (see Figure 12):

1. Switch off the dedicated customer site circuit breaker for the power supply, and remove the power cord from the AC power source. Follow the instructions for your site.
2. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an ESD grounding point.
3. Remove the power cord from the power supply.
4. Press the release latch on the right side of the power supply to disconnect the power supply from the chassis.
5. Pull the power supply straight out of the chassis.

Figure 35: Removing an AC Power Cord

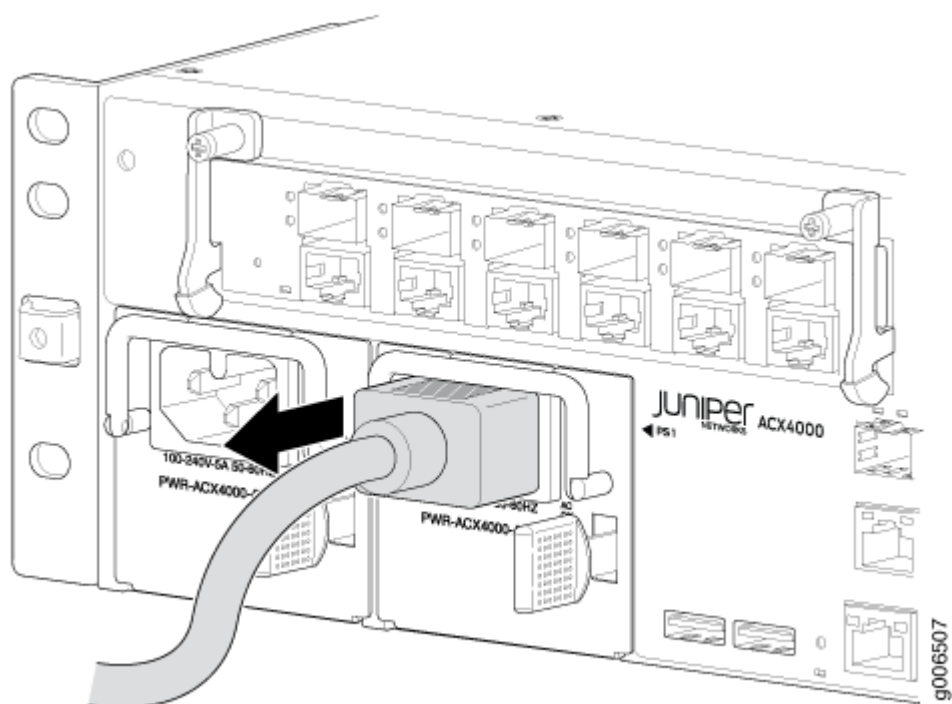
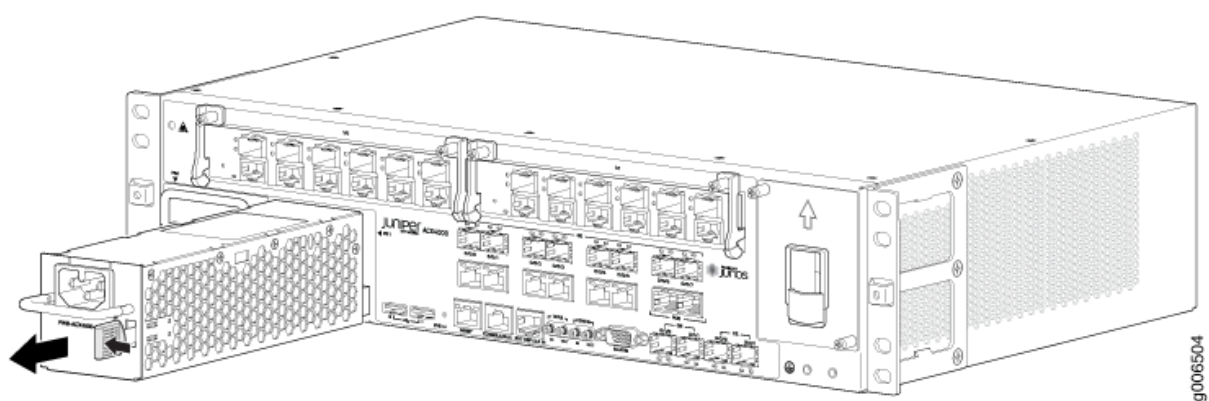


Figure 36: Removing an AC Power Supply



## SEE ALSO

[Connecting AC Power Cords to the ACX4000 Router](#) | 102

[ACX4000 AC Power Specifications](#) | 61

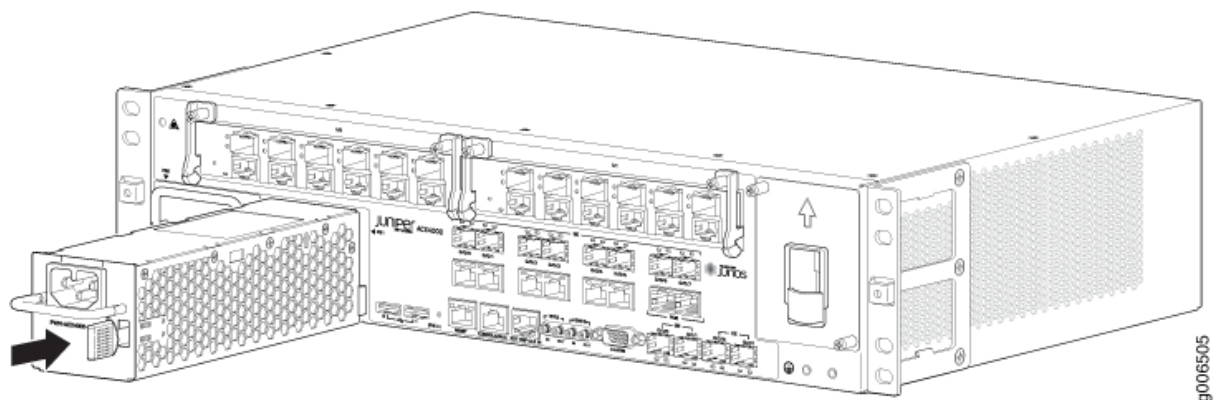
## Installing an ACX4000 AC Power Supply

To install an AC power supply (see Figure 13):

1. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an ESD grounding point.
2. Using both hands, slide the power supply straight into the chassis until the power supply is fully seated in the chassis slot. The power supply faceplate should be flush with any adjacent power supply faceplate or blank installed in the power supply slot.
3. Attach the power cord to the power supply.
4. Attach the power cord to the AC power source, and switch on the dedicated customer site circuit breaker. Follow the instructions for your site.

Observe the status LED on the power supply faceplate. If the power supply is correctly installed and functioning normally, the status LED lights green steadily.

**Figure 37: Installing an AC Power Supply**



### SEE ALSO

[Connecting AC Power Cords to the ACX4000 Router | 102](#)

[ACX4000 AC Power Specifications | 61](#)

[ACX4000 AC Power Cord Specifications | 62](#)

## Replacing an ACX4000 DC Power Supply

### IN THIS SECTION

- [Removing an ACX4000 DC Power Supply | 142](#)
- [Installing an ACX4000 DC Power Supply | 144](#)

### Removing an ACX4000 DC Power Supply

Before you remove a power supply, be aware of the following:

**NOTE:** The minimum number of power supplies must be present in the router at all times.



**WARNING:** Before you perform DC power procedures, ensure there is no power to the DC circuit. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the off position, and tape the switch handle of the circuit breaker in the off position.



**CAUTION:** To maintain proper cooling and prevent thermal shutdown of the operating power supply unit, each power supply slot must contain either a power supply or a blank panel. If you remove a power supply, you must install a replacement power supply or a blank panel shortly after the removal.

**NOTE:** After powering off a power supply, wait at least 60 seconds before turning it back on.

To remove a DC power supply (see Figure 14):

1. Switch off the dedicated customer site circuit breaker for the power supply being removed. Follow your site's procedures for ESD.
2. Make sure that the voltage across the DC power source cable leads is 0 V and that there is no chance that the cables might become active during the removal process.
3. Verify that the status LED on the power supply is not lit.

4. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an ESD grounding point.
5. Move the DC circuit breaker on the DC power supply faceplate to the off (O) position.
6. Remove the clear plastic cover protecting the terminal studs on the faceplate (see Figure 15).
7. Remove the screw from each of the terminals. (Use a number 2 Phillips screwdriver.)
8. Remove the cable lugs from the terminals.
9. Carefully move the power cables out of the way.
10. Press the latch located on the left side of the power supply, to release it from the chassis.
11. Pull the power supply straight out of the chassis.

**Figure 38: Removing a DC Power Supply**

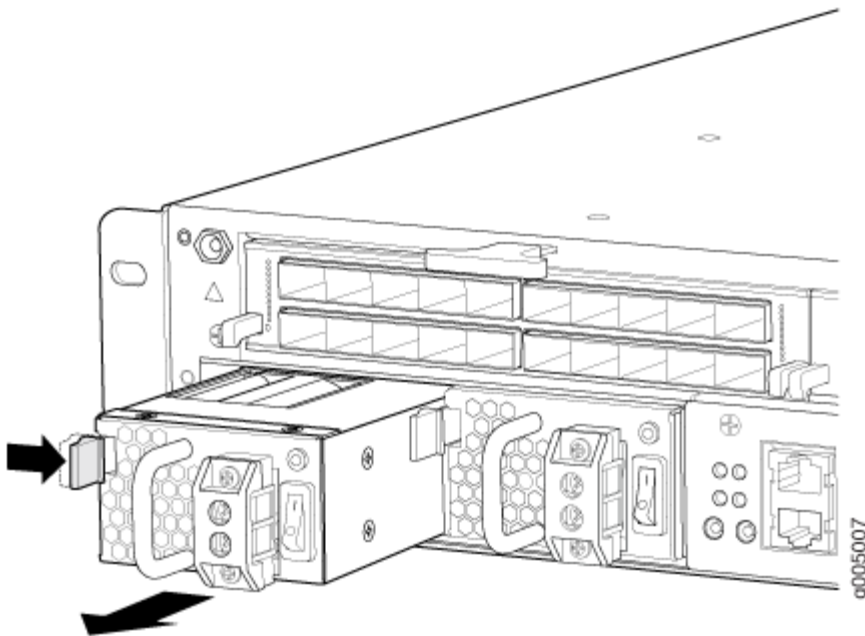
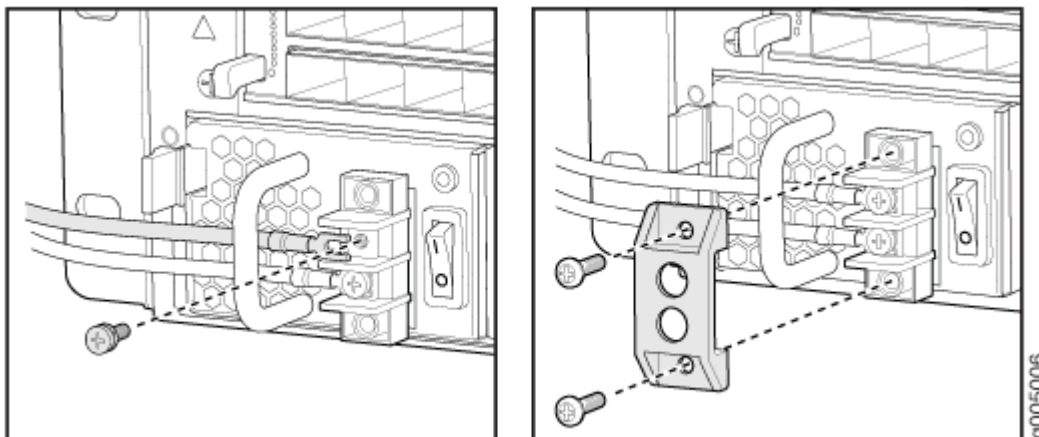




Figure 39: Disconnecting the DC Power Cables



## Installing an ACX4000 DC Power Supply



**WARNING:** Before you perform DC power procedures, ensure there is no power to the DC circuit. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the off position, and tape the switch handle of the circuit breaker in the off position.

To install a DC power supply (see Figure 16):

1. Ensure that the voltage across the DC power source cable leads is 0 V and that there is no chance that the cable leads might become active during installation.
2. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an ESD grounding point.
3. Using both hands, slide the power supply straight into the chassis until the power supply is fully seated in the chassis slot. The power supply faceplate should be flush with any adjacent power supply faceplate or blank installed in the power supply slot.
4. Remove the clear plastic cover protecting the terminal on the faceplate.
5. Remove the screws from the terminals.
6. Verify that the DC power cables are correctly labeled before making connections to the power supply. In a typical power distribution scheme where the return is connected to chassis ground at the battery plant, you can use a multimeter to verify the resistance of the DC cables to chassis ground:  
For -48V and -60V:
  - a. The cable with very large resistance (indicating an open circuit) to chassis ground is the DC input cable (-).

- b. The cable with very low resistance (indicating a closed circuit) to chassis ground is the return cable (+).

For +24V:

- a. The cable with very low resistance (indicating a closed circuit) to chassis ground is the DC input cable (-).
  - b. The cable with very large resistance (indicating an open circuit) to chassis ground is the return cable (+).
7. Remove the screws and flat washers from the terminals.
  8. Secure each power cable lug to the terminal with the flat washers and screw (see Figure 17). Apply between 8 lb-in. (0.9 Nm) and 9 lb-in. (1.02 Nm) of torque to each screw. Do not overtighten the screw. (Use a number 2 Phillips screwdriver.)
    - a. Secure the positive DC source power cable lug to the return (+) terminal.
    - b. Secure the negative DC source power cable lug to the input (-) terminal.



**CAUTION:** Ensure that each power cable lug seats flush against the surface of the terminal block as you are tightening the screws. Ensure that each screw is properly threaded into the terminal. Applying installation torque to the screw when improperly threaded may result in damage to the terminal.



**CAUTION:** The maximum torque rating of the terminal screws on the DC power supply is 9 lb-in. (1.02 Nm). The terminal screws may be damaged if excessive torque is applied. Use only a torque-controlled driver to tighten screws on the DC power supply terminals. Use an appropriately sized driver, with a maximum torque capacity of 9 lb-in. or less. Ensure that the driver is undamaged and properly calibrated and that you have been trained in its use. You may wish to use a driver that is designed to prevent overtorque when the preset torque level is achieved.

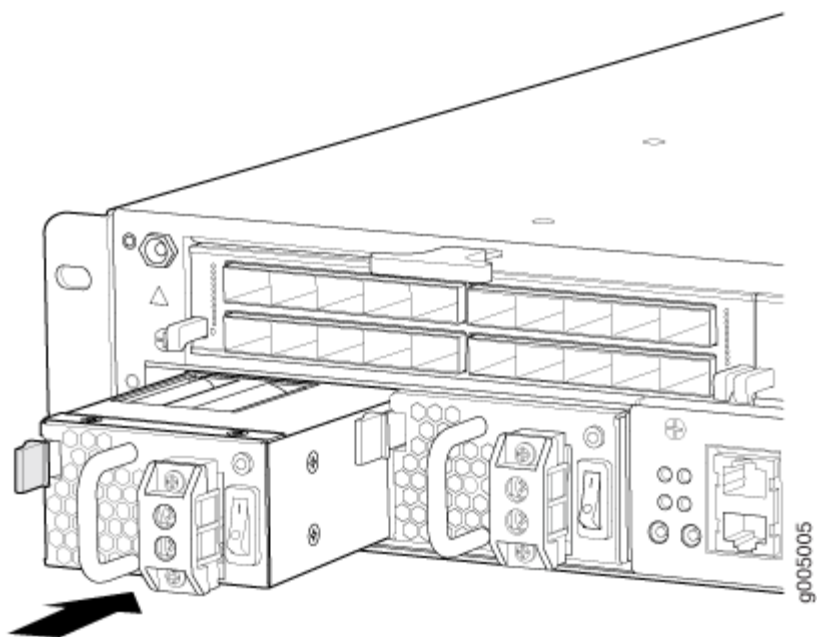
9. Replace the clear plastic cover over the terminals on the faceplate.
10. Connect each DC power cable to the appropriate external DC power source.

**NOTE:** For information about connecting to external DC power sources, see the instructions for your site.

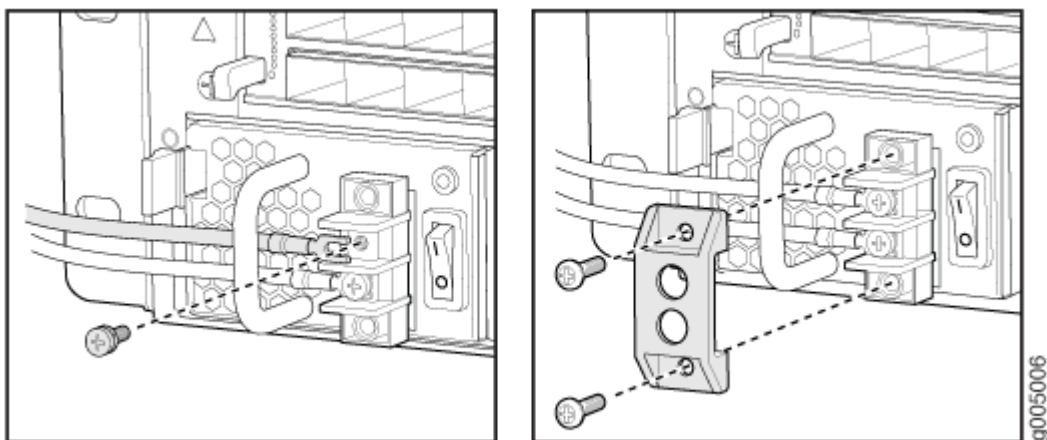
11. Switch on the external circuit breakers to provide voltage to the DC power source cable leads. Observe the system LED on the front of the router. If the DC power cable is correctly installed and

functioning normally, the system LED lights green steadily. If the status LED indicates that the power supply is not functioning normally, repeat the installation and cabling procedures.

**Figure 40: Installing a DC Power Supply**



**Figure 41: Connecting the DC Power Cables**



**SEE ALSO**

[ACX4000 DC Power Specifications | 64](#)

[ACX4000 DC Power Specifications | 64](#)

[Prevention of Electrostatic Discharge Damage | 186](#)

# 5

CHAPTER

## Troubleshooting Hardware

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[Troubleshooting the ACX4000 Router](#) | 149

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# Troubleshooting the ACX4000 Router

## IN THIS SECTION

- [Troubleshooting Resources for ACX4000 Routers | 149](#)
- [Monitoring System Log Messages | 150](#)
- [Alarm Types and Severity Classes on ACX Series Routers | 151](#)
- [Verifying Active Alarms | 152](#)

## Troubleshooting Resources for ACX4000 Routers

### IN THIS SECTION

- [Command-Line Interface | 149](#)
- [Front Panel LEDs | 149](#)

### Command-Line Interface

The Junos OS command-line interface (CLI) is the primary tool for controlling and troubleshooting router hardware, the Junos OS, routing protocols, and network connectivity. CLI commands display information from routing tables, information specific to routing protocols, and information about network connectivity derived from the ping and traceroute utilities.

You enter CLI commands on one or more external management devices connected to ports on the front panel.

For information about using the CLI to troubleshoot the Junos OS, see the appropriate Junos OS configuration guide.

### Front Panel LEDs

The front panel on the router contains LEDs that allow you to troubleshoot the router.

LEDs on the front panel include the following:

- System LED—One LED labeled **SYS** on the right side of the front panel indicates the status of the router.
- Management and console port LEDs—Two pairs of LEDs on the front panel indicate the status of the ports. The ports are labeled **MGMT** and **CONSOLE/AUX**.
- Link LEDs—Each network port has one pair of port LEDs that indicate the status of the ports.

For more information on front panel LEDs, see ["ACX4000 LEDs Overview" on page 52](#).

## SEE ALSO

[Alarm Types and Severity Classes on ACX Series Routers | 151](#)

[Monitoring System Log Messages | 150](#)

## Monitoring System Log Messages

### IN THIS SECTION

● [Purpose | 150](#)

● [Action | 150](#)

### Purpose

Use the monitoring functionality to view system log messages for ACX Series routers.

### Action

To view events in the CLI, enter the `show log` command. For more information see [Displaying a Log File from a Single-Chassis System](#).

## Alarm Types and Severity Classes on ACX Series Routers

### IN THIS SECTION

- [Alarm Types | 151](#)
- [Alarm Severity Classes | 152](#)

Before monitoring the alarms on the router, become familiar with the terms defined in [Table 31 on page 151](#).

**Table 31: Alarm Terms**

Term	Definition
Alarm	Signal that alerts you to conditions that might prevent normal operation. On a router, the alarm signal is the ALM LED that is lit on the front of the chassis.
Alarm condition	Failure event that triggers an alarm.
Alarm severity	Seriousness of the alarm. The level of severity can be either major (steady red) or minor (steady amber).
Chassis alarm	Predefined alarm that is triggered by a physical condition on the router, such as a power failure, excessive component temperature, or media failure.
System alarm	Predefined alarm that is triggered by a missing rescue configuration or failure to install a license for a licensed software feature.

### Alarm Types

The router supports these alarms:

- Chassis alarms indicate a failure on the router or one of its components. Chassis alarms are preset and cannot be modified.



- System alarms indicate a missing rescue configuration. System alarms are preset and cannot be modified, although you can configure them to appear automatically in the J-Web interface display or CLI display.

## Alarm Severity Classes

Alarms on ACX Series routers have two severity classes:

- Major (steady red)—Indicates a critical situation on the router that has resulted from one of the following conditions. A major alarm condition requires immediate action.
  - One or more hardware components have failed.
  - One or more hardware components have exceeded temperature thresholds.
  - An alarm condition that is configured on an interface has triggered a critical warning.
- Minor (steady amber)—Indicates a noncritical condition on the router that, if left unchecked, might cause an interruption in service or degradation in performance. A minor alarm condition requires monitoring or maintenance.

A missing rescue configuration generates a minor system alarm.

## Verifying Active Alarms

### IN THIS SECTION

- Purpose | 152
- Action | 153
- Meaning | 153

### Purpose

Use the monitoring functionality to view alarm information for the ACX Series routers, including alarm type, alarm severity, and a brief description for each active alarm on the router.

Action

- Observe the system LED on the front panel of the router. If the router is functioning normally with no alarms, the system LED lights green steadily.
- Issue the `show chassis alarms` command to verify the status of router. As shown in the sample output, the value `Class` indicates the severity of the alarm.

```
user@host> show chassis alarms
1 alarms currently active
Alarm time          Class  Description
2012-04-08 14:13:37 PDT  Minor Host 0 Boot from alternate media
```

When the router is functioning normally with no active alarms, the CLI displays the output as shown:

```
user@host> show chassis alarms
No alarms currently active
```

Meaning

[Table 32 on page 153](#) lists the alarm output fields.

Table 32: Alarm Output Fields

Field	Values
Alarm time	Date and time when the failure was detected.
Class	Alarm severity—either major or minor.
Description	Brief synopsis of the alarm.

# 6

CHAPTER

## Contacting Customer Support

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Contacting Customer Support and Returning the Chassis or Components | 155

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# Contacting Customer Support and Returning the Chassis or Components

## IN THIS SECTION

- [Displaying ACX4000 Components and Serial Numbers | 155](#)
- [ACX4000 Chassis Serial Number Label | 156](#)
- [How to Return a Hardware Component to Juniper Networks, Inc. | 157](#)
- [Guidelines for Packing Hardware Components for Shipment | 157](#)
- [Packing the ACX Series Router for Shipment | 158](#)

## Displaying ACX4000 Components and Serial Numbers

Before contacting Juniper Networks, Inc. to request a Return Materials Authorization (RMA), you must find the serial number on the router or component. To display all of the router components and their serial numbers, enter the following command-line interface (CLI) command:

```
user@host> show chassis hardware
Hardware inventory:
Item           Version  Part number  Serial number  Description
Chassis
Midplane       REV 00    650-037055   HS0211334046   ACX4000
Routing Engine
FEB 0          BUILTIN  BUILTIN      BUILTIN        Forwarding Engine Processor
FPC 0          BUILTIN  BUILTIN      BUILTIN        FPC BUILTIN
  PIC 0        BUILTIN  BUILTIN      BUILTIN        16x CHE1T1, RJ48
  PIC 1        BUILTIN  BUILTIN      BUILTIN        8x 1GE(LAN) RJ45
  PIC 2        BUILTIN  BUILTIN      BUILTIN        2x 1GE(LAN) SFP
    Xcvr 0     REV 01    740-031851   PLG02MD        SFP-SX
    Xcvr 1     REV 01    740-031851   PLG3353        SFP-SX
  PIC 3        BUILTIN  BUILTIN      BUILTIN        2x 10GE(LAN) SFP+
    Xcvr 1     REV 01    740-021310   C10F99166      SFP+-10G-LRM
```

Most components also have a small rectangular serial number ID label (see [Figure 42 on page 156](#)) attached to the component body.

**Figure 42: Serial Number ID Label**



#### SEE ALSO

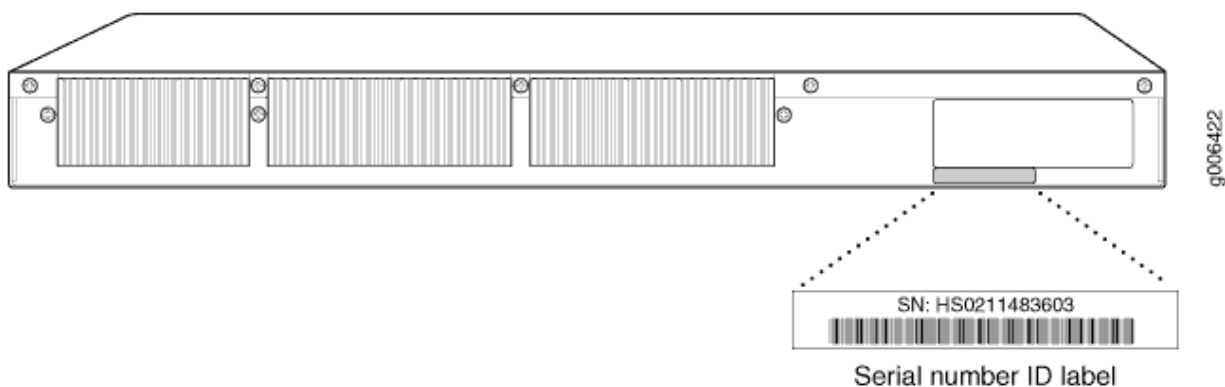
[ACX4000 Chassis Serial Number Label | 156](#)

[How to Return a Hardware Component to Juniper Networks, Inc. | 157](#)

## ACX4000 Chassis Serial Number Label

The chassis serial number is located on the rear of the chassis (see [Figure 43 on page 156](#)).

**Figure 43: ACX4000 Chassis Serial Number Label**



#### SEE ALSO

[Displaying ACX4000 Components and Serial Numbers | 155](#)

[How to Return a Hardware Component to Juniper Networks, Inc. | 157](#)

## How to Return a Hardware Component to Juniper Networks, Inc.

If a hardware component fails, please contact Juniper Networks, Inc. to obtain a Return Material Authorization (RMA) number. This number is used to track the returned material at the factory and to return repaired or new components to the customer as needed.

**NOTE:** Do not return any component to Juniper Networks, Inc. unless you have first obtained an RMA number. Juniper Networks, Inc. reserves the right to refuse shipments that do not have an RMA. Refused shipments are returned to the customer by collect freight.

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

For product problems or technical support issues, contact the Juniper Networks Technical Assistance Center (JTAC) by using the Service Request Manager link at <https://support.juniper.net/support/> or at 1-888-314-JTAC (within the United States) or 1-408-745-9500 (from outside the United States).

To return a defective hardware component:

1. Determine the part number and serial number of the defective component.
2. Obtain an RMA number from the Juniper Networks Technical Assistance Center (JTAC). You can send e-mail or telephone as described above.
3. Provide the following information in your e-mail message or during the telephone call:
  - Part number and serial number of component
  - Your name, organization name, telephone number, and fax number
  - Description of the failure
4. The support representative validates your request and issues an RMA number for return of the component.
5. Pack the component for shipment.

## Guidelines for Packing Hardware Components for Shipment

To pack and ship individual components:

- When you return components, make sure that they are adequately protected with packing materials and packed so that the pieces are prevented from moving around inside the carton.
- Use the original shipping materials if they are available.

- Place individual components in antistatic bags.
- Write the RMA number on the exterior of the box to ensure proper tracking.



**CAUTION:** Do not stack any of the hardware components.

## Packing the ACX Series Router for Shipment

To pack the router for shipment:

1. Retrieve the shipping box and packing materials in which the router was originally shipped. If you do not have these materials, contact your Juniper Networks representative about approved packaging materials.
2. On the console or other management device connected to the Routing Engine, enter CLI operational mode and issue the following command to shut down the router software.

```
user@host> request system halt
```

Wait until a message appears on the console confirming that the operating system has halted.

For more information about the command, see the [CLI Explorer](#).

3. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an ESD grounding point.
4. Shut down power to the router by pressing the AC input switch or DC circuit breaker for all power supplies to the off (O) position.
5. Disconnect power from the router.
6. Remove the cables that connect to all external devices.
7. Remove all field replaceable units (FRUs) from the router.
8. Remove the router from the rack. One person should grasp the router while a second person unscrews and removes the mounting screws from the rack. One lifter can then move the router to the shipping container.
9. Place the router in the shipping container.
10. Cover the router with an ESD bag and place the packing foam on top of and around the router.
11. Replace the accessory box on top of the packing foam.
12. Securely tape the box closed.
13. Write the RMA number on the exterior of the box to ensure proper tracking.

# 7

CHAPTER

## Safety and Compliance Information

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# General Safety Guidelines and Warnings

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

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

- Some parts of the chassis, including AC and DC power supply surfaces, power supply unit handles, SFB card handles, and fan tray handles might become hot. The following label provides the warning for hot surfaces on the chassis:



- Always ensure that all modules, power supplies, and cover panels are fully inserted and that the installation screws are fully tightened.

## Definitions of Safety Warning Levels

The documentation uses the following levels of safety warnings (there are two *Warning* formats):

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



**CAUTION:** You need to observe the specified guidelines to prevent minor injury or discomfort to you or severe damage to the device.

**Attention** Veillez à respecter les consignes indiquées pour éviter toute incommodité ou blessure légère, voire des dégâts graves pour l'appareil.



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

**Avertissement** Ce symbole signale un risque de blessure provoquée par rayon laser.



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

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

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

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

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

**Avvertenza** Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di lavorare su qualsiasi apparecchiatura, occorre conoscere i pericoli relativi ai circuiti elettrici ed essere al corrente delle pratiche standard per la prevenzione di incidenti.

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

## Qualified Personnel Warning



**WARNING:** Only trained and qualified personnel should install or replace the device.

**Waarschuwing** Installatie en reparaties mogen uitsluitend door getraind en bevoegd personeel uitgevoerd worden.

**Varoitus** Ainoastaan koulutettu ja pätevä henkilökunta saa asentaa tai vaihtaa tämän laitteen.

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

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

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

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

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

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

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

## Warning Statement for Norway and Sweden



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

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

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

# Fire Safety Requirements

## IN THIS SECTION

- [Fire Suppression | 165](#)
- [Fire Suppression Equipment | 165](#)

In the event of a fire emergency, the safety of people is the primary concern. You should establish procedures for protecting people in the event of a fire emergency, provide safety training, and properly provision fire-control equipment and fire extinguishers.

In addition, you should establish procedures to protect your equipment in the event of a fire emergency. Juniper Networks products should be installed in an environment suitable for electronic equipment. We recommend that fire suppression equipment be available in the event of a fire in the vicinity of the equipment and that all local fire, safety, and electrical codes and ordinances be observed when you install and operate your equipment.

## Fire Suppression

In the event of an electrical hazard or an electrical fire, you should first turn power off to the equipment at the source. Then use a Type C fire extinguisher, which uses noncorrosive fire retardants, to extinguish the fire.

## Fire Suppression Equipment

Type C fire extinguishers, which use noncorrosive fire retardants such as carbon dioxide and Halotron™, are most effective for suppressing electrical fires. Type C fire extinguishers displace oxygen from the point of combustion to eliminate the fire. For extinguishing fire on or around equipment that draws air from the environment for cooling, you should use this type of inert oxygen displacement extinguisher instead of an extinguisher that leaves residues on equipment.

Do not use multipurpose Type ABC chemical fire extinguishers (dry chemical fire extinguishers). The primary ingredient in these fire extinguishers is monoammonium phosphate, which is very sticky and

difficult to clean. In addition, in the presence of minute amounts of moisture, monoammonium phosphate can become highly corrosive and corrodes most metals.

Any equipment in a room in which a chemical fire extinguisher has been discharged is subject to premature failure and unreliable operation. The equipment is considered to be irreparably damaged.

**NOTE:** To keep warranties effective, do not use a dry chemical fire extinguisher to control a fire at or near a Juniper Networks device. If a dry chemical fire extinguisher is used, the unit is no longer eligible for coverage under a service agreement.

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

## Installation Instructions Warning



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

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

**Varoituis** Lue asennusohjeet ennen järjestelmän yhdistämistä virtälähteeseen.

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

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

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

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

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

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

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

## Chassis and Component Lifting Guidelines

- Before moving the device to a site, ensure that the site meets the power, environmental, and clearance requirements.
- Before lifting or moving the device, disconnect all external cables and wires.
- As when lifting any heavy object, ensure that your legs bear most of the weight rather than your back. Keep your knees bent and your back relatively straight. Do not twist your body as you lift. Balance the load evenly and be sure that your footing is firm.
- Use the following lifting guidelines to lift devices and components:
  - Up to 39.7 lb (18 kg): One person.
  - From 39.7 lb (18 kg) to 70.5 lb (32 kg): Two or more people.
  - From 70.5 lb (32 kg) to 121.2 lb (55 kg): Three or more people.
  - Above 121.2 lb (55 kg): Use material handling systems (such as levers, slings, lifts, and so on). When this is not practical, engage specially trained persons or systems (such as riggers or movers).

## Restricted Access Warning



**WARNING:** This unit is intended for installation in restricted access areas. A restricted access area is an area to which access can be gained only by service personnel through the use of a special tool, lock and key, or other means of security, and which is controlled by the authority responsible for the location.

**Waarschuwing** Dit toestel is bedoeld voor installatie op plaatsen met beperkte toegang. Een plaats met beperkte toegang is een plaats waar toegang slechts door servicepersoneel verkregen kan worden door middel van een speciaal instrument, een slot en sleutel, of een ander veiligheidsmiddel, en welke beheerd wordt door de overheidsinstantie die verantwoordelijk is voor de locatie.

**Varoitus** Tämä laite on tarkoitettu asennettavaksi paikkaan, johon pääsy on rajoitettua. Paikka, johon pääsy on rajoitettua, tarkoittaa paikkaa, johon vain huoltohenkilöstö pääsee jonkin erikoistyökalun, lukkoon sopivan avaimen tai jonkin muun turvalaitteen avulla ja joka on paikasta vastuussa olevien toimivaltaisten henkilöiden valvoma.



**Avertissement** Cet appareil est à installer dans des zones d'accès réservé. Ces dernières sont des zones auxquelles seul le personnel de service peut accéder en utilisant un outil spécial, un mécanisme de verrouillage et une clé, ou tout autre moyen de sécurité. L'accès aux zones de sécurité est sous le contrôle de l'autorité responsable de l'emplacement.

**Warnung** Diese Einheit ist zur Installation in Bereichen mit beschränktem Zutritt vorgesehen. Ein Bereich mit beschränktem Zutritt ist ein Bereich, zu dem nur Wartungspersonal mit einem Spezialwerkzeug, Schloß und Schlüssel oder anderer Sicherheitsvorkehrungen Zugang hat, und der von dem für die Anlage zuständigen Gremium kontrolliert wird.

**Avvertenza** Questa unità deve essere installata in un'area ad accesso limitato. Un'area ad accesso limitato è un'area accessibile solo a personale di assistenza tramite un'attrezzo speciale, lucchetto, o altri dispositivi di sicurezza, ed è controllata dall'autorità responsabile della zona.

**Advarsel** Denne enheten er laget for installasjon i områder med begrenset adgang. Et område med begrenset adgang gir kun adgang til servicepersonale som bruker et spesielt verktøy, lås og nøkkel, eller en annen sikkerhetsanordning, og det kontrolleres av den autoriteten som er ansvarlig for området.

**Aviso** Esta unidade foi concebida para instalação em áreas de acesso restrito. Uma área de acesso restrito é uma área à qual apenas tem acesso o pessoal de serviço autorizado, que possua uma ferramenta, chave e fechadura especial, ou qualquer outra forma de segurança. Esta área é controlada pela autoridade responsável pelo local.

**¡Atención!** Esta unidad ha sido diseñada para instalarse en áreas de acceso restringido. Área de acceso restringido significa un área a la que solamente tiene acceso el personal de servicio mediante la utilización de una herramienta especial, cerradura con llave, o algún otro medio de seguridad, y que está bajo el control de la autoridad responsable del local.

**Varning!** Denna enhet är avsedd för installation i områden med begränsat tillträde. Ett område med begränsat tillträde får endast tillträdas av servicepersonal med ett speciellt verktyg, lås och nyckel, eller annan säkerhetsanordning, och kontrolleras av den auktoritet som ansvarar för området.

## Ramp Warning



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

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

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

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

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

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

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

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

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

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

## Rack-Mounting and Cabinet-Mounting Warnings

Ensure that the rack or cabinet in which the device is installed is evenly and securely supported. Uneven mechanical loading could lead to a hazardous condition.



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

- Install the device in a rack that is secured to the building structure.
- Mount the device at the bottom of the rack if it is the only unit in the rack.
- When mounting the device on a partially filled rack, load the rack from the bottom to the top, with the heaviest component at the bottom of the rack.

- If the rack is provided with stabilizing equipment, install the stabilizers before mounting or servicing the device in the rack.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

- O Juniper Networks switch deverá ser instalado numa prateleira fixa à estrutura do edifício.
- Esta unidade deverá ser montada na parte inferior da estante, caso seja esta a única unidade a ser montada.
- Ao montar esta unidade numa estante parcialmente ocupada, coloque os itens mais pesados na parte inferior da estante, arrumando-os de baixo para cima.
- Se a estante possuir um dispositivo de estabilização, instale-o antes de montar ou reparar a unidade.

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

- El Juniper Networks switch debe instalarse en un bastidor fijado a la estructura del edificio.
- Colocar el equipo en la parte inferior del bastidor, cuando sea la única unidad en el mismo.

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

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

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

## Grounded Equipment Warning



**WARNING:** This device must be properly grounded at all times. Follow the instructions in this guide to properly ground the device to earth.

**Waarschuwing** Dit apparaat moet altijd goed geaard zijn. Volg de instructies in deze gids om het apparaat goed te aarden.

**Varoitus** Laitteen on oltava pysyvästi maadoitettu. Maadoita laite asianmukaisesti noudattamalla tämän oppaan ohjeita.

**Avertissement** L'appareil doit être correctement mis à la terre à tout moment. Suivez les instructions de ce guide pour correctement mettre l'appareil à la terre.

**Warnung** Das Gerät muss immer ordnungsgemäß geerdet sein. Befolgen Sie die Anweisungen in dieser Anleitung, um das Gerät ordnungsgemäß zu erden.

**Avvertenza** Questo dispositivo deve sempre disporre di una connessione a massa. Seguire le istruzioni indicate in questa guida per connettere correttamente il dispositivo a massa.

**Advarsel** Denne enheten på jordes skikkelig hele tiden. Følg instruksjonene i denne veiledningen for å jorde enheten.

**Aviso** Este equipamento deverá estar ligado à terra. Siga las instrucciones en esta guía para conectar correctamente este dispositivo a tierra.

**¡Atención!** Este dispositivo debe estar correctamente conectado a tierra en todo momento. Siga las instrucciones en esta guía para conectar correctamente este dispositivo a tierra.

**Varning!** Den här enheten måste vara ordentligt jordad. Följ instruktionerna i den här guiden för att jorda enheten ordentligt.

## Radiation from Open Port Apertures Warning



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

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

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

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

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

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

**Advarsel** Unngå utsettelse for stråling, og stirr ikke inn i åpninger som er åpne, fordi usynlig stråling kan 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.

## Laser and LED Safety Guidelines and Warnings

### IN THIS SECTION

- [General Laser Safety Guidelines | 176](#)
- [Class 1 Laser Product Warning | 176](#)
- [Class 1 LED Product Warning | 177](#)
- [Laser Beam Warning | 177](#)

Juniper Networks devices are equipped with laser transmitters, which are considered a Class 1 Laser Product by the U.S. Food and Drug Administration and are evaluated as a Class 1 Laser Product per IEC/EN 60825-1 requirements.

Observe the following guidelines and warnings:



## General Laser Safety Guidelines

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

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



**LASER 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.

**Avertissement** Les connecteurs à fibre optique sans terminaison peuvent émettre un rayonnement laser invisible. Le cristallin de l'œil humain faisant converger toute la puissance du laser sur la rétine, toute focalisation directe de l'œil sur une source laser, —même de faible puissance—, peut entraîner des lésions oculaires irréversibles.

## Class 1 Laser Product Warning



**LASER WARNING:** Class 1 laser product.

**Waarschuwing** Klasse-1 laser produkt.

**Varoitus** Luokan 1 lasertuote.

**Avertissement** 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.

## Class 1 LED Product Warning



**LASER WARNING:** Class 1 LED product.

**Waarschuwing** Klasse 1 LED-product.

**Varoitus** Luokan 1 valodiodituote.

**Avertissement** 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.

## Laser Beam Warning



**LASER 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.

**Avertissement** 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.

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

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

## Maintenance and Operational Safety Guidelines and Warnings

### IN THIS SECTION

- [Battery Handling Warning | 178](#)
- [Jewelry Removal Warning | 179](#)
- [Lightning Activity Warning | 181](#)
- [Operating Temperature Warning | 182](#)
- [Product Disposal Warning | 183](#)

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

### Battery Handling Warning



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

**Waarschuwing** Er is ontploffingsgevaar als de batterij verkeerd vervangen wordt. Vervang de batterij slechts met hetzelfde of een equivalent type dat door de fabrikant

aanbevolen is. Gebruikte batterijen dienen overeenkomstig fabrieksvoorschriften weggeworpen te worden.

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

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

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

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

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

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

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

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

## Jewelry Removal Warning



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

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

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

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

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

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

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

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

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

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

## Lightning Activity Warning



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

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

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

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

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

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

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

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

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

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

## Operating Temperature Warning



**WARNING:** To prevent the device from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature. To prevent airflow restriction, allow at least 6 in. (15.2 cm) of clearance around the ventilation openings.

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

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

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

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

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

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

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

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

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

## Product Disposal Warning



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

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

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

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

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

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

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

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

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

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



# General Electrical Safety Guidelines and Warnings



**WARNING:** Certain ports on the device are designed for use as intrabuilding (within-the-building) interfaces only (Type 2 or Type 4 ports as described in *GR-1089-CORE*) and require isolation from the exposed outside plant (OSP) cabling. To comply with NEBS (Network Equipment-Building System) requirements and protect against lightning surges and commercial power disturbances, the intrabuilding ports *must not* be metalically 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 metalically to OSP wiring.

**Avertissement** Certains ports de l'appareil sont destinés à un usage en intérieur uniquement (ports Type 2 ou Type 4 tels que décrits dans le document *GR-1089-CORE*) et doivent être isolés du câblage de l'installation extérieure exposée. Pour respecter les exigences NEBS et assurer une protection contre la foudre et les perturbations de tension secteur, les ports pour intérieur *ne doivent pas* être raccordés physiquement aux interfaces prévues pour la connexion à l'installation extérieure ou à son câblage. Les ports pour intérieur de l'appareil sont réservés au raccordement de câbles pour intérieur ou non exposés uniquement. L'ajout de protections ne constitue pas une précaution suffisante pour raccorder physiquement ces interfaces au câblage de l'installation extérieure.



**CAUTION:** Before removing or installing components of a device, connect an electrostatic discharge (ESD) grounding strap to an ESD point and wrap and fasten the other end of the strap around your bare wrist. Failure to use an ESD grounding strap could result in damage to the device.

**Attention** Avant de retirer ou d'installer des composants d'un appareil, raccordez un bracelet antistatique à un point de décharge électrostatique et fixez le bracelet à votre poignet nu. L'absence de port d'un bracelet antistatique pourrait provoquer des dégâts sur l'appareil.

- Install the device in compliance with the following local, national, and international electrical codes:
  - United States—National Fire Protection Association (NFPA 70), United States National Electrical Code.
  - Other countries—International Electromechanical Commission (IEC) 60364, Part 1 through Part 7.
  - Evaluated to the TN power system.

- Canada—Canadian Electrical Code, Part 1, CSA C22.1.
- Suitable for installation in Information Technology Rooms in accordance with Article 645 of the National Electrical Code and NFPA 75.

Peut être installé dans des salles de matériel de traitement de l'information conformément à l'article 645 du National Electrical Code et à la NFPA 75.

- Locate the emergency power-off switch for the room in which you are working so that if an electrical accident occurs, you can quickly turn off the power.
- Make sure that you clean grounding surface and give them a bright finish before making grounding connections.
- Do not work alone if potentially hazardous conditions exist anywhere in your workspace.
- Never assume that power is disconnected from a circuit. Always check the circuit before starting to work.
- Carefully look for possible hazards in your work area, such as moist floors, ungrounded power extension cords, and missing safety grounds.
- Operate the device within marked electrical ratings and product usage instructions.
- To ensure that the device and peripheral equipment function safely and correctly, use the cables and connectors specified for the attached peripheral equipment, and make certain they are in good condition.

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

## Action to Take After an Electrical Accident

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

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

# 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 44 on page 187](#)) in one hand and touch the exposed, bare metal of the device with the other hand immediately before inserting the component into the device.



**WARNING:** For safety, periodically check the resistance value of the ESD grounding strap. The measurement must be in the range 1 through 10 Mohms.

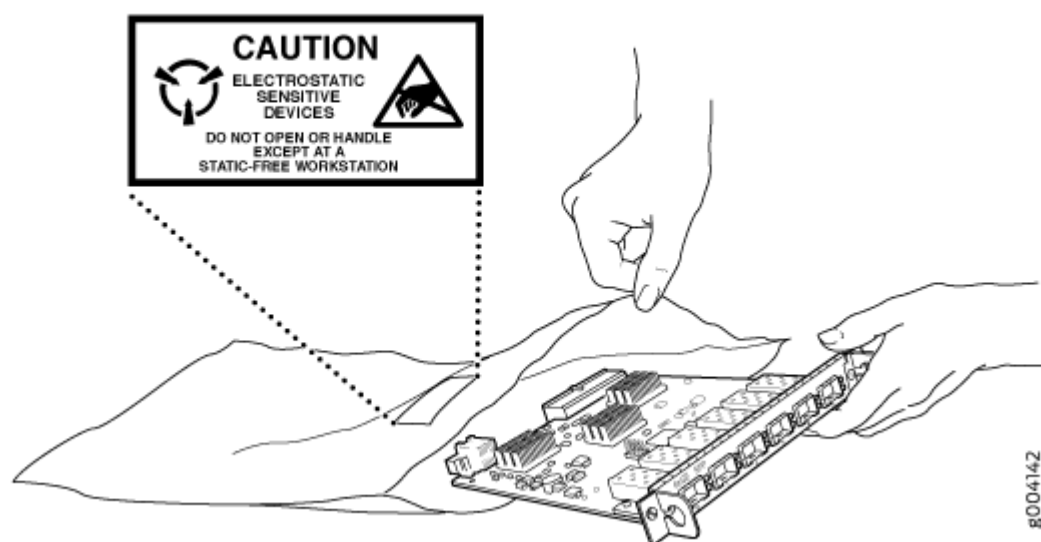
**Avertissement** Par mesure de sécurité, vérifiez régulièrement la résistance du bracelet antistatique. Cette valeur doit être comprise entre 1 et 10 mégohms (Mohms).

- When handling any component that is subject to ESD damage and that is removed from the device, make sure the equipment end of your ESD wrist strap is attached to the ESD point on the chassis.

If no grounding strap is available, touch the exposed, bare metal of the device to ground yourself before handling the component.

- Avoid contact between the component that is subject to ESD damage and your clothing. ESD voltages emitted from clothing can damage components.
- When removing or installing a component that is subject to ESD damage, always place it component-side up on an antistatic surface, in an antistatic card rack, or in an antistatic bag (see [Figure 44 on page 187](#)). If you are returning a component, place it in an antistatic bag before packing it.

Figure 44: Placing a Component into an Antistatic Bag



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

**Attention** Les câbles ANSI/TIA/EIA-568, par exemple Cat 5e et Cat 6, peuvent emmagasiner des charges électrostatiques. Pour évacuer ces charges, reliez toujours les câbles à une prise de terre adaptée avant de les raccorder au système.

## AC Power Electrical Safety Guidelines

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

- Note the following warnings printed on the device:

**“CAUTION:** THIS UNIT HAS MORE THAN ONE POWER SUPPLY CORD. DISCONNECT ALL POWER SUPPLY CORDS BEFORE SERVICING TO AVOID ELECTRIC SHOCK.”

**“ATTENTION:** CET APPAREIL COMPORTE PLUS D'UN CORDON D'ALIMENTATION. AFIN DE PRÉVENIR LES CHOCS ÉLECTRIQUES, DÉBRANCHER TOUT CORDON D'ALIMENTATION AVANT DE FAIRE LE DÉPANNAGE.”

- AC-powered devices are shipped with a three-wire electrical cord with a grounding-type plug that fits only a grounding-type power outlet. Do not circumvent this safety feature. Equipment grounding must comply with local and national electrical codes.
- You must provide an external certified circuit breaker (2-pole circuit breaker or 4-pole circuit breaker based on your device) rated minimum 20 A in the building installation.
- The power cord serves as the main disconnecting device for the AC-powered device. The socket outlet must be near the AC-powered device and be easily accessible.
- For devices that have more than one power supply connection, you must ensure that all power connections are fully disconnected so that power to the device is completely removed to prevent electric shock. To disconnect power, unplug all power cords (one for each power supply).

#### Power Cable Warning (Japanese)

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

**注意**

附属の電源コードセットはこの製品専用です。

他の電気機器には使用しないでください。

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## AC Power Disconnection Warning



**WARNING:** Before working on the device or near power supplies, unplug all the power cords from an AC-powered device.

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

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

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

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

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

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

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

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

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

## ACX4000 DC Power Electrical Safety Guidelines

The following electrical safety guidelines apply to a DC-powered router:

- A DC-powered router is equipped with a DC terminal block that is rated for the power requirements of a maximally configured router. To supply sufficient power, terminate the DC input wiring on a facility DC source capable of supplying at least 5 A @ -48 VDC per input for each power supply. We recommend that the 48-VDC facility DC source should be equipped with a circuit breaker rated at 5 A @ -48 VDC) minimum, or as required by local code.

Incorporate an easily accessible disconnect device into the facility wiring. In the United States and Canada, the 48 VDC facility should be equipped with a circuit breaker rated a minimum of 125 percent of the power provisioned for the input in accordance with the National Electrical Code in the US and the Canadian Electrical Code in Canada.

- Run two wires from the circuit breaker box to a source of 48 VDC. Use appropriate gauge wire to handle up to 5 A
- Be sure to connect the ground wire or conduit to a solid office (earth) ground. A closed loop ring is recommended for terminating the ground conductor at the ground stud.

- A DC-powered router that is equipped with a DC terminal block is intended only for installation in a restricted access location. In the United States, a restricted access area is one in accordance with Articles 110-16, 110-17, and 110-18 of the National Electrical Code ANSI/NFPA 70.

**NOTE:** Primary overcurrent protection is provided by the building circuit breaker. This breaker should protect against excess currents, short circuits, and earth faults in accordance with NEC ANSI/NFPA70.

- Ensure that the polarity of the DC input wiring is correct. Under certain conditions, connections with reversed polarity might trip the primary circuit breaker or damage the equipment.
- For personal safety, connect the green and yellow wire to safety (earth) ground at both the router and the supply side of the DC wiring.
- The marked input voltage of –48 VDC for a DC-powered router is the nominal voltage associated with the battery circuit, and any higher voltages are only to be associated with float voltages for the charging function.
- Because the router is a positive ground system, you must connect the positive lead to the terminal labeled +, the negative lead to the terminal labeled –, and the earth ground to the chassis grounding points.

## RELATED DOCUMENTATION

[DC Power Copper Conductors Warning | 190](#)

[DC Power Disconnection Warning | 191](#)

[DC Power Grounding Requirements and Warning | 192](#)

[DC Power Wiring Sequence Warning | 193](#)

[DC Power Wiring Terminations Warning | 195](#)

# DC Power Copper Conductors Warning



**WARNING:** Use copper conductors only.

**Waarschuwing** Gebruik alleen koperen geleiders.

**Varoitus** Käytä vain kuparijohtimia.

**Attention** Utilisez uniquement des conducteurs en cuivre.

**Warnung** Verwenden Sie ausschließlich Kupferleiter.

**Avvertenza** Usate unicamente dei conduttori di rame.

**Advarsel** Bruk bare kobberledninger.

**Aviso** Utilize apenas fios condutores de cobre.

**¡Atención!** Emplee sólo conductores de cobre.

**Varning!** Använd endast ledare av koppar.

## DC Power Disconnection Warning



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

**Waarschuwing** Voordat u een van de onderstaande procedures uitvoert, dient u te controleren of de stroom naar het gelijkstroom circuit uitgeschakeld is. Om u ervan te verzekeren dat alle stroom UIT is geschakeld, kiest u op het schakelbord de stroomverbreker die het gelijkstroom circuit bedient, draait de stroomverbreker naar de UIT positie en plakt de schakelaarhendel van de stroomverbreker met plakband in de UIT positie vast.

**Varoitus** Varmista, että tasavirtapiirissä ei ole virtaa ennen seuraavien toimenpiteiden suorittamista. Varmistaaksesi, että virta on KATKAISTU täysin, paikanna tasavirrasta huolehtivassa kojetaulussa sijaitseva suojakytkin, käännä suojakytkin KATKAISTU-asentoon ja teippaa suojakytkimen varsi niin, että se pysyy KATKAISTU-asennossa.

**Avertissement** Avant de pratiquer l'une quelconque des procédures ci-dessous, vérifier que le circuit en courant continu n'est plus sous tension. Pour en être sûr, localiser le disjoncteur situé sur le panneau de service du circuit en courant continu, placer le disjoncteur en position fermée (OFF) et, à l'aide d'un ruban adhésif, bloquer la poignée du disjoncteur en position OFF.



**Warnung** Vor Ausführung der folgenden Vorgänge ist sicherzustellen, daß die Gleichstromschaltung keinen Strom erhält. Um sicherzustellen, daß sämtlicher Strom abgestellt ist, machen Sie auf der Schalttafel den Unterbrecher für die Gleichstromschaltung ausfindig, stellen Sie den Unterbrecher auf AUS, und kleben Sie den Schaltergriff des Unterbrechers mit Klebeband in der AUS-Stellung fest.

**Avvertenza** Prima di svolgere una qualsiasi delle procedure seguenti, verificare che il circuito CC non sia alimentato. Per verificare che tutta l'alimentazione sia scollegata (OFF), individuare l'interruttore automatico sul quadro strumenti che alimenta il circuito CC, mettere l'interruttore in posizione OFF e fissarlo con nastro adesivo in tale posizione.

**Advarsel** Før noen av disse prosedyrene utføres, kontroller at strømmen er frakoblet likestrømkretsen. Sørg for at all strøm er slått AV. Dette gjøres ved å lokalisere strømbryteren på brytertavlen som betjener likestrømkretsen, slå strømbryteren AV og teipe bryterhåndtaket på strømbryteren i AV-stilling.

**Aviso** Antes de executar um dos seguintes procedimentos, certifique-se que desligou a fonte de alimentação de energia do circuito de corrente contínua. Para se assegurar que toda a corrente foi DESLIGADA, localize o disjuntor no painel que serve o circuito de corrente contínua e coloque-o na posição OFF (Desligado), segurando nessa posição a manivela do interruptor do disjuntor com fita isoladora.

**¡Atención!** Antes de proceder con los siguientes pasos, comprobar que la alimentación del circuito de corriente continua (CC) esté cortada (OFF). Para asegurarse de que toda la alimentación esté cortada (OFF), localizar el interruptor automático en el panel que alimenta al circuito de corriente continua, cambiar el interruptor automático a la posición de Apagado (OFF), y sujetar con cinta la palanca del interruptor automático en posición de Apagado (OFF).

**Varning!** Innan du utför någon av följande procedurer måste du kontrollera att strömförsörjningen till likströmskretsen är bruten. Kontrollera att all strömförsörjning är BRUTEN genom att slå AV det överspänningsskydd som skyddar likströmskretsen och tejpa fast överspänningsskyddets omkopplare i FRÅN-läget.

## DC Power Grounding Requirements and Warning

An insulated grounding conductor that is identical in size to the grounded and ungrounded branch circuit supply conductors but is identifiable by green and yellow stripes is installed as part of the branch circuit that supplies the device. The grounding conductor is a separately derived system at the supply transformer or motor generator set.



**WARNING:** When you install the device, the ground connection must always be made first and disconnected last.

**Waarschuwing** Bij de installatie van het toestel moet de aardverbinding altijd het eerste worden gemaakt en het laatste worden losgemaakt.

**Varoitus** Laitetta asennettaessa on maahan yhdistäminen aina tehtävä ensiksi ja maadoituksen irti kytkeminen viimeiseksi.

**Avertissement** Lors de l'installation de l'appareil, la mise à la terre doit toujours être connectée en premier et déconnectée en dernier.

**Warnung** Der Erdanschluß muß bei der Installation der Einheit immer zuerst hergestellt und zuletzt abgetrennt werden.

**Avvertenza** In fase di installazione dell'unità, eseguire sempre per primo il collegamento a massa e disconnetterlo per ultimo.

**Advarsel** Når enheten installeres, må jordledningen alltid tilkobles først og frakobles sist.

**Aviso** Ao instalar a unidade, a ligação à terra deverá ser sempre a primeira a ser ligada, e a última a ser desligada.

**¡Atención!** Al instalar el equipo, conectar la tierra la primera y desconectarla la última.

**Warning!** Vid installation av enheten måste jordledningen alltid anslutas först och kopplas bort sist.

## DC Power Wiring Sequence Warning



**WARNING:** Wire the DC power supply using the appropriate lugs. When connecting power, the proper wiring sequence is ground to ground, +RTN to +RTN, then -48 V to -48 V. When disconnecting power, the proper wiring sequence is -48 V to -48 V, +RTN to +RTN, then ground to ground. Note that the ground wire must always be connected first and disconnected last.

**Waarschuwing** De juiste bedradingsvolgorde verbonden is aarde naar aarde, +RTN naar +RTN, en -48 V naar -48 V. De juiste bedradingsvolgorde losgemaakt is en -48 naar -48 V, +RTN naar +RTN, aarde naar aarde.

**Varoitus** Oikea yhdistettävä kytkentäjärjestys on maajohto maajohtoon, +RTN varten +RTN, -48 V varten - 48 V. Oikea irrotettava kytkentäjärjestys on -48 V varten - 48 V, +RTN varten +RTN, maajohto maajohtoon.

**Avertissement** Câblez l'alimentation d'alimentation CC En utilisant les crochets appropriés à l'extrémité de câblage. En reliant la puissance, l'ordre approprié de câblage est rectifié pour rectifier, +RTN à +RTN, puis -48 V à -48 V. En débranchant la puissance, l'ordre approprié de câblage est -48 V à -48 V, +RTN à +RTN, a alors rectifié pour rectifier. Notez que le fil de masse devrait toujours être relié d'abord et débranché pour la dernière fois. Notez que le fil de masse devrait toujours être relié d'abord et débranché pour la dernière fois.

**Warnung** Die Stromzufuhr ist nur mit geeigneten Ringösen an das DC Netzteil anzuschliessen. Die richtige Anschlusssequenz ist: Erdanschluss zu Erdanschluss, +RTN zu +RTN und dann -48V zu -48V. Die richtige Sequenz zum Abtrennen der Stromversorgung ist -48V zu -48V, +RTN zu +RTN und dann Erdanschluss zu Erdanschluss. Es ist zu beachten dass der Erdanschluss immer zuerst angeschlossen und als letztes abgetrennt wird.

**Avvertenza** Mostra la morsettiera dell'alimentatore CC. Cablare l'alimentatore CC usando i connettori adatti all'estremità del cablaggio, come illustrato. La corretta sequenza di cablaggio è da massa a massa, da positivo a positivo (da linea ad L) e da negativo a negativo (da neutro a N). Tenere presente che il filo di massa deve sempre venire collegato per primo e scollegato per ultimo.

**Advarsel** Riktig tilkoples tilkopplingssekvens er jord til jord, +RTN til +RTN, -48 V til -48 V. Riktig frakoples tilkopplingssekvens er -48 V til -48 V, +RTN til +RTN, jord til jord.

**Aviso** Ate con alambre la fuente de potencia cc Usando los terminales apropiados en el extremo del cableado. Al conectar potencia, la secuencia apropiada del cableado se muele para moler, +RTN a +RTN, entonces -48 V a -48 V. Al desconectar potencia, la secuencia apropiada del cableado es -48 V a -48 V, +RTN a +RTN, entonces molió para moler. Observe que el alambre de tierra se debe conectar siempre primero y desconectar por último. Observe que el alambre de tierra se debe conectar siempre primero y desconectar por último.

**¡Atención!** Wire a fonte de alimentação de DC Usando os talões apropriados na Extremidade da fiação. Ao conectar a potência, a sequência apropriada da fiação é moída para moer, +RTN a +RTN, então -48 V a -48 V. Ao desconectar a potência, a sequência apropriada da fiação é -48 V a -48 V, +RTN a +RTN, moeu então para moer. Anote que o fio à terra deve sempre ser conectado primeiramente e desconectado por último. Anote que o fio à terra deve sempre ser conectado primeiramente e desconectado por último.

**Varning!** Korrekt kopplingssekvens ar jord till jord, +RTN till +RTN, -48 V till -48 V.  
Korrekt kopplas kopplingssekvens ar -48 V till -48 V, +RTN till +RTN, jord till jord.

## DC Power Wiring Terminations Warning



**WARNING:** When stranded wiring is required, use approved wiring terminations, such as closed-loop or spade-type with upturned lugs. These terminations must be the appropriate size for the wires and must clamp both the insulation and conductor.

**Waarschuwing** Wanneer geslagen bedrading vereist is, dient u bedrading te gebruiken die voorzien is van goedgekeurde aansluitpunten, zoals het gesloten-lus type of het grijperschop type waarbij de aansluitpunten omhoog wijzen. Deze aansluitpunten dienen de juiste maat voor de draden te hebben en dienen zowel de isolatie als de geleider vast te klemmen.

**Varoitus** Jos säikeellinen johdin on tarpeen, käytä hyväksyttyä johdinliitääntä, esimerkiksi suljettua silmukkaa tai kourumaista liitääntä, jossa on ylöspäin käännetyt kiinnityskorvat. Tällaisten liitääntöjen tulee olla kooltaan johtimiin sopivia ja niiden tulee puristaa yhteen sekä eristeen että johdinosan.

**Avertissement** Quand des fils torsadés sont nécessaires, utiliser des douilles terminales homologuées telles que celles à circuit fermé ou du type à plage ouverte avec cosses rebroussées. Ces douilles terminales doivent être de la taille qui convient aux fils et doivent être refermées sur la gaine isolante et sur le conducteur.

**Warnung** Wenn Litzenverdrahtung erforderlich ist, sind zugelassene Verdrahtungsabschlüsse, z.B. für einen geschlossenen Regelkreis oder gabelförmig, mit nach oben gerichteten Kabelschuhen zu verwenden. Diese Abschlüsse sollten die angemessene Größe für die Drähte haben und sowohl die Isolierung als auch den Leiter festklemmen.

**Avvertenza** Quando occorre usare trecce, usare connettori omologati, come quelli a occhiello o a forcella con linguette rivolte verso l'alto. I connettori devono avere la misura adatta per il cablaggio e devono serrare sia l'isolante che il conduttore.

**Advarsel** Hvis det er nødvendig med flertrådede ledninger, brukes godkjente ledningsavslutninger, som for eksempel lukket sløyfe eller spadetype med oppoverbøyde kabelsko. Disse avslutningene skal ha riktig størrelse i forhold til ledningene, og skal klemme sammen både isolasjonen og lederen.

**Aviso** Quando forem requeridas montagens de instalação eléctrica de cabo torcido, use terminações de cabo aprovadas, tais como, terminações de cabo em circuito fechado e planas com terminais de orelha voltados para cima. Estas terminações de cabo deverão ser do tamanho apropriado para os respectivos cabos, e deverão prender simultaneamente o isolamento e o fio condutor.

**¡Atención!** Cuando se necesite hilo trenzado, utilizar terminales para cables homologados, tales como las de tipo "bucle cerrado" o "espada", con las lengüetas de conexión vueltas hacia arriba. Estos terminales deberán ser del tamaño apropiado para los cables que se utilicen, y tendrán que sujetar tanto el aislante como el conductor.

**Varning!** När flertrådiga ledningar krävs måste godkända ledningskontakter användas, t.ex. kabelsko av sluten eller öppen typ med uppåtvänd tapp. Storleken på dessa kontakter måste vara avpassad till ledningarna och måste kunna hålla både isoleringen och ledaren fastklämda.

## Midplane Energy Hazard Warning



**WARNING:** High levels of electrical energy are distributed across the midplane. Be careful not to contact the midplane connectors, or any component connected to the midplane, with any metallic object while servicing components.

## Multiple Power Supplies Disconnection Warning



**WARNING:** The network device has more than one power supply connection. All connections must be removed completely to remove power from the unit completely.

**Waarschuwing** Deze eenheid heeft meer dan één stroomtoevoerverbinding; alle verbindingen moeten volledig worden verwijderd om de stroom van deze eenheid volledig te verwijderen.

**Varoitus** Tässä laitteessa on useampia virtalähdekytkentöjä. Kaikki kytkennät on irrotettava kokonaan, jotta virta poistettaisiin täysin laitteesta.

**Avertissement** Cette unité est équipée de plusieurs raccordements d'alimentation. Pour supprimer tout courant électrique de l'unité, tous les cordons d'alimentation doivent être débranchés.

**Warnung** Diese Einheit verfügt über mehr als einen Stromanschluß; um Strom gänzlich von der Einheit fernzuhalten, müssen alle Stromzufuhren abgetrennt sein.

**Avvertenza** Questa unità ha più di una connessione per alimentatore elettrico; tutte le connessioni devono essere completamente rimosse per togliere l'elettricità dall'unità.

**Advarsel** Denne enheten har mer enn én strømtilkobling. Alle tilkoblinger må kobles helt fra for å eliminere strøm fra enheten.

**Aviso** Este dispositivo possui mais do que uma conexão de fonte de alimentação de energia; para poder remover a fonte de alimentação de energia, deverão ser desconectadas todas as conexões existentes.

**¡Atención!** Esta unidad tiene más de una conexión de suministros de alimentación; para eliminar la alimentación por completo, deben desconectarse completamente todas las conexiones.

**Warning!** Denna enhet har mer än en strömförsörjningsanslutning; alla anslutningar måste vara helt avlägsnade innan strömtillförseln till enheten är fullständigt bruten.

## TN Power Warning



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

**Waarschuwing** Het apparaat is ontworpen om te functioneren met TN energiesystemen.

**Varoitus** Kojе on suunniteltu toimimaan TN-sähkövoimajärjestelmien yhteydessä.

**Avertissement** Ce dispositif a été conçu pour fonctionner avec des systèmes d'alimentation TN.

**Warnung** Das Gerät ist für die Verwendung mit TN-Stromsystemen ausgelegt.

**Avvertenza** Il dispositivo è stato progettato per l'uso con sistemi di alimentazione TN.

**Advarsel** Utstyret er utfomet til bruk med TN-strømsystemer.

**Aviso** O dispositivo foi criado para operar com sistemas de corrente TN.

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

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

## Agency Approvals for ACX4000 Routers

### IN THIS SECTION

- [Compliance Statement for Argentina | 200](#)

The ACX4000 router complies with the following standards:

- Safety
  - CAN/CSA-22.2 No. 60950-1 (2007), Safety of Information Technology Equipment
  - UL 60950-1 Information Technology Equipment - Safety - Part 1: General Requirements
  - EN 60950-1 European Norm, Safety of Information Technology Equipment
  - IEC 60950-1 Information Technology Equipment - Safety - Part 1: General Requirements (with country deviations)
  - EN 60825-1 Safety of Laser Products - Part 1: Equipment Classification, Requirements and User's Guide
- EMC
  - EN 300 386 V1.3.3 Telecom Network Equipment - EMC Requirements
- EMI
  - FCC Part 15 Class A USA Radiated Emissions
  - EN 55022 Class A European Radiated Emissions
  - VCCI Class A Japanese Radiated Emissions

- BSMI CNS 13438 and NCC C6357 Taiwan Radiated Emissions
- Immunity
  - EN 55024 Information Technology Equipment Immunity Characteristics
  - EN-61000-3-2 Power Line Harmonics
  - EN-61000-3-3 Power Line Voltage Fluctuations
  - 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 Conducted Disturbances Immunity
  - EN-61000-4-11 Voltage Dips and Sags
- ETSI
  - ETSI EN-300 019: Environmental Conditions & Environmental Tests for Telecommunications Equipment
  - ETSI EN 300 019-2-1 (2000) – Storage
  - ETSI EN 300 019-2-2 (1999) – Transportation
  - ETSI EN 300 019-2-3 (2003) – Stationary Use at Weather-protected Locations
  - ETSI EN 300 019-2-4 (2003) – Stationary Use at Non-Weather-protected Locations
  - ETS 300753 (1997) – Acoustic noise emitted by telecommunications equipment
  - GR-3108-CORE Issue 2, December 2008 – Generic Requirements for Network Equipment in the Outside Plant (OSP)

The router is designed to comply with the following standards:

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



## Compliance Statement for Argentina

EQUIPO DE USO IDÓNEO.

### RELATED DOCUMENTATION

[Compliance Statements for EMC Requirements | 200](#)

[Compliance Statements for Data Center | 200](#)

[Compliance Statements for Acoustic Noise for ACX4000 Routers | 202](#)

[Compliance Statements for Environmental Requirements | 202](#)

## Compliance Statements for Data Center

- The equipment is suitable for installation as part of the Common Bonding Network (CBN).
- The equipment is suitable for installation in locations where the National Electrical Code (NEC) applies.
- The battery return connection is to be treated as an isolated DC return (that is, DC-I), as defined in GR-1089-CORE.
- You must provision a readily accessible device outside of the equipment to disconnect power. The device must also be rated based on local electrical code practice.

## Compliance Statements for EMC Requirements

### IN THIS SECTION

- [Canada | 201](#)
- [European Community | 201](#)
- [Israel | 201](#)
- [Japan | 201](#)

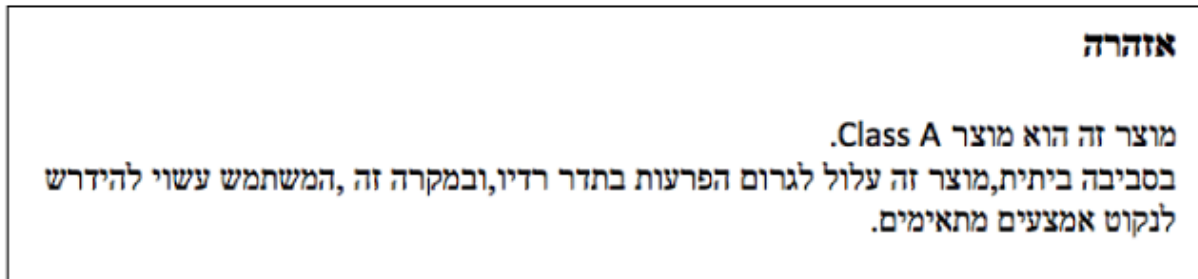
## Canada

CAN ICES-3 (A)/NMB-3(A)

## European Community

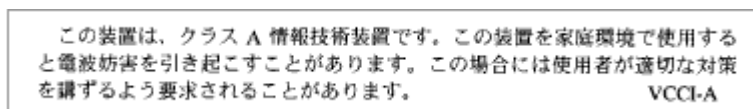
This is a Class A product. In a domestic environment, this product might cause radio interference in which case the user might be required to take adequate measures.

## Israel



Translation from Hebrew—Warning: This product is Class A. In residential environments, the product might cause radio interference, and in such a situation, the user might be required to take adequate measures.

## Japan



The preceding translates as follows:

This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this product is used near a radio or television receiver in a domestic environment, it might cause radio interference. Install and use the equipment according to the instruction manual. VCCI-A.

## United States

The hardware 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 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 the user will be required to correct the interference at his own expense.

## Compliance Statements for Environmental Requirements

Batteries in this product are not based on mercury, lead, or cadmium substances. The batteries used in this product are in compliance with EU Directives 91/157/EEC, 93/86/EEC, and 98/101/EEC. The product documentation includes instructional information about the proper method of reclamation and recycling.

## Compliance Statements for Acoustic Noise for ACX4000 Routers

The router complies with NEBS Level 3 requirements:

- GR-63-CORE: NEBS, Physical Protection
- GR-1089-CORE: EMC and Electrical Safety for Network Telecommunications Equipment

RELATED DOCUMENTATION

<a href="#">Compliance Statements for Data Center   200</a>
<a href="#">Compliance Statements for EMC Requirements   200</a>
<a href="#">Compliance Statements for Environmental Requirements   202</a>