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ACX2000 and ACX2100 Universal Metro Router Hardware Guide

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ACX2000 and ACX2100 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 ACX2000 and ACX2100 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

- ACX2000 and ACX2100 Router Quick Start

CHAPTER 1

Overview

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ACX2000 and ACX2100 System Overview

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ACX2000 and ACX2100 Universal Metro Router Overview

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- Benefits of the ACX2000 and ACX2100 Routers | 3
- ACX2000 Router Description | 3
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The ACX2000 and ACX2100 Universal Metro Routers are 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.

The ACX Series router is a single-board router with a built-in Routing Engine and one Packet Forwarding Engine. Because there is no switching fabric, the single Packet Forwarding Engine takes care of both ingress and egress 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 and 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 compact routers are one rack unit (U; that is, 1.75 in., or 4.45 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. The chassis measures 1.75 in. (4.45 cm) high, 9.4 in. (24 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.

Benefits of the ACX2000 and ACX2100 Routers

- **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.

ACX2000 Router Description

The ACX2000 router contains sixteen T1/E1 ports, six Gigabit Ethernet ports, and two PoE ports. The ACX2000 router also supports installation of two Gigabit Ethernet SFP transceivers and two 10-Gigabit Ethernet SFP+ transceivers.

The ACX2000 router has one “pseudo” Flexible PIC Concentrator (FPC 0), and four “pseudo” PICs (PIC 0 through 3).

Figure 1 on page 4 shows the front view of the ACX2000 router. Figure 2 on page 4 shows the rear view.

Figure 1: Front View of the ACX2000 Router

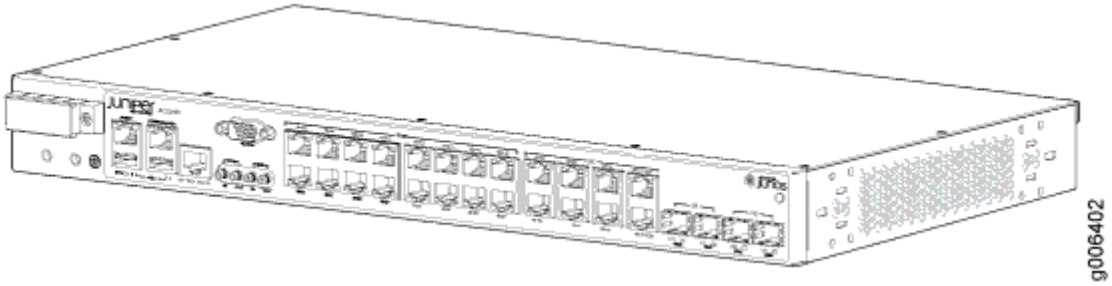
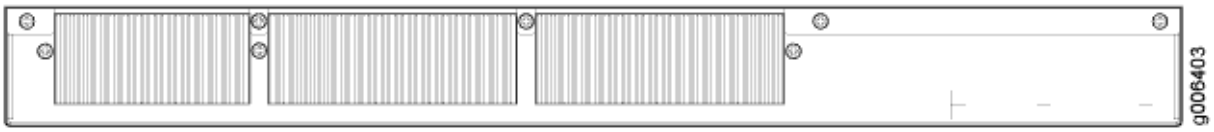


Figure 2: Rear View of the ACX2000 Router



ACX2100 Router Description

The ACX2100 router contains sixteen T1/E1 ports, and four Gigabit Ethernet ports. The ACX2100 router also contains two ports for installing Gigabit Ethernet SFP transceivers and two ports for installing 10-Gigabit Ethernet SFP+ transceivers. The ports labeled **COMBO PORTS** provide an additional four copper Gigabit Ethernet ports or four Gigabit Ethernet SFP ports. You can use only one set of combination ports at a time.

The ACX2100 router has two “pseudo” Flexible PIC Concentrators (FPC 0 and FPC 1), and four “pseudo” PICs (PIC 0 through 3).

Figure 3 on page 5 shows the front view of the ACX2100 router. Figure 4 on page 5 shows the rear view.

Figure 3: Front View of the ACX2100 Router

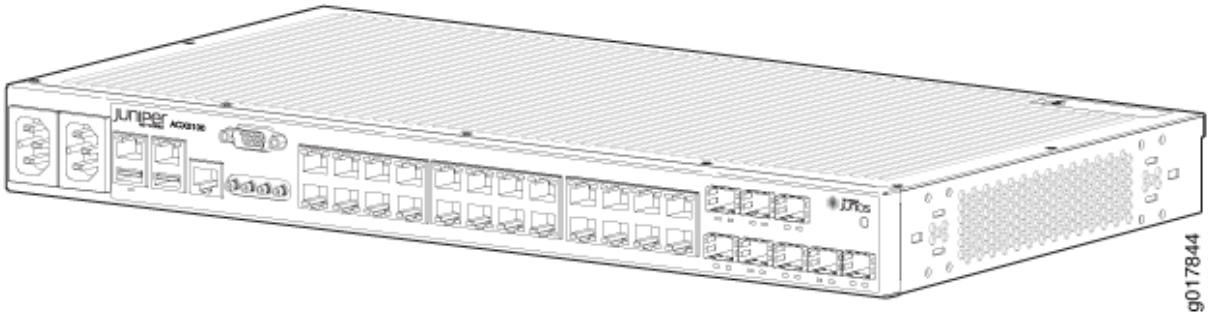
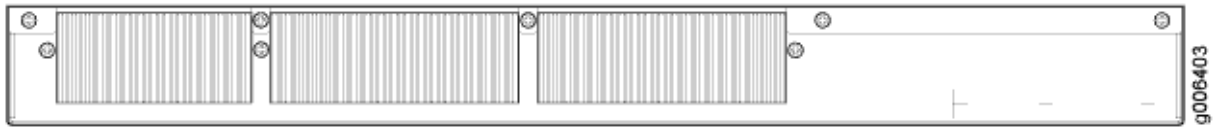


Figure 4: Rear View of the ACX2100 Router



SEE ALSO

- Front Panel of an ACX2000 Router | 46
- Front Panel of an ACX2100 Router | 48

ACX2000 and ACX2100 Routers Hardware and CLI Terminology Mapping

IN THIS SECTION

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- ACX2100 Hardware and CLI Terminology Mapping | 8

ACX2000 Hardware and CLI Terminology Mapping

Table 1 on page 6 describes the hardware terms used in ACX2000 router documentation and the corresponding terms used in the Junos OS command line interface (CLI). Figure 5 on page 8 shows the port locations of the interfaces.

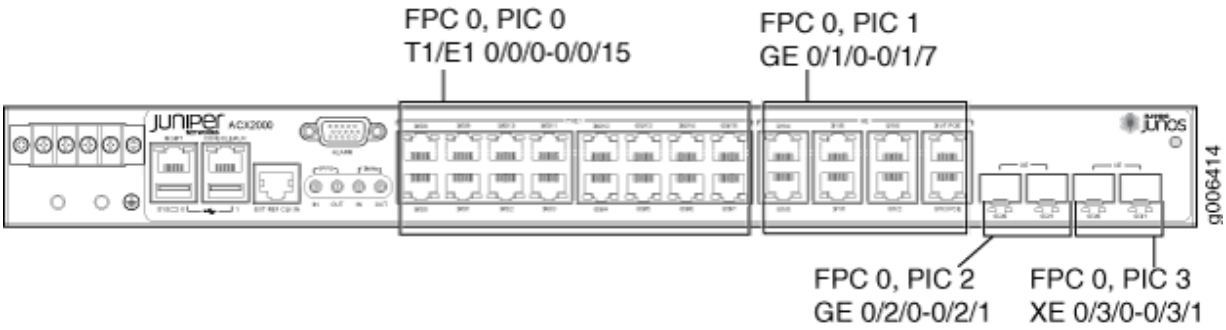
Table 1: CLI Equivalents of Terms Used in Documentation for ACX2000 Routers

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	ACX2000	–	Router chassis	"Chassis Physical Specifications for ACX2000 and ACX2100 Routers" on page 75
FPC (*n*)	Abbreviated name of the Flexible PIC Concentrator (FPC)	Value of *n* is always 0.	The router does not have actual FPCs. In this case, FPC refers to the router itself.	Interface Naming Conventions Used in the Junos OS Operational Commands
PIC (*n*)	Abbreviated name of the Physical Interface Card (PIC)	*n* is a value in the range of 0–3.	The router does not have actual PIC devices; see entries for PIC 0 through PIC 3 for the equivalent item on the router.	Interface Naming Conventions Used in the Junos OS Operational Commands
	16x T1/E1 (RJ-48)	PIC 0	Built-in network ports on the front panel of the router	"ACX2000 and ACX2100 Universal Metro Router Overview" on page 2
	One of the following: • 6x 1GE (RJ-45) • 2x 1GE (POE RJ-45)	PIC 1	Built-in network ports on the front panel of the router	"ACX2000 and ACX2100 Universal Metro Router Overview" on page 2

Table 1: CLI Equivalents of Terms Used in Documentation for ACX2000 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 (SFP)	PIC 2	Built-in uplink ports on the front panel of the router	"ACX2000 and ACX2100 Universal Metro Router Overview" on page 2
	2x 10GE (SFP+)	PIC 3	Built-in uplink ports on the front panel of the router	"ACX2000 and ACX2100 Universal Metro Router Overview" on page 2
Xcvr (*n*)	Abbreviated name of the transceiver	*n* is a value equivalent to the number of the port in which the transceiver is installed.	Optical transceivers	"Uplink Ports on ACX2000 and ACX2100 Routers" on page 50
Power supply (*n*)	Built-in power supply	Value of *n* is always 0.	DC power supply	"ACX2000 and ACX2100 Power Overview" on page 63
Fan	Fan **NOTE**: ACX2000 routers are fanless models.	–	Fan	"Cooling System and Airflow in an ACX2000 and ACX2100 Router" on page 62

Figure 5: ACX2000 Interface Port Mapping



ACX2100 Hardware and CLI Terminology Mapping

Table 2 on page 8 describes the hardware terms used in ACX2100 router documentation and the corresponding terms used in the Junos OS command line interface (CLI). Figure 6 on page 10 shows the port locations of the interfaces.

Table 2: CLI Equivalents of Terms Used in Documentation for ACX2100 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	ACX2100	–	Router chassis	"Chassis Physical Specifications for ACX2000 and ACX2100 Routers" on page 75
FPC (*n*)	Abbreviated name of the Flexible PIC Concentrator (FPC)	*n* is a value in the range of 0–1.	The router does not have actual FPCs. In this case, FPC refers to the router itself.	Interface Naming Conventions Used in the Junos OS Operational Commands
PIC (*n*)	Abbreviated name of the Physical Interface Card (PIC)	*n* is a value in the range of 0–3.	The router does not have actual PIC devices; see entries for PIC 0 through PIC 3 for the equivalent item on the router.	Interface Naming Conventions Used in the Junos OS Operational Commands

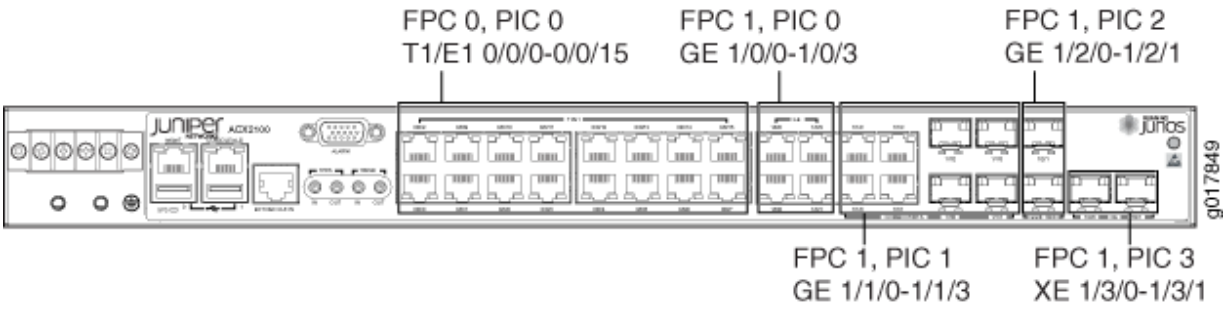
Table 2: CLI Equivalents of Terms Used in Documentation for ACX2100 Routers *(Continued)*

Hardware Item (as displayed in the CLI)	Description (as displayed in the CLI)	Value (as displayed in the CLI)	Item in Documentation	Additional Information
	16x T1/E1 (RJ-48)	PIC 0 on FPC 0	Built-in network ports on the front panel of the router	"ACX2000 and ACX2100 Universal Metro Router Overview" on page 2
	4x 1GE (RJ-45)	PIC 0 on FPC 1	Built-in network ports on the front panel of the router	"ACX2000 and ACX2100 Universal Metro Router Overview" on page 2
	One of the following: • 4x 1GE (RJ-45) • 4x 1GE (SFP)	PIC 1 on FPC 1	Built-in uplink ports on the front panel of the router	"ACX2000 and ACX2100 Universal Metro Router Overview" on page 2
	2x 1GE (SFP)	PIC 2 on FPC 1	Built-in uplink ports on the front panel of the router	"ACX2000 and ACX2100 Universal Metro Router Overview" on page 2
	2x 10GE (SFP+)	PIC 3 on FPC 1	Built-in uplink ports on the front panel of the router	"ACX2000 and ACX2100 Universal Metro Router Overview" on page 2
Xcvr (*n*)	Abbreviated name of the transceiver	*n* is a value equivalent to the number of the port in which the transceiver is installed.	Optical transceivers	"Uplink Ports on ACX2000 and ACX2100 Routers" on page 50

Table 2: CLI Equivalents of Terms Used in Documentation for ACX2100 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
Power supply (*n*)	Built-in power supply	Value of *n* is always 0.	AC or DC power supply	"ACX2000 and ACX2100 Power Overview" on page 63
Fan	Fan **NOTE**: ACX2100 routers are fanless models.	–	Fan	"Cooling System and Airflow in an ACX2000 and ACX2100 Router" on page 62

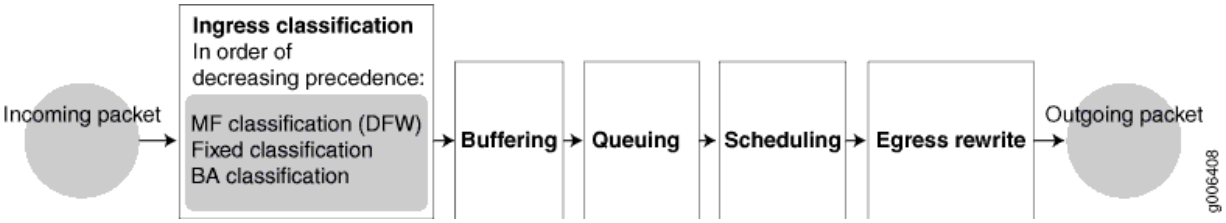
Figure 6: ACX2100 Interface Port Mapping



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 7 on page 11.

Figure 7: 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.

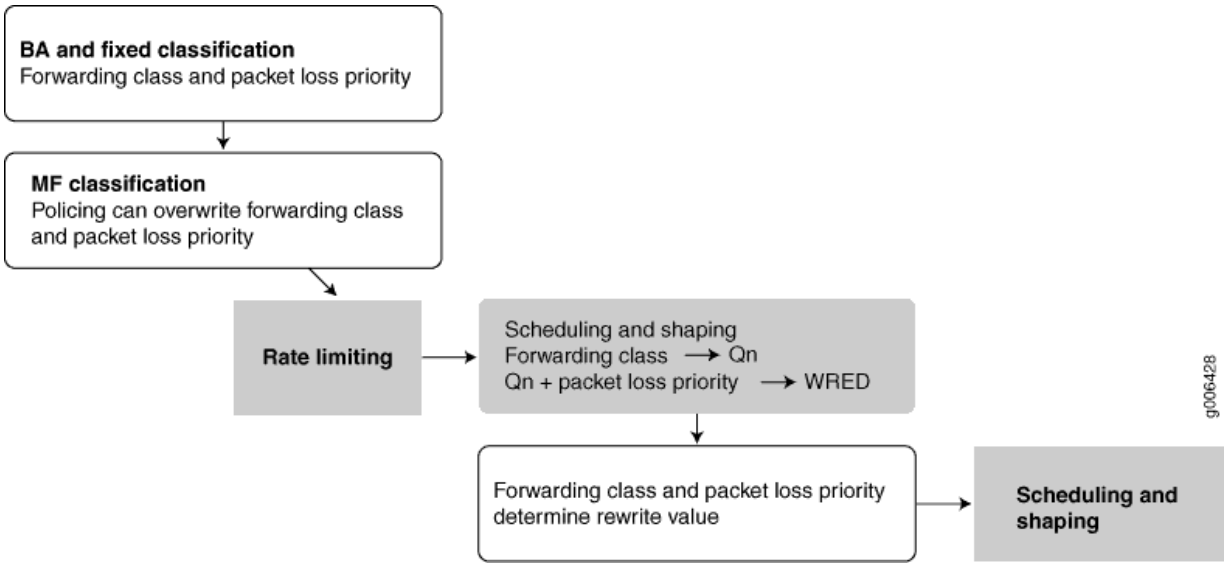
However, the ACX Series routers can also employ multiple BA classifiers on the same physical interface. The physical interfaces do not have to employ the same type of BA classifier. For example, a single physical interface can use classifiers based on IP precedence as well as IEEE 802.1p. If the CoS 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 8 on page 12. 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 8: ACX Series Router Packet Handling



SEE ALSO

ACX2000 and ACX2100 Routers Hardware and CLI Terminology Mapping | 5

Configuring CoS on ACX Series Routers

Protocols and Applications Supported by ACX Series Routers

Table 3 on page 13 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 3: Protocols and Applications Supported by ACX Series Routers

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
Interface and Encapsulation Types										
Ethernet interfaces—1G, 10G	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Ethernet interfaces—40G	–	–	–	–	–	–	15.1X54–D20	15.1X54–D20	–	18.2R1
ATM interfaces (IMA only)	12.2	–	12.2	12.2R2	–	–	–	–	–	–
E1 interfaces	12.2	–	12.2	12.2R2	–	–	–	–	–	–

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
T1 interfaces	12.2	–	12.2	12.2R2	–	–	–	–	–	–
Circuit emulation interfaces (SAToP, CESoP)	12.2	–	12.2	12.2R2	-	12.3x51-D10	–	–	–	–
SONET/SDH interfaces	–	–	–	–	–	12.3x51-D10 (requires a MIC)	–	–	–	–
Layer 3										
Static routes	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
OSPF	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
IS-IS	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
BGP	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
Internet Control Message Protocol (ICMP)	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Address Resolution Protocol (ARP)	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Bidirectional Forwarding Detection (BFD) protocol	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
Dynamic Host Configuration Protocol (DHCP)	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
IP fast reroute (FRR) (OSPF, IS-IS)	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Maximum transmission unit (MTU) range (256 to 9192)	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
Layer 3 VPNs	12.3R1	12.3R1	12.3R1	12.3R1	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
RSVP	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
LDP (targeted and direct)	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
MPLS, VPLS, VPNs										

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX5000	ACX5448
Static label-switched path (LSP)	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
FRR	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Traffic engineering	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
E-LINE	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Pseudowire Emulation Edge to Edge (PWE3 [signaled])	12.2	–	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	–	18.2R1
Static Ethernet PWs	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Layer 2 circuits	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
IEE802.1ag CC monitoring on active and standby pseudowires	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
VPLS	–	–	–	–	–	–	15.1X54–D20	15.1X54–D20	–	18.2R1
Ethernet Layer 2										
Ethernet in the first mile (EFM 802.3ah)	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
802.1ag connectivity fault management (CFM)	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
IEE802.1ag interface-status type, length, and value (TLV)	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
QoS										
Firewall filters (access control lists—ACLs)—family inet	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
Standard firewall filter match conditions for MPLS traffic	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Firewall filters—family ccc/any	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Firewall - Port Mirroring	12.2R1	12.2R2	12.2R1	12.2R2	12.3X54–D15	12.3x51-D10	17.1R1	17.1R1	-	18.2R1
Policing—per logical interface	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
Policing—per physical interface	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Policing—per family	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
TrTCM (color aware, color blind)	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51 12.3X54–D15-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
SrTCM (color aware, color blind)	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Host protection	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Eight queues per port	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
Priority queuing	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Rate control	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Scheduling with two different priorities	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
Low-latency queue (LLQ)	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Weighted random early detection (WRED) drop profile (DP)	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Classification—DSCP	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX5000	ACX5448
Classification—MPLS EXP	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Classification—IEEE 802.1p	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Rewrite—DSCP	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX5000	ACX5448
Rewrite MPLS EXP	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Rewrite 802.1p	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Rewrite MPLS and DSCP to different values	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Timing										

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX5000	ACX5448
Timing-1588-v2, 1588-2008–backup clock	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	–	–	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Synchronous Ethernet	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	–	–	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Building-integrated timing supply (BITS)	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	–	–	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	-

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX5000	ACX5448
Clock synchronization	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	–	–	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	-
Redundant clock (multiple 1588 primaries)	–	–	–	–	–	–	–	–	–	-
Transparent clock	–	–	–	–	–	–	15.1X54–D20	15.1X54–D20	–	18.2R1
Grand Primary Clock	–	–	–	–	–	–	–	–	12.3X54–D20 and 17.3R1 (Indoor) 12.3X54–D25 (Outdoor)	-
OAM, Troubleshooting, Manageability, Lawful Intercept										

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
Network Time Protocol (NTP)	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
SNMP	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
802.1ag CFM	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
802.3ah LFM	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Y.1731 Fault and Performance Management	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
MPLS OAM	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
RMON	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Layer 2 traceroute	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
DNS	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
TFTP for software downloads	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Port mirroring (local port mirroring)	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	–	–	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Interface loopback	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX5000	ACX5448
Ethernet loopback	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	–	–	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	-
Interface byte and packet stats	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Interface queue stats	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
Drop packet stats	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Distinguish each 802.1ag connection by VLAN-ID	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Interface passive-monitor-mode	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX5000	ACX5448
Multipacket mirror	–	–	–	–	–	–	–	–	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	-
Security										
TACACS AAA	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
RADIUS authentication	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
Control plane DOS prevention	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
High Availability										
MPLS FRR	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
BFD	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
ATM Transport										

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX5000	ACX5448
ATM over PWE3	12.2	–	12.2	12.2R2	12.3X54–D15	12.3x51-D10	–	–	–	-
RFC4717 ATM encapsulation: S6.1 ATM N to one cell mode (required as per standard)	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	–	–	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	-
RFC4717: S6.3—ATM AAL5 SDU encapsulation (optional)	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	–	–	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	-
ATM PWE3 control word	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	–	–	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	-

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX5000	ACX5448
ATM PWE3 by means of dynamic labels	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	–	–	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	-
ATM VPI/VCI swapping	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	–	–	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	-
ATM idle/unassigned cell suppression	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	–	–	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	-

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX5000	ACX5448
ATM support for N to 1 PW promiscuous mode: 1 PW per port and 1 PW per VPI	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	–	–	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	-
Cell concatenation (1 to 30 cells per packet)	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	–	–	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	-
Packet/byte counters per VP and VC	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	–	–	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	-

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
Inverse multiplexing over ATM (IMA)	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	–	–	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	-
ATM Encapsulation										
AAL5 SDU (n-to-1 cell relay)	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	–	–	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	-
ATM Queuing										
ATM service categories (CBR, nrt-VBR, UBR) to the UNI	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	–	–	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	-

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX5000	ACX5448
MAP ATM service categories to PW EXP bits	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	–	–	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	-
Input policing per VC	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	–	–	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	-
VC output shaping	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	–	–	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	-

Table 3: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
Early packet discard	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	–	–	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	-
MIBs										
Standard SNMP MIBs	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1
Juniper Networks enterprise-specific MIBs	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	15.1X54–D20	15.1X54–D20	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	18.2R1

SEE ALSO

ACX Series Universal Metro Routers

ACX2000 Chassis Components

IN THIS SECTION

- Front Panel of an ACX2000 Router | 46
- Front Panel of an ACX2100 Router | 48
- Uplink Ports on ACX2000 and ACX2100 Routers | 50
- ACX2000 and ACX2100 Alarm Contact Port | 55
- Clocking Ports on the ACX2000 and the ACX2100 Router | 57
- LEDs on ACX2000 and ACX2100 Routers | 58

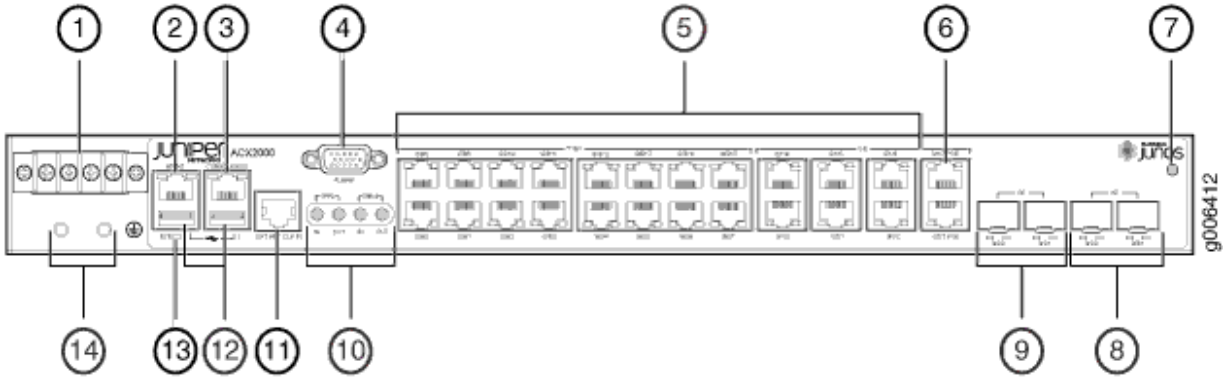
Front Panel of an ACX2000 Router

The front panel of an ACX2000 router consists of the following components (see Figure 9 on page 47):

- Chassis status LED labeled **SYS**
- DC power terminals
- Two USB ports for upgrading Junos OS
- Management Ethernet port labeled **MGMT**
- Console or auxiliary port labeled **CONSOLE/AUX**
- Alarm contact port labeled **ALARM**—accepts a DE-15 alarm cable
- External clocking input port labeled **EXT REF CLK IN**
- External clocking ports supporting **1PPS** and **10MHz** input and output
- Network ports and corresponding status LEDs:
  - Sixteen T1/E1 ports labeled **0/0/0** through **0/0/15**

- Six Gigabit Ethernet RJ-45 ports labeled **0/1/0** through **0/1/2** and **0/1/4** through **0/1/6**
- Two 65-W PoE Gigabit Ethernet ports labeled **0/1/3 POE** and **0/1/7 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 **0/2/0** and **0/2/1** that accept SFP transceivers
- Two 10-Gigabit Ethernet (**XE**) ports labeled **0/3/0** and **0/3/1** that accept SFP+ transceivers

Figure 9: Front Panel of the ACX2000 Router



1– DC terminals	8– 10-Gigabit Ethernet SFP+ ports
2– Management Ethernet port	9– Gigabit Ethernet SFP ports
3– Console or auxiliary port	10– External clocking ports
4– Alarm contact port	11– External clocking input port
5– T1/E1 and RJ-45 Gigabit Ethernet network ports	12– USB ports
6– PoE Gigabit Ethernet ports	13– System LED
7– ESD point	14– Grounding terminals

SEE ALSO

ACX2000 and ACX2100 Universal Metro Router Overview | 2

LEDs on ACX2000 and ACX2100 Routers | 58

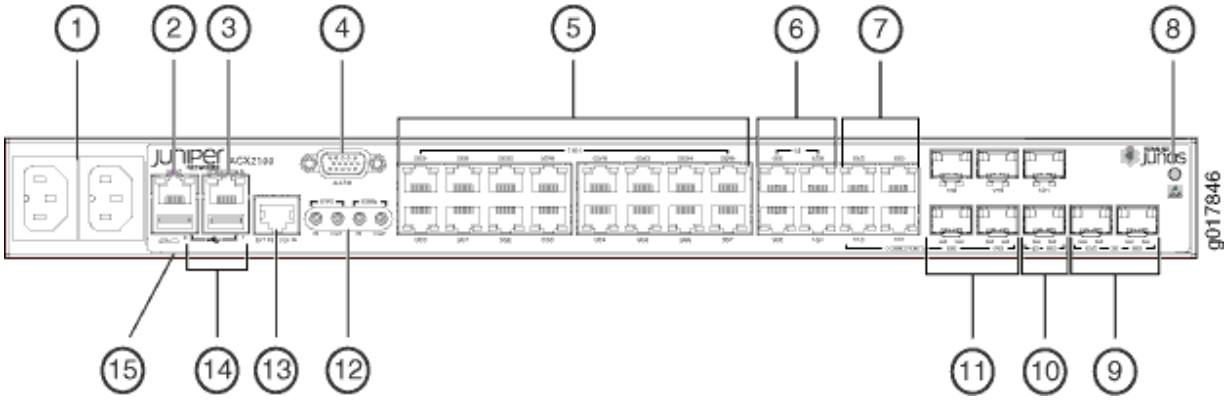
Front Panel of an ACX2100 Router

The front panel of an ACX2100 router consists of the following components (see Figure 10 on page 49 and Figure 11 on page 49):

- Chassis status LED labeled **SYS**
- AC power inlets or DC terminals
- Two USB ports for upgrading Junos OS
- Management Ethernet port labeled **MGMT**
- Console or auxiliary port labeled **CONSOLE/AUX**
- Alarm contact port labeled **ALARM**—accepts a DE-15 alarm cable
- External clocking input port labeled **EXT REF CLK IN**
- External clocking ports supporting **1PPS** and **10MHz** input and output
- Network ports and corresponding status LEDs:
  - Sixteen T1/E1 ports labeled **0/0/0** through **0/0/15**
  - Four Gigabit Ethernet (**GE**) ports labeled **1/0/0** through **1/0/3**
  - Combination (**COMBO**) ports labeled **1/1/0** through **1/1/3**, either:
    - Four Gigabit Ethernet RJ-45 ports
    - Four Gigabit Ethernet SFP ports
  - Two Gigabit Ethernet (**GE**) ports labeled **1/2/0** through **1/2/1** that accept SFP transceivers

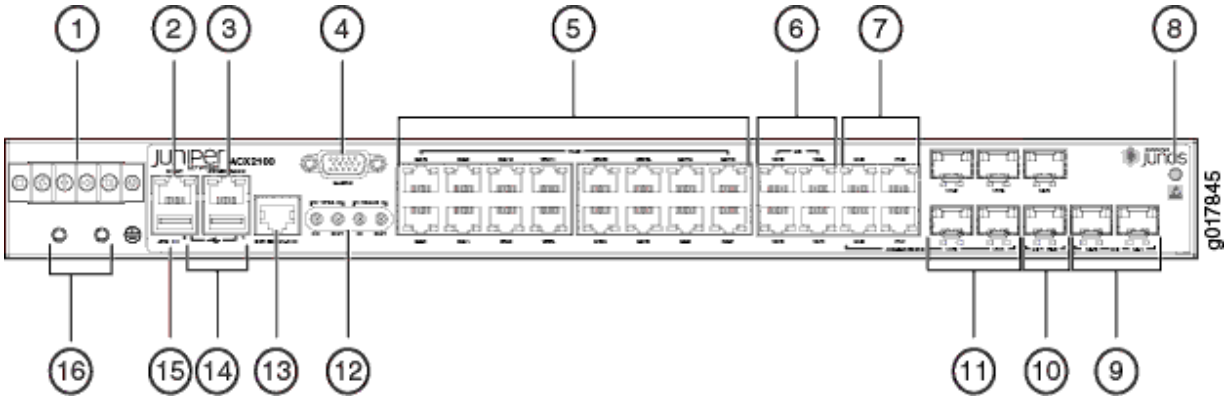
- Two 10-Gigabit Ethernet (**XE**) ports labeled **1/3/0** and **1/3/1** that accept SFP+ transceivers

Figure 10: Front Panel of the AC-Powered ACX2100 Router



1– AC inlets	9– Ten-Gigabit Ethernet SFP+ ports
2– Management Ethernet port	10– Gigabit Ethernet SFP ports
3– Console or auxiliary port	11– Combination Gigabit Ethernet SFP ports
4– Alarm contact port	12– External clocking ports
5– T1/E1 network ports	13– External clocking input port
6– Gigabit Ethernet network ports	14– USB ports
7– Combination Gigabit Ethernet RJ-45 ports	15– System LED
8– ESD point	

Figure 11: Front Panel of the DC-Powered ACX2100 Router



1– DC terminals	9– Ten-Gigabit Ethernet SFP+ ports
2– Management Ethernet port	10– Gigabit Ethernet SFP ports

3– Console or auxiliary port	11– Combination Gigabit Ethernet SFP ports
4– Alarm contact port	12– External clocking ports
5– T1/E1 network ports	13– External clocking input port
6– Gigabit Ethernet network ports	14– USB ports
7– Combination Gigabit Ethernet RJ-45 ports	15– System LED
8– ESD point	16– Grounding terminals

Uplink Ports on ACX2000 and ACX2100 Routers

IN THIS SECTION

- T1/E1 Ports | **51**
- Gigabit Ethernet RJ-45 Ports | **52**
- PoE Ports | **52**
- Gigabit Ethernet SFP Ports | **53**
- 10-Gigabit Ethernet SFP+ Ports | **54**

Unless otherwise specified, the information about uplink ports applies to both ACX2000 and ACX2100 routers.

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 ACX2000 is located at https://apps.juniper.net/hct/product/#prd=ACX2000. The list of supported transceivers for the ACX2100 is located at https://apps.juniper.net/hct/product/#prd=ACX2100.

T1/E1 Ports

The router has sixteen T1/E1 ports located on the front panel. Table 4 on page 51 describes the ports in more detail.

Table 4: T1/E1 Port Features

Feature	Description
Line rate	E1: 2.048 Mbps per channel T1: 1.544 Mbps per channel
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)	**0/0/0** through **0/0/15**
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`

Gigabit Ethernet RJ-45 Ports

The front panel of the ACX2000 router has six Gigabit Ethernet RJ-45 ports, and the ACX2100 router has eight Gigabit Ethernet RJ-45 ports. Table 5 on page 52 describes the ports in more detail.

Table 5: RJ-45 Port Features

Feature	Description
Supported standards	• 10BASE-T Copper • 100BASE-T • 1000BASE-T
Cable	Category 5
Connector	RJ-45
Port numbering (hardware)	• ACX2000: **0/1/0** through **0/1/2** and **0/1/4** through **0/1/6** • ACX2100: **1/0/0** through **1/0/3** and **1/1/0** through **1/1/3**
Port numbering (software)	• ACX2000: `ge-0/1/0` through `ge-0/1/2` and `ge-0/1/4` through `ge-0/1/6` • ACX2100: `ge-1/0/0` through `ge-1/0/3` and `ge-1/1/0` through `ge-1/1/3`

PoE Ports

Each ACX2000 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 6 on page 52 describes the ports in more detail.

Table 6: PoE Port Features

Feature	Description
Supported standards	IEEE 802.3af (PoE) and IEEE 802.3at (PoE+)

Table 6: PoE Port Features *(Continued)*

Feature	Description
Per port power limit	65 W
Cable	Copper Ethernet LAN cable
Connector	RJ-45
Port numbering (hardware)	**0/1/3 POE** and **0/1/7 POE**
Port numbering (software)	`ge-0/1/3` and `ge-0/1/7`

Gigabit Ethernet SFP Ports

The **GE** ports described in Table 7 on page 53 support small form-factor pluggable (SFP) transceivers.

NOTE: On the ACX2000 router, 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. On the ACX2100 router, you can use both sets at the same time.

Table 7: SFP Port Features

Feature	Description
Supported standards	See the Hardware Compatibility Tool for the specifications of transceivers supported on the ACX2000 or ACX2100. The list of supported transceivers for the ACX2000 is located at https://pathfinder.juniper.net/hct/product/#prd=ACX2000. The list of supported transceivers for the ACX2100 is located at https://pathfinder.juniper.net/hct/product/#prd=ACX2100.
Cable	
Connector	

Table 7: SFP Port Features *(Continued)*

Feature	Description
Port numbering (hardware)	• ACX2000: **0/2/0** and **0/2/1** • ACX2100: **1/1/0** through **1/1/3** and **1/2/0** and **1/2/1**
Port numbering (software)	• ACX2000: `ge-0/2/0` and `ge-0/2/1` • ACX2100: `ge-1/1/0` through `ge-1/1/3` and `ge-1/2/0` and `ge-1/2/1`

10-Gigabit Ethernet SFP+ Ports

The **XE** ports described in Table 8 on page 54 support SFP+ transceivers.

NOTE: On the ACX2000 router, 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. On the ACX2100 router, you can use both sets at the same time.

Table 8: SFP+ Port Features

Feature	Description
Supported standards	See the Hardware Compatibility Tool for the specifications of transceivers supported on the ACX2000 or ACX2100. The list of supported transceivers for the ACX2000 is located at https://pathfinder.juniper.net/hct/product/#prd=ACX2000. The list of supported transceivers for the ACX2100 is located at https://pathfinder.juniper.net/hct/product/#prd=ACX2100.
Cable	
Connector	
Port numbering (hardware)	• ACX2000: **0/3/0** and **0/3/1** • ACX2100: **1/1/0** through **1/1/3** and **1/2/0** and **1/2/1**

Table 8: SFP+ Port Features *(Continued)*

Feature	Description
Port numbering (software)	• ACX2000: `xe-0/3/0` and `xe-0/3/1` • ACX2100: `xe-1/3/0` through `xe-1/3/1`

ACX2000 and ACX2100 Alarm Contact Port

The ACX2000 and ACX2100 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 ACX2000 and ACX2100 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 9 on page 55 describes the functions of the alarm contacts.

Table 9: 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.

Table 9: Alarm Relay Contact Functions *(Continued)*

Contact Name	Contact Name	Function
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 12 on page 56 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 12: Sample Output Alarm-Reporting Device

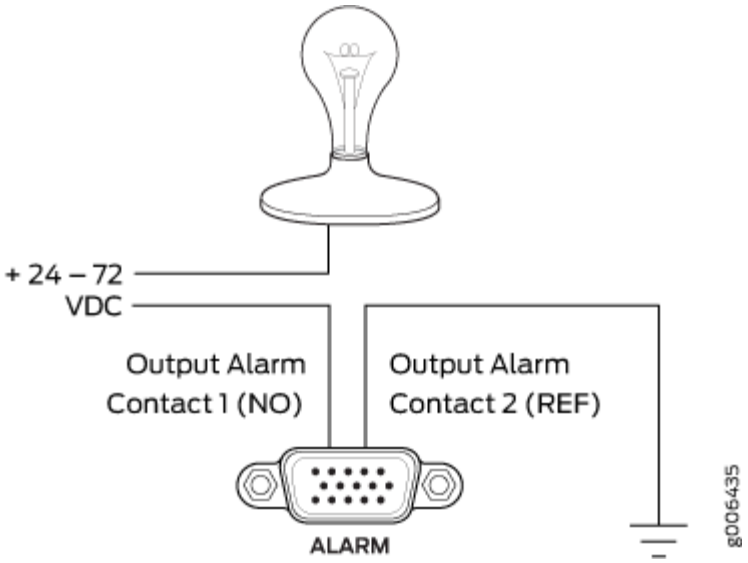
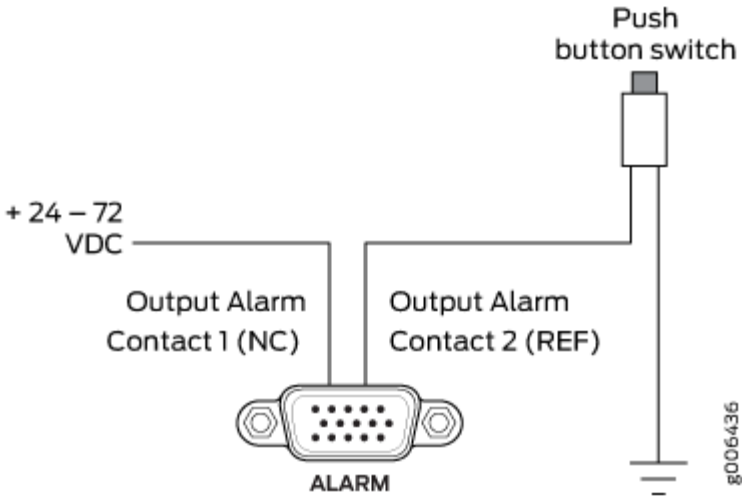


Figure 13 on page 57 shows an example of a wiring diagram for a simple input alarm-reporting device. In this case the push button switch is an alarm sensor that triggers an input alarm when a door-open condition occurs.

Figure 13: Sample Input Alarm-Reporting Device



SEE ALSO

Alarm Contact Port Pinouts on the ACX2000 and ACX2100 Router | **90**

Clocking Ports on the ACX2000 and the ACX2100 Router

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 PPS, and 10 MHz. The four SubMiniature B (SMB) connectors and one RJ-48 port 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 router include:

- External building-integrated timing system (BITS) timing port

- 10-MHz timing connectors (one input and one output)
- 1.544-MHz/2.048 MHz T1/E1 (RJ-48) ports for timing input or output
- 1 pulse-per-second (PPS) connectors (one input and one output)
- Time-of-Day (TOD) RS232 port
- SyncE support on RJ-45/SFP ports as timing input or output
- Packet timing (IEEE 1588v2) includes:
  - Timing input when configured as Ordinary Clock (OC) or Boundary Clock (BC)
  - Timing output when configured as BC

SEE ALSO

Clocking Ports Specifications on the ACX2000 and the ACX2100 Router | 95

LEDs on ACX2000 and ACX2100 Routers

IN THIS SECTION

- System LED on the Front Panel | 59
- T1/E1 Port LEDs | 59
- Ethernet Port LEDs | 60
- PoE Port LEDs | 60
- SFP and SFP+ Port LEDs | 61
- Management and Console Port LEDs on the Front Panel | 61

Unless otherwise specified, the information about LEDs applies to both ACX2000 and ACX2100 routers.

System LED on the Front Panel

One bicolor LED labeled **SYS** indicates the status of the router. Table 10 on page 59 describes the system LED in more detail.

Table 10: 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.

T1/E1 Port LEDs

The front panel has sixteen T1/E1 ports, each with one pair of port LEDs. Table 11 on page 59 describes the LEDs in more detail.

Table 11: T1/E1 Port LEDs

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

Ethernet Port LEDs

The front panel of the ACX2000 router has six Gigabit Ethernet RJ-45 ports, and the ACX2100 router has eight Gigabit Ethernet RJ-45 ports, each with one pair of port LEDs. Table 12 on page 60 describes the LEDs in more detail.

Table 12: Ethernet Port LEDs

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

PoE Port LEDs

The front panel of the ACX2000 router has two PoE Gigabit Ethernet ports, each with one pair of port LEDs. Table 13 on page 60 describes the LEDs in more detail.

Table 13: PoE Port LEDs

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

SFP and SFP+ Port LEDs

The front panel has Gigabit Ethernet SFP ports and 10-Gigabit Ethernet SFP+ ports, each with one pair of port LEDs. Table 14 on page 61 describes the LEDs in more detail.

Table 14: SFP and SFP+ Link LEDs

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

Management and Console Port LEDs on the Front Panel

Two RJ-45 ports, labeled **MGMT** and **CONSOLE/AUX**, each have a pair of LEDs that display the status of the port. Table 15 on page 61 describes the LEDs in more detail.

Table 15: Management and Console LEDs

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

SEE ALSO

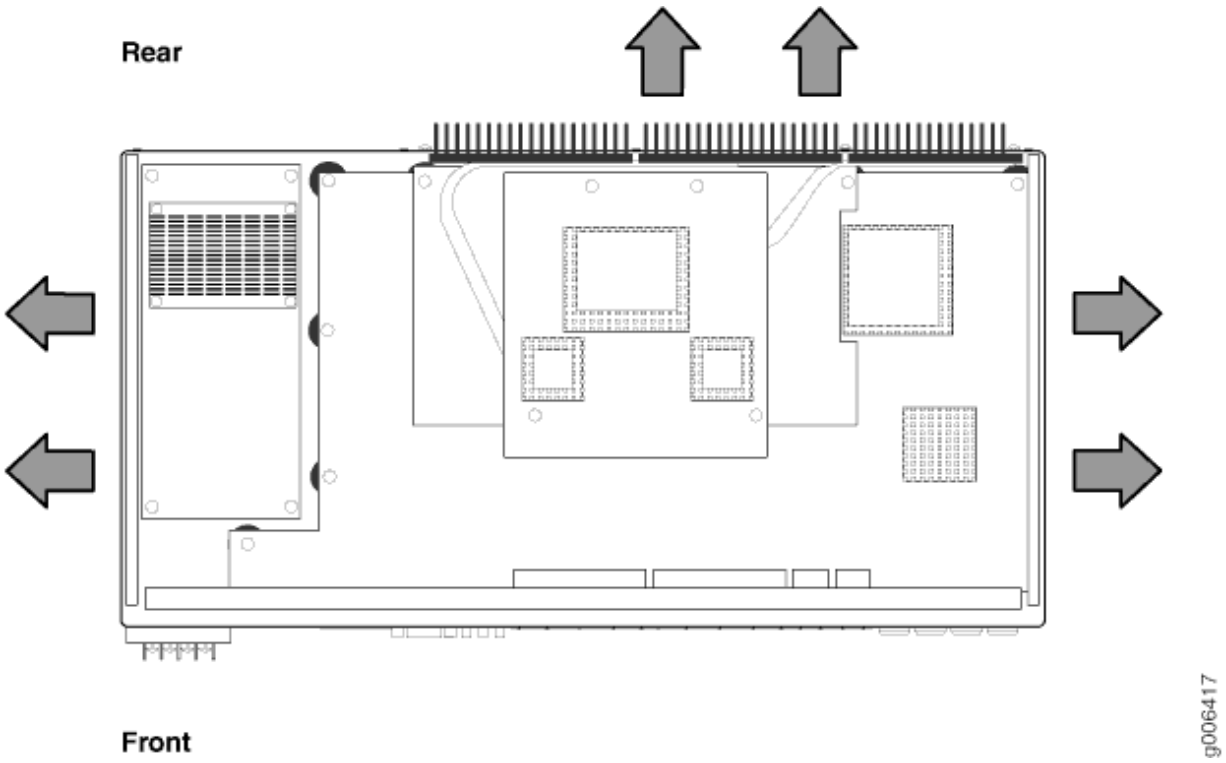
Troubleshooting Resources for ACX2000 and ACX2100 Routers | 132

Cooling System and Airflow in an ACX2000 and ACX2100 Router

The ACX2000 and ACX2100 routers do not contain fans and are passively cooled by the heatsinks (see Figure 14 on page 62).

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 14: Cooling System and Airflow in an ACX2000 and ACX2100 Router



RELATED DOCUMENTATION

- Site Preparation Checklist for ACX2000 and ACX2100 Routers | 70
- Rack Requirements for ACX2000 and ACX2100 Routers | 83
- Cabinet Requirements for ACX2000 and ACX2100 Routers | 80
- Clearance Requirements for Airflow and Hardware Maintenance on ACX2000 and ACX2100 Routers | 74
- ACX2000 and ACX2100 Router Environmental Specifications | 75

ACX2000 Power System

IN THIS SECTION

- ACX2000 and ACX2100 Power Overview | 63
- ACX2100 AC Power Specifications | 64
- ACX2100 AC Power Cord Specifications | 64
- ACX2000 and ACX2100 DC Power Specifications | 66

ACX2000 and ACX2100 Power Overview

Both ACX2000 and ACX2100 routers are available as DC-powered models. The ACX2100 is also available as an AC-powered model. The power supply in the router is built along the front panel of the chassis, with the DC power terminals or AC inlets on the front to connect power to the router.

Table 16 on page 63 lists the power consumed by the routers.

Table 16: Power Consumed by ACX2000 and ACX2100 Routers

Description	Value
Maximum power consumed by the router	52.8 W @-60V and 0.88A (ACX2100- DC) 62.3 W @264V and 0.236A (ACX2100-AC)

SEE ALSO

ACX2000 and ACX2100 Universal Metro Router Overview | 2

Connecting DC Power Cables to the ACX2000 or ACX2100 Router | 107

ACX2000 and ACX2100 DC Power Electrical Safety Guidelines | 171

ACX2100 AC Power Specifications

Table 17 on page 64 lists the AC power system electrical specifications.

Table 17: AC Power System Electrical Specifications

Item	Specification
AC input voltage	Operating range: 100 to 240 VAC
AC input line frequency	50 to 60 Hz (nominal)
AC system current rating	2 A (100 VAC) or 1 A (240 VAC)

NOTE: 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. Doing so enables you to operate the router in any configuration without upgrading the power infrastructure.

SEE ALSO

Connecting AC Power Cords to the ACX2100 Router | 109

ACX2100 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 18 on page 65 provides specifications on the AC power cord provided for each country or region.

Table 18: 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
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。

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.

SEE ALSO

Connecting AC Power Cords to the ACX2100 Router | 109

ACX2000 and ACX2100 DC Power Specifications

The power supplies in DC-powered ACX2000 and ACX2100 routers are built in along the front left panel of the chassis with DC power terminals to connect power to the router. The power supplies are labeled **PS0** and **PS1**.

When the ACX2100 router are operating normally and both power supplies are switched on, load sharing between them occurs automatically. When one power supply fails or is turned off, the other power supply immediately assumes the entire electrical load for the system. A single power supply can provide full power for as long as the router is operational.

NOTE: When only one power supply is available on an ACX2100 router, we recommend that you connect both the power inputs to the same source. That is, connect both the DC power inputs of

the ACX2100 router to the only available power supply. Doing so ensures that you get the maximum amount of hold-up time during a power failure.

ACX2000 and ACX2100 routers support a wide range of voltage ranges as shown in Table 19 on page 67.

Table 19: DC Power Electrical Specifications

Item	Specification
DC input voltages	• 20 to 30 VDC • –39 to –56 VDC • –39 to –72 VDC
DC input currents	• 10 A @ 24 VDC • 5 A @ –48 VDC • 4 A @ –60 VDC
Power supply output	110 W
PoE output	65 W per port at 54 V

NOTE: We recommend that you provide at least 10.5 A @ 24 VDC and use a facility circuit breaker rated for 10 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

ACX2000 and ACX2100 DC Power Electrical Safety Guidelines | **171**

DC Power Copper Conductors Warning | **173**

DC Power Disconnection Warning | **173**

DC Power Grounding Requirements and Warning | 175

DC Power Wiring Sequence Warning | 176

DC Power Wiring Terminations Warning | 177

CHAPTER 2

Site Planning, Preparation, and Specifications

Site Preparation Checklist for ACX2000 and ACX2100 Routers | 70

ACX2000 and ACX2100 Site Guidelines and Requirements | 72

ACX2000 and ACX2100 Network Cable and Transceiver Planning | 85

ACX2000 and ACX2100 Alarm, Management, and Clocking Cable Specifications and Pinouts | 90

Site Preparation Checklist for ACX2000 and ACX2100 Routers

The checklist in Table 20 on page 70 summarizes the tasks you need to perform when preparing a site for router installation.

Table 20: Site Preparation Checklist

Item or Task	For More Information	Performed By	Date
Environment			
Verify that environmental factors such as temperature and humidity do not exceed router tolerances.	"ACX2000 and ACX2100 Router Environmental Specifications" on page 75		
Power			
Measure the distance between external power sources and router installation site.			
Locate sites for connection of system grounding.			
Calculate the power consumption and requirements.	"ACX2000 and ACX2100 DC Power Specifications" on page 66 "ACX2100 AC Power Specifications" on page 64		
Hardware Configuration			
Choose the number and types of routers you want to install.	"ACX2000 and ACX2100 Universal Metro Router Overview" on page 2		
Rack or Cabinet			

Table 20: Site Preparation Checklist *(Continued)*

Item or Task	For More Information	Performed By	Date
Verify that your rack or cabinet meets the minimum requirements for the installation of the router.	"Rack Requirements for ACX2000 and ACX2100 Routers" on page 83 "Cabinet Requirements for ACX2000 and ACX2100 Routers" on page 80		
Plan rack or cabinet location, including required space clearances.	"Clearance Requirements for Airflow and Hardware Maintenance on ACX2000 and ACX2100 Routers" on page 74		
Secure the rack or cabinet to the floor and building structure.			
Cables			
Acquire cables and connectors: • Determine the number of cables needed based on your planned configuration. • Review the maximum distance allowed for each cable. Choose the length of cable based on the distance between the hardware components being connected.			
Plan the cable routing and management.			

RELATED DOCUMENTATION

Installing and Connecting an ACX2000 or ACX2100 Router Overview | 98

ACX2000 and ACX2100 Site Guidelines and Requirements

IN THIS SECTION

- General Site Guidelines | 72
- Site Electrical Wiring Guidelines | 73
- Clearance Requirements for Airflow and Hardware Maintenance on ACX2000 and ACX2100 Routers | 74
- Chassis Physical Specifications for ACX2000 and ACX2100 Routers | 75
- ACX2000 and ACX2100 Router Environmental Specifications | 75
- ACX2000 and ACX2100 Chassis Grounding Cable and Lug Specifications | 77
- Cabinet Requirements for ACX2000 and ACX2100 Routers | 80
- Rack Requirements for ACX2000 and ACX2100 Routers | 83

General Site Guidelines

Efficient device operation requires proper site planning and maintenance and 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 and that exhaust from other equipment does not blow into the intake vents of the device.
- Follow the prescribed electrostatic discharge (ESD) prevention procedures to prevent damaging the equipment. Static discharge can cause components to fail completely or intermittently over time.
- Install the device in a secure area, so that only authorized personnel can access the device.

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

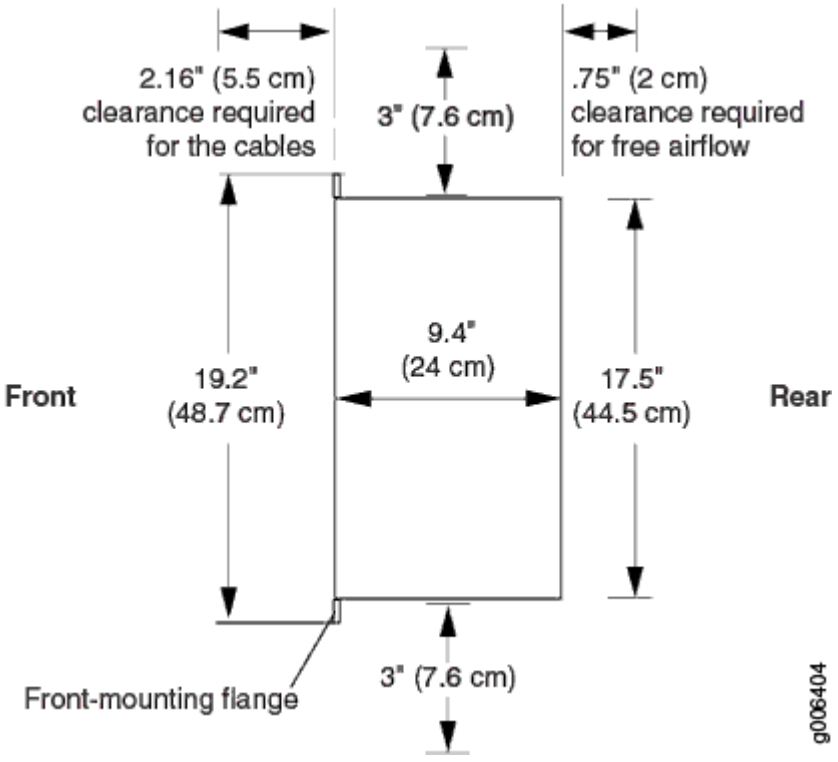
Site Wiring Factor	Guidelines
Signaling limitations	If your site experiences any of the following problems, consult experts in electrical surge suppression and shielding: • Improperly installed wires cause radio frequency interference (RFI). • Damage from lightning strikes occurs when wires exceed recommended distances or pass between buildings. • Electromagnetic pulses (EMPs) caused by lightning damage unshielded conductors and electronic devices.
Radio frequency interference	To reduce or eliminate RFI from your site wiring, do the following: • Use a twisted-pair cable with a good distribution of grounding conductors. • If you must exceed the recommended distances, use a high-quality twisted-pair cable with one ground conductor for each data signal, when applicable.
Electromagnetic compatibility	If your site is susceptible to problems with electromagnetic compatibility (EMC), particularly from lightning or radio transmitters, seek expert advice. Some of the problems caused by strong sources of electromagnetic interference (EMI) are: • Destruction of the signal drivers and receivers in the device • Electrical hazards as a result of power surges conducted over the lines into the equipment

Clearance Requirements for Airflow and Hardware Maintenance on ACX2000 and ACX2100 Routers

When planning the installation site, allow sufficient clearance around the rack (see Figure 15 on page 74):

- 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.
- Ensure that there is a minimum 1 meter/second airflow in any direction.

Figure 15: ACX2000 and ACX2100 Chassis Dimensions and Clearance Requirements



SEE ALSO

Installing and Connecting an ACX2000 or ACX2100 Router Overview | 98

Chassis Physical Specifications for ACX2000 and ACX2100 Routers

The ACX2000 router is a rigid sheet-metal structure that houses the hardware components. Table 22 on page 75 summarizes the physical specifications of the ACX2000 router.

Table 22: Physical Specifications of the ACX2000 and ACX2100 Router Chassis

Description	Value
Height	1.75 in. (4.45 cm)
Width	• 17.5 in. (44.5 cm) • 19.2 in. (48.7 cm) with mounting brackets attached
Depth	9.4 in. (24 cm)
Weight	7 lb (3.2 kg)

ACX2000 and ACX2100 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)
Relative humidity	Normal operation ensured in relative humidity range of 5% to 90%, noncondensing
Temperature	• Harsh environment: –40°F (–40°C) to 149°F (65°C) • Central office environment: 23°F (–5°C) to 131°F (55°C)
Commercial grade SFP/SFP+ temperature	• Harsh environment: –40°F (–40°C) to 122°F (50°C) • Central office environment: –40°F (–40°C) to 104°F (40°C)
Seismic	Designed to meet Telcordia Technologies Zone 4 earthquake requirements

Table 23: Router Environmental Specifications *(Continued)*

Description	Value

Configuration	• Harsh environment:
	  • PoE Power: 65-W each port (max spec)
	  • 1GB ports: Full traffic
	  • 10GB ports: Full traffic 1G ports
	  • T1/E1 ports: Full traffic
	  • SFP/SFP+: Extended temperature grade or industrial grade
	• Central office environment:
	  • PoE Power: 30W each port (max spec)
	  • 1GB ports: Full traffic
	  • 10GB ports: Full traffic 1G ports
	  • T1/E1 ports: Full traffic
	  • SFP/SFP+: Extended temperature grade or industrial grade

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.

ACX2000 and ACX2100 Chassis Grounding Cable and Lug Specifications

IN THIS SECTION

- Grounding Points Specifications | **78**
- Grounding Cable Lug Specifications | **79**

Grounding Cable Specifications | 80

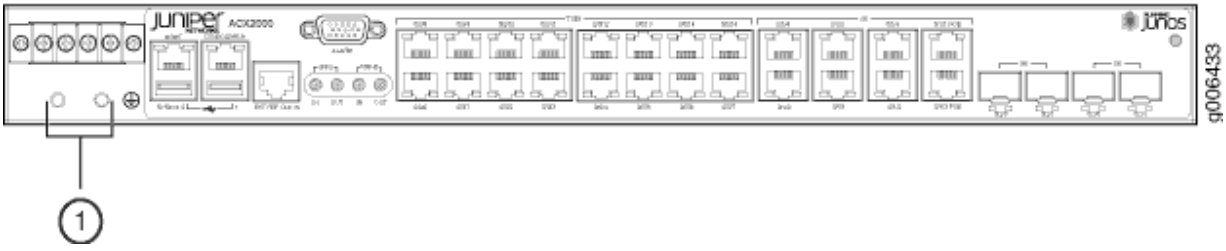
Grounding Points Specifications

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 ACX Series routers, you must connect a grounding cable to earth ground and then attach it to the chassis grounding points using the two paint piercing washers and two screws provided (see Figure 16 on page 78).

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 ACX2000 and ACX2100 routers in a restricted-access location and ensure that the chassis is always properly grounded. The routers have a two-hole protective grounding terminal provided on the chassis. See Figure 16 on page 78. 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 16: Grounding Points on the ACX2000 and ACX2100 Router



1– Grounding points

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

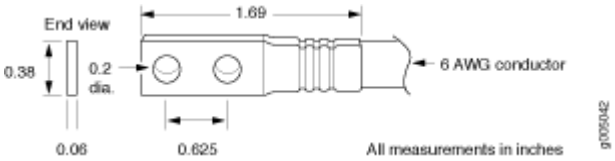
NOTE: All surfaces on the router that are unplated must be brought to a bright finish and treated with an antioxidant solution before connecting the router.

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 17 on page 79) 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 17: Grounding Cable Lug



CAUTION: Before router installation begins, 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^2), minimum 90°C wire, or as required by the local code.

SEE ALSO

Connecting the ACX2000 or ACX2100 Router to Earth Ground | **105**

Prevention of Electrostatic Discharge Damage | **167**

Cabinet Requirements for ACX2000 and ACX2100 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 81 provides the cabinet requirements and specifications for the router.

Table 24: Cabinet Requirements and Specifications for the ACX2000 and ACX2100 Router

Cabinet Requirement	Guidelines
Cabinet size	• You can mount the router in a cabinet that contains a 19-in. (48.3 cm) rack as defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310–D) published by the Electronics Industry Association (http://www.eia.org). **NOTE**: The cabinet must meet the strength requirements to support the weight of the router. • The minimum cabinet size must be able to accommodate the maximum external dimensions of the router.
Cabinet clearance	• The outer edges of the mounting brackets extend the width of the chassis to 19 in. (48.3 cm). • The minimum total clearance inside the cabinet is 30 in. (76.2 cm) between the inside of the front door and the inside of the rear door.

Table 24: Cabinet Requirements and Specifications for the ACX2000 and ACX2100 Router *(Continued)*

Cabinet Requirement	Guidelines
Cabinet airflow requirements	When you mount the router in a cabinet, ensure that ventilation through the cabinet is sufficient to prevent overheating. • Ensure an adequate cool air supply to dissipate the thermal output of the router or routers. • 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. • 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. • Route and dress all cables to minimize the blockage of airflow to and from the chassis. • Ensure that the spacing of rails and adjacent cabinets allows for the proper clearance around the router and cabinet. • A cabinet larger than the minimum required provides better airflow and reduces the chance of overheating.

SEE ALSO

Installing and Connecting an ACX2000 or ACX2100 Router Overview | 98

Rack Requirements for ACX2000 and ACX2100 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 83 provides the rack requirements and specifications for the router.

Table 25: Rack Requirements and Specifications for the Router

Rack Requirement	Guidelines
Rack type	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. A U is the standard rack unit defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310–D) published by the Electronics Industry Association (http://www.eia.org). The rack must meet the strength requirements to support the weight of the chassis.
Mounting bracket hole spacing	The holes in the mounting brackets are spaced at 1 U (1.75 in., or 4.45 cm) so that the router can be mounted in any rack that provides holes spaced at that distance.

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

Rack Requirement	Guidelines
Rack size and strength	• Ensure that the rack complies with this standard: • A 19-in. (48.3 cm) rack as defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310-D) published by the Electronics Industry Association (http://www.eia.org). • Ensure that the rack rails are spaced widely enough to accommodate the 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). • The rack must be strong enough to support the weight of the router. • Ensure that the spacing of rails and adjacent racks allows for the proper clearance around the router and rack.
Rack connection to building structure	• Secure the rack to the building structure. • If earthquakes are a possibility in your geographical area, secure the rack to the floor. • Secure the rack to the ceiling brackets as well as to the wall or floor brackets for maximum stability.

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 ACX2000 or ACX2100 Router Overview | 98

ACX2000 and ACX2100 Network Cable and Transceiver Planning

IN THIS SECTION

- Determining Transceiver Support and Specifications | 85
- Calculating Power Budget and Power Margin for Fiber-Optic Cables | 86
- Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion | 88

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

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 | **86**
- How to Calculate Power Margin for Fiber-Optic Cables | **87**

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):

$P_B = P_T - P_R$

$P_B = -15\ dBm - (-28\ dBm)$

P_B = 13 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 87 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
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 87. 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:

$P_M = P_B - LL$

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

$P_M = 13\ dB - 2\ dB - 2.5\ dB - 1\ dB - 0.5\ dB$

$P_M = 7\ dB$

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 87. 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:

$P_M = P_B - LL$

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

$P_M = 13\ dB - 4\ dB - 3.5\ dB$

$P_M = 5.5\ dB$

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 | **88**
- Attenuation and Dispersion in Fiber-Optic Cable | **89**

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.

ACX2000 and ACX2100 Alarm, Management, and Clocking Cable Specifications and Pinouts

IN THIS SECTION

- Alarm Contact Port Pinouts on the ACX2000 and ACX2100 Router | 90
- Management Port Connector Pinout Information for ACX Series Routers | 93
- Console or Auxiliary Port Connector Pinout on ACX Series Routers | 93
- USB Port Specifications for an ACX Series Router | 94
- Clocking Ports Specifications on the ACX2000 and the ACX2100 Router | 95

Alarm Contact Port Pinouts on the ACX2000 and ACX2100 Router

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 90 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)

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

Pin Number	Signal Definition	Direction	CLI Port Mapping	Function
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)
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)

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

Pin Number	Signal Definition	Direction	CLI Port Mapping	Function
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)

SEE ALSO

ACX2000 and ACX2100 Universal Metro Router Overview | **2**

Front Panel of an ACX2000 Router | **46**

LEDs on ACX2000 and ACX2100 Routers | **58**

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 93 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 94 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

Clocking Ports Specifications on the ACX2000 and the ACX2100 Router

IN THIS SECTION

- External Clocking Port Connector Specifications | 95
- External Clocking Input Port Specifications | 95

Two sets of clocking ports allow you to connect the ACX2000 and ACX2100 router to external clocking devices.

External Clocking Port Connector Specifications

The external clocking port on the router contains four SMB connectors that support 10 MHz GPS and 1 pulse-per-second (PPS) signals. These signals can also be accessed through the External Clocking Input port. These signals are internally isolated and have surge protection. Use a Molex 50-ohm SMB connector or equivalent (not provided) to connect to the external clocking ports.

External Clocking Input Port Specifications

An external clocking input port labeled **EXT REF CLK IN** on the front panel of the router allows you to connect external clock signal sources.

The port uses an autosensing RJ-48 connector to support framed T1 or E1 signals. Two LEDs indicate link activity on the port and function in the same way as the T1/E1 ports. The clocking information is extracted from the input, but the data is discarded.

Table 30 on page 96 provides the pinout information for the RJ-48 connector for the external clocking input port.

Table 30: External Clocking Input Port Connector Pinouts

Pin	Description	Direction
1	EXT_CLKA_RRING_LINE	Input
2	EXT_CLKA_RTIP_LINE	Input
3	Reserved	–
4	EXT_CLKA_TRING_LINE	Output
5	EXT_CLKA_TTIP_LINE	Output
6	Reserved	–
7	Reserved	–
8	Reserved	–

SEE ALSO

- Clocking Ports on the ACX2000 and the ACX2100 Router | **57**
- ACX2000 and ACX2100 Universal Metro Router Overview | **2**
- Front Panel of an ACX2000 Router | **46**
- LEDs on ACX2000 and ACX2100 Routers | **58**

CHAPTER 3

Initial Installation and Configuration

Installing and Connecting an ACX2000 or ACX2100 Router Overview | 98

Unpacking and Mounting the ACX2000 and ACX2100 Routers | 99

Connecting the ACX2000 and ACX2100 Routers to Power | 104

Connecting the ACX2000 and ACX2100 to External Devices | 111

Initially Configuring the ACX2000 or ACX2100 Router | 116

Installing and Connecting an ACX2000 or ACX2100 Router Overview

To install and connect an ACX2000 or ACX2100 router:

1. Unpack the router and verify the parts received. See "Unpacking an ACX2000 or ACX2100 Router" on page 99.
2. Install the mounting hardware for your rack or cabinet. See "Installing the ACX2000 or ACX2100 Mounting Brackets" on page 101.
3. Install the router. See "Installing the ACX2000 or ACX2100 Router in the Rack" on page 102.
4. Ground the router. See "Connecting the ACX2000 or ACX2100 Router to Earth Ground" on page 105.
5. Connect the power and power on the router.
   - AC-powered models—See "Connecting AC Power Cords to the ACX2100 Router" on page 109.
   - DC-powered models—See "Connecting DC Power Cables to the ACX2000 or ACX2100 Router" on page 107.
6. Connect the router to external devices. See:
   - "Connecting ACX2000 or ACX2100 Routers to Management Devices" on page 111
   - "Connecting ACX2000 or ACX2100 Routers to an External Alarm-Reporting Device" on page 115
   - "Connecting ACX2000 or ACX2100 Routers to External Clocking Devices" on page 114
7. Configure the router. See "Initially Configuring the ACX2000 or ACX2100 Router" on page 116

RELATED DOCUMENTATION

Site Preparation Checklist for ACX2000 and ACX2100 Routers | 70

Unpacking and Mounting the ACX2000 and ACX2100 Routers

IN THIS SECTION

- Unpacking an ACX2000 or ACX2100 Router | **99**
- Parts Inventory (Packing List) for an ACX2000 and ACX2100 Router | **100**
- Installing the ACX2000 or ACX2100 Mounting Brackets | **101**
- Installing the ACX2000 or ACX2100 Router in the Rack | **102**

Unpacking an ACX2000 or ACX2100 Router

The ACX2000 and ACX2100 routers are shipped in a cardboard carton, secured with foam packing material. The carton also contains an accessory box.



CAUTION: The 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 ACX2000 and ACX2100 Router" on page 100.

7. Save the shipping carton and packing materials in case you need to move or ship the router later.

SEE ALSO

ACX2000 and ACX2100 Universal Metro Router Overview | 2

Site Preparation Checklist for ACX2000 and ACX2100 Routers | 70

Parts Inventory (Packing List) for an ACX2000 and ACX2100 Router

The ACX2000 and ACX2100 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 31 on page 100 lists the parts and their quantities in the packing list.

Table 31: Parts List for an ACX2000 and ACX2100 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
RJ-45 cable and RJ-45 to DB-9 serial port adapter	1

Table 31: Parts List for an ACX2000 and ACX2100 Router *(Continued)*

Component	Quantity
Quick Start installation instructions	1
Juniper Networks Product Warranty	1
End User License Agreement	1

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

ACX2000 and ACX2100 Universal Metro Router Overview | 2

Installing the ACX2000 or ACX2100 Mounting Brackets

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

- Phillips (+) screwdriver, number 2

Two mounting brackets for front or rear mounting ship with the router (see Figure 18 on page 102 and Figure 19 on page 102).

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 18: Installing the Mounting Brackets to the Front of the ACX2000 or ACX2100 Router

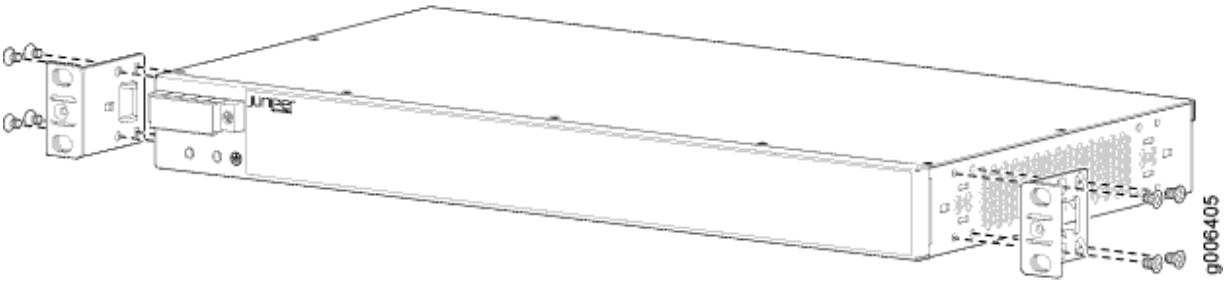
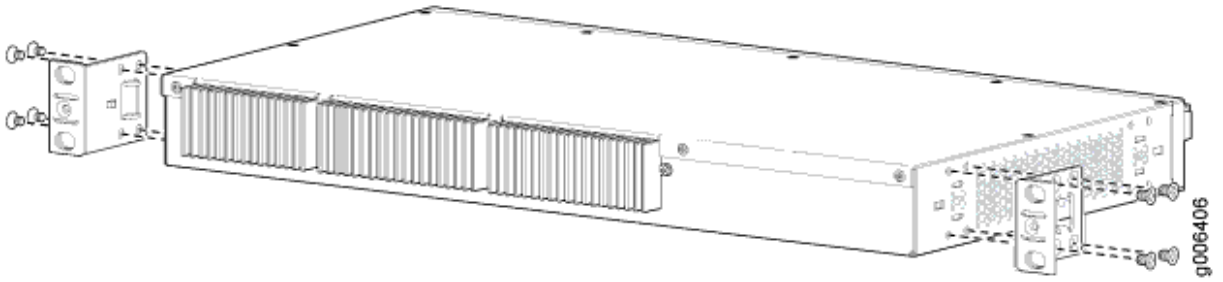


Figure 19: Installing the Mounting Brackets to the Rear of the ACX2000 or ACX2100 Router



Installing the ACX2000 or ACX2100 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 20 on page 104):

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 (about 7 lb (3.2 kg)) and is adequately supported at the installation site.

NOTE: One person must be available to lift the router 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.

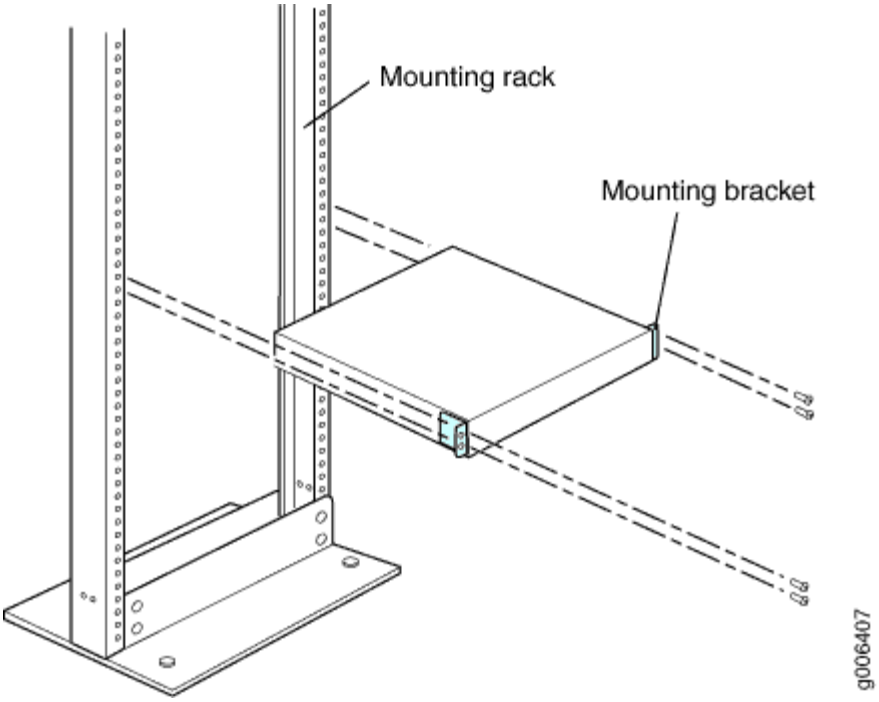


WARNING: To prevent injury, keep your back straight and lift with your legs, not your back. Avoid twisting your body as you lift. Balance the load evenly and be sure that your footing is solid.

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 20: Installing the Front-Mounted Router in the Rack



SEE ALSO

Site Preparation Checklist for ACX2000 and ACX2100 Routers | 70

Connecting the ACX2000 and ACX2100 Routers to Power

IN THIS SECTION

Connecting the ACX2000 or ACX2100 Router to Earth Ground | 105

Connecting DC Power Cables to the ACX2000 or ACX2100 Router | **107**
Connecting AC Power Cords to the ACX2100 Router | **109**

Connecting the ACX2000 or ACX2100 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^2) 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:

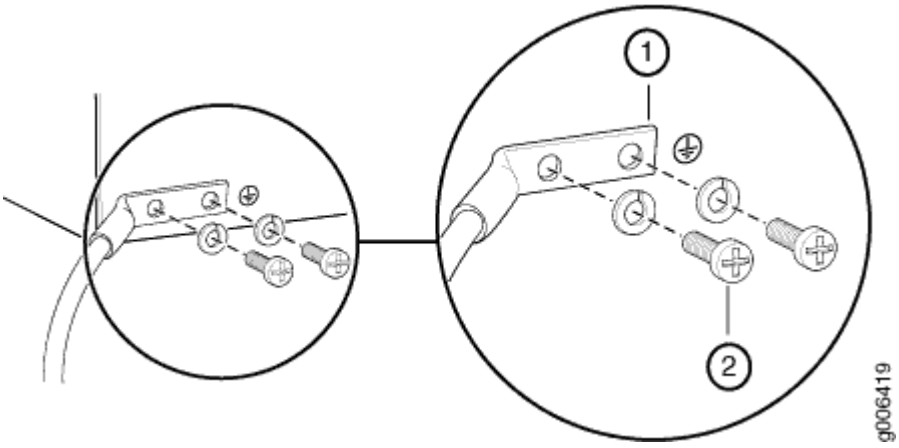
1. Verify that a licensed electrician has attached the cable lug provided with the router to the grounding cable.
2. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an approved site ESD grounding point. See the instructions for your site.
3. Ensure that all 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 21 on page 106).
8. Secure the grounding cable lug with the washers and screws. The holes are sized for SAE 10-32 screws. Apply 4 lb-in. (0.49 Nm) of torque to each screw. Do not overtighten the screw. (Use a number 2 Phillips screwdriver.)

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

CAUTION: The maximum torque rating of the grounding screws on the router is 4 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.

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 21: Grounding Points on the ACX2000 and ACX2100 Router



1– Grounding lug

2– SAE 10-32 screws and washers

SEE ALSO

Installing and Connecting an ACX2000 or ACX2100 Router Overview | 98

ACX2000 and ACX2100 Power Overview | 63

ACX2000 and ACX2100 Chassis Grounding Cable and Lug Specifications | 77

Connecting DC Power Cables to the ACX2000 or ACX2100 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 22 on page 109). 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.

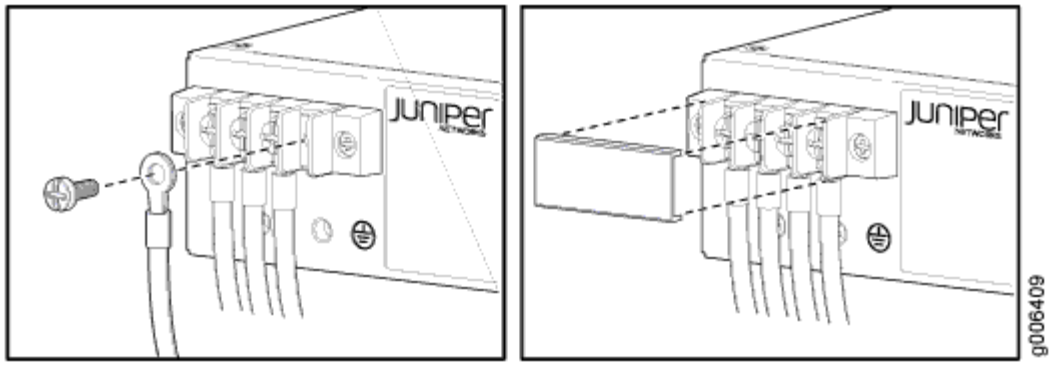
6. Replace the clear plastic cover over the terminals on the faceplate.
7. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an approved site ESD grounding point. See the instructions for your site.
8. Connect each DC power cable to the appropriate external DC power source.

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

9. 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 system LED indicates that the power supply is not functioning normally, repeat the installation and cabling procedures.

Figure 22: Connecting DC Power to the Router



SEE ALSO

- ACX2000 and ACX2100 Power Overview | **63**
- Installing and Connecting an ACX2000 or ACX2100 Router Overview | **98**
- ACX2000 and ACX2100 DC Power Specifications | **66**

Connecting AC Power Cords to the ACX2100 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:

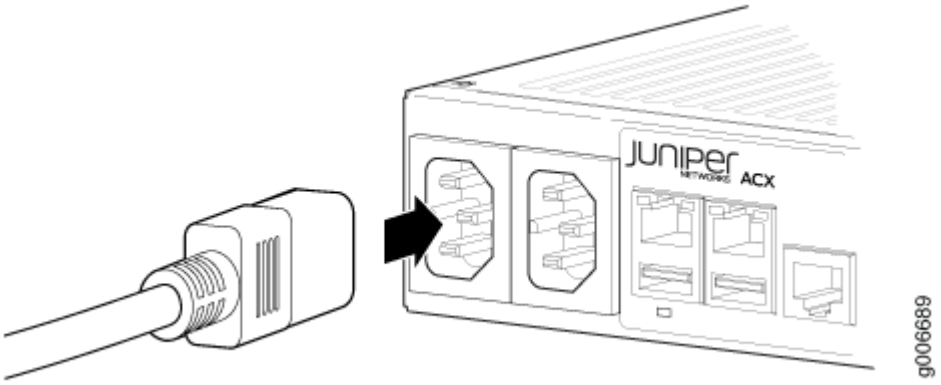
1. Locate the power cords, which should have a plug appropriate for your geographical location. See the "ACX2100 AC Power Cord Specifications" on page 64.
2. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an ESD grounding point.
3. Insert the appliance coupler 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 supplies.
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 23: Connecting AC Power to the Router



SEE ALSO

ACX2000 and ACX2100 Power Overview | 63

ACX2100 AC Power Specifications | 64

Connecting the ACX2000 and ACX2100 to External Devices

IN THIS SECTION

- Connecting ACX2000 or ACX2100 Routers to Management Devices | 111
- Connecting ACX2000 or ACX2100 Routers to External Clocking Devices | 114
- Connecting ACX2000 or ACX2100 Routers to an External Alarm-Reporting Device | 115

Connecting ACX2000 or ACX2100 Routers to Management Devices

IN THIS SECTION

- Connecting the Router to a Network for Out-of-Band Management | 111
- Connecting the Router to a Management Console or Auxiliary Device | 112

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 (provided)
- Management host, such as a PC, with an Ethernet port (not provided)

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

To connect to the **MGMT** port on the 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 24: Ethernet Cable Connector

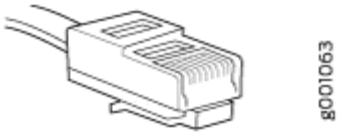
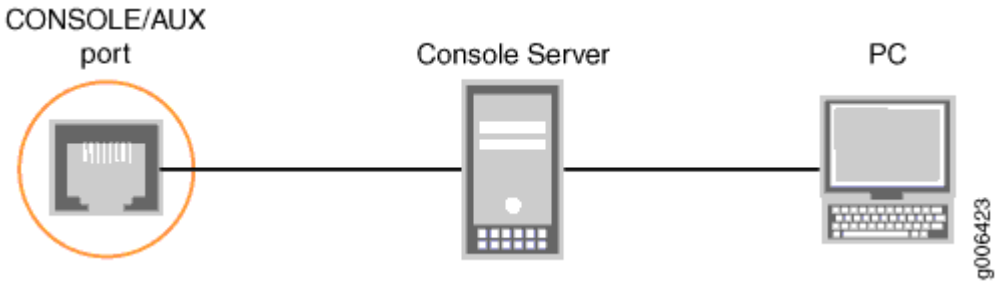


Figure 25: Ethernet Port



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, which is provided with the router.

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 26 on page 113 shows the connector. Figure 27 on page 113 shows the ports.)

   CAUTION: Do not connect Power over Ethernet (PoE) cable to the **AUX** port or the **CONSOLE** port. Connecting PoE cable to the **AUX** or **CONSOLE** ports might damage these ports permanently.

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 26: Routing Engine Console and Auxiliary Cable Connector

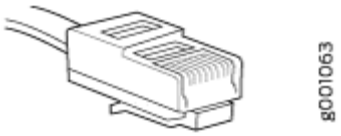
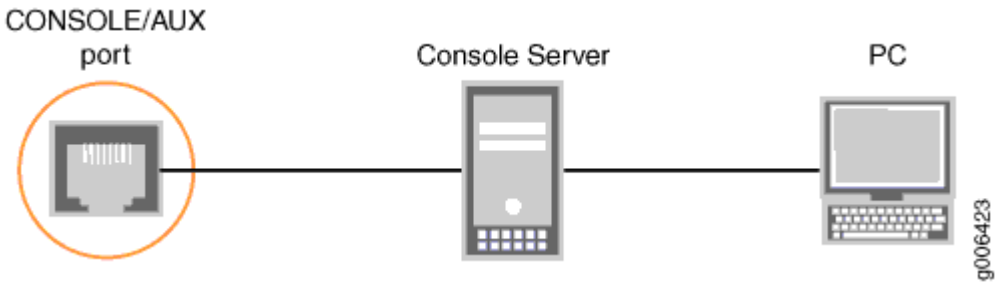


Figure 27: Auxiliary and Console Connections



RELATED DOCUMENTATION

Installing and Connecting an ACX2000 or ACX2100 Router Overview | **98**

Connecting the ACX2000 or ACX2100 Router to Earth Ground | **105**

Management Port Connector Pinout Information for ACX Series Routers | **93**

Connecting ACX2000 or ACX2100 Routers to External Clocking Devices

IN THIS SECTION

- Connecting 1-PPS and 10-MHz Timing Devices to the Router | 114
- Connecting a T1 or E1 External Clocking Device to the Router | 114

The ACX2000 and ACX2100 routers support external clock synchronization for Synchronous Ethernet, T1 or E1 line timing sources, and external inputs.

Connecting 1-PPS and 10-MHz Timing Devices to the Router

The router has four SMB connectors that support 1-PPS and 10-MHz timing devices.

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

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

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

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

Connecting a T1 or E1 External Clocking Device to the Router

The 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:
   - "Initially Configuring the ACX2000 or ACX2100 Router" on page 116
   - 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
```

SEE ALSO

Clocking Ports Specifications on the ACX2000 and the ACX2100 Router | 95

Connecting ACX2000 or ACX2100 Routers 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^2), 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^2.
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

ACX2000 and ACX2100 Alarm Contact Port | **55**

Alarm Contact Port Pinouts on the ACX2000 and ACX2100 Router | **90**

Initially Configuring the ACX2000 or ACX2100 Router

The ACX2000 and ACX2100 routers ship 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

ACX2000 and ACX2100 Routers Hardware and CLI Terminology Mapping | 5

Protocols and Applications Supported by ACX Series Routers | 12

4

CHAPTER

Maintaining Components

Maintaining ACX2000 and ACX2100 Components | 122

Maintaining ACX2000 and ACX2100 Components

IN THIS SECTION

- Routine Maintenance Procedures for the ACX2000 and ACX2100 Router | 122
- Maintaining Cables That Connect to ACX2000 or ACX2100 Network Ports | 123
- Maintaining the ACX2000 and ACX2100 Uplink Ports | 124
- Removing a Transceiver from the ACX2000 or ACX2100 | 125
- Installing a Transceiver in the ACX2000 or ACX2100 | 127
- Replacing an ACX2000 or ACX2100 Management Ethernet Cable | 128
- Replacing an ACX2000 or ACX2100 Console or Auxiliary Cable | 129

Routine Maintenance Procedures for the ACX2000 and ACX2100 Router

IN THIS SECTION

- Purpose | 122
- Action | 122

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 font panel—system LED.

Maintaining Cables That Connect to ACX2000 or ACX2100 Network Ports

IN THIS SECTION

- Purpose | 123
- Action | 123

Purpose

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

Action

On a regular basis:

- Place excess cable out of the way. Do not allow fastened loops of cable to dangle from the connector, 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.

Maintaining the ACX2000 and ACX2100 Uplink Ports

IN THIS SECTION

- Purpose | 124
- Action | 124

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 "LEDs on ACX2000 and ACX2100 Routers" on page 58. 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.

ACX2000 router:

```
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+
```

ACX2100 router:

```
user@host> show chassis fpc pic-status
Slot 0   Online
  PIC 0  Online       16x CHE1T1, RJ48
Slot 1   Online
  PIC 0  Online        4x 1GE(LAN)  RJ45
  PIC 1  Online       4x 1GE(LAN) SFP, RJ45
  PIC 2  Online       2x 1GE(LAN) SFP
  PIC 3  Online       2x 10GE(LAN) SFP+
```

SEE ALSO

ACX2000 and ACX2100 Routers Hardware and CLI Terminology Mapping | 5

Removing a Transceiver from the ACX2000 or ACX2100

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

To remove a transceiver (see Figure 28 on page 126):

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.

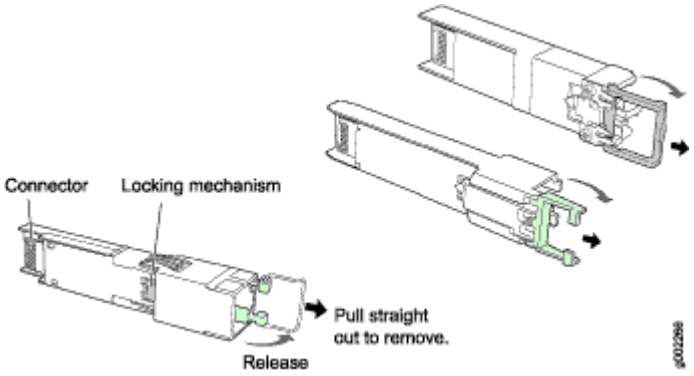
4. Remove the cable connector from the transceiver.
5. Pull the ejector handle out from the transceiver to unlock the transceiver.

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 28: 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 | 46

Front Panel of an ACX2100 Router | 48

Uplink Ports on ACX2000 and ACX2100 Routers | 50

Installing a Transceiver in the ACX2000 or ACX2100

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. For more information about the component LEDs, see the "LEDs on ACX2000 and ACX2100 Routers" on page 58.

SEE ALSO

Front Panel of an ACX2000 Router | 46

Uplink Ports on ACX2000 and ACX2100 Routers | 50

Replacing an ACX2000 or ACX2100 Management Ethernet Cable

IN THIS SECTION

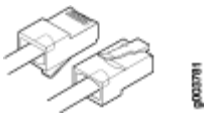
- Removing an ACX2000 or ACX2100 Management Ethernet Cable | 128
- Installing an ACX2000 and ACX2100 Management Ethernet Cable | 128

Removing an ACX2000 or ACX2100 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 2 shows the connector.
3. Disconnect the cable from the network device.

Figure 29: Ethernet Cable Connectors



SEE ALSO

Management Port Connector Pinout Information for ACX Series Routers | 93

Installing an ACX2000 and ACX2100 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

Management Port Connector Pinout Information for ACX Series Routers | 93

Replacing an ACX2000 or ACX2100 Console or Auxiliary Cable

IN THIS SECTION

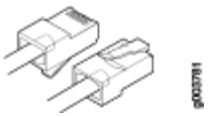
- Removing an ACX2000 or ACX2100 Console or Auxiliary Cable | 129
- Installing an ACX2000 or ACX2100 Console or Auxiliary Cable | 129

Removing an ACX2000 or ACX2100 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 3 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 | 93

Installing an ACX2000 or ACX2100 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 | 93

5
CHAPTER

Troubleshooting Hardware

Troubleshooting ACX2000 and ACX2100 | 132

Troubleshooting ACX2000 and ACX2100

IN THIS SECTION

- Troubleshooting Resources for ACX2000 and ACX2100 Routers | 132
- Monitoring System Log Messages | 133
- Alarm Types and Severity Classes on ACX Series Routers | 133
- Verifying Active Alarms | 135

Troubleshooting Resources for ACX2000 and ACX2100 Routers

IN THIS SECTION

- Command-Line Interface | 132
- Front Panel LEDs | 132

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 "LEDs on ACX2000 and ACX2100 Routers" on page 58.

Monitoring System Log Messages

IN THIS SECTION

- Purpose | 133
- Action | 133

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 | 134

Alarm Severity Classes | 134

Before monitoring the alarms on the router, become familiar with the terms defined in Table 32 on page 134.

Table 32: Alarm Terms

Term	Definition
Alarm	Signal alerting you to conditions that might prevent normal operation. On a router, the alarm signal is the red system 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 (blinking red).
Chassis alarm	Predefined alarm triggered by a physical condition on the router, such as a power failure, excessive component temperature, or media failure.
System alarm	Predefined alarm 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 configured on an interface has triggered a critical warning.
- Minor (blinking red)—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 | 135
- Action | 135
- Meaning | 136

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 33 on page 136 lists the alarm output fields.

Table 33: 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.

CHAPTER 6

Contacting Customer Support and Returning the Chassis or Components

Contacting Customer Support and Returning the Chassis or Components

IN THIS SECTION

- How to Return a Hardware Component to Juniper Networks, Inc. | 138
- Locating the Serial Number on a ACX2000 or ACX2100 Chassis or Component | 139
- ACX2000 and ACX2100 Chassis Serial Number Label | 140
- Guidelines for Packing Hardware Components for Shipment | 140
- Packing the ACX Series Router for Shipment | 140

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.

Locating the Serial Number on a ACX2000 or ACX2100 Chassis or Component

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                                                  ACX2000
Midplane         REV 00   650-037055   HS0211334046      ACX2000
Routing Engine            BUILTIN      BUILTIN           Routing Engine
FEB 0                     BUILTIN      BUILTIN           Forwarding Engine Processor
FPC 0                     BUILTIN      BUILTIN           FPC BUILTIN
    PIC 0                 BUILTIN      BUILTIN           16x CHE1T1, RJ48
    PIC 1                 BUILTIN      BUILTIN           8x 1GE(LAN) RJ45
    PIC 2                 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           2x 10GE(LAN) SFP+
      Xcvr 1     REV 01   740-021310   C10F99166         SFPP-10GE-SR
```

Most components also have a small rectangular serial number ID label (see Figure 31 on page 139) attached to the component body.

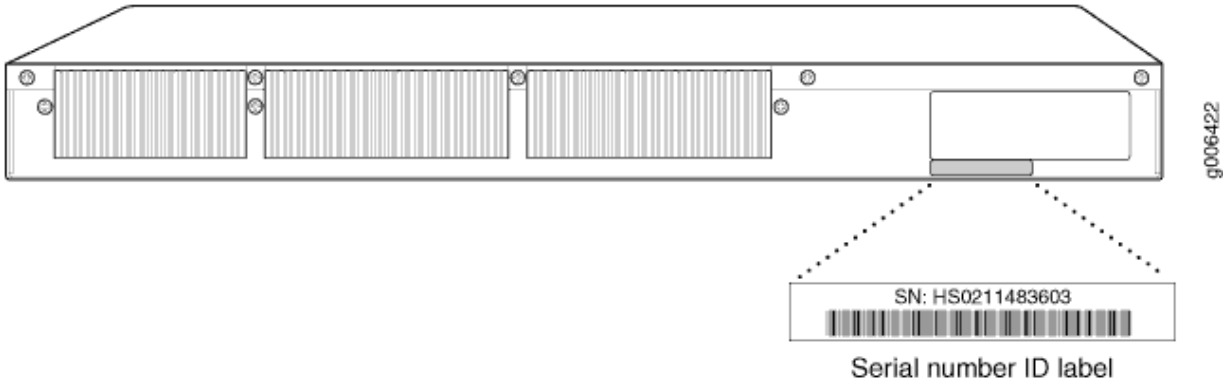
Figure 31: Serial Number ID Label



ACX2000 and ACX2100 Chassis Serial Number Label

The chassis serial number is located on the rear of the chassis (see Figure 32 on page 140).

Figure 32: ACX2000 and ACX2100 Chassis Serial Number Label



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.

CHAPTER 7

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 of the 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 be familiar with standard practices for preventing accidents.

Waarschuwing Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken,

dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van standaard maatregelen om ongelukken te voorkomen.

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

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

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

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

Advarsel Dette varselsymbolet betyr fare. Du befinner deg i en situasjon som kan føre til personskade. Før du utfører arbeid på utstyr, må du vare oppmerksom på de faremomentene som elektriske kretser innebærer, samt gjøre deg kjent med vanlig praksis når det gjelder å unngå ulykker.

Aviso Este símbolo de aviso indica perigo. Encontra-se numa situação que lhe poderá causar danos físicos. Antes de começar a trabalhar com qualquer equipamento, familiarize-se com os perigos relacionados com circuitos eléctricos, e com quaisquer práticas comuns que possam prevenir possíveis acidentes.

¡Atención! Este símbolo de aviso significa peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considerar los riesgos que entraña la corriente eléctrica y familiarizarse con los procedimientos estándar de prevención de accidentes.

Varning! Denna varningssymbol signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanligt förfarande för att förebygga skador.

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.

Installation Instructions Warning



WARNING: Read the installation instructions before you connect the device to a power source.
Waarschuwing Raadpleeg de installatie-aanwijzingen voordat u het systeem met de voeding verbindt.

Varoitus Lue asennusohjeet ennen järjestelmän yhdistämistä virtalähteeseen.

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

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

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

Advarsel Les installasjonsinstruksjonene før systemet kobles til strømkilden.

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

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

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

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 most of the weight is borne by your legs rather than your back. Keep your knees bent and your back relatively straight. Do not twist your body as you lift. Balance the load evenly and be sure that your footing is firm.
- Use the following lifting guidelines to lift devices and components:

- Up to 39.7 lb (18 kg): One person.
- 39.7 lb (18 kg) to 70.5 lb (32 kg): Two or more people.
- 70.5 lb (32 kg) to 121.2 lb (55 kg): Three or more people.
- Above 121.2 lb (55 kg): Material handling systems (such as levers, slings, lifts and so on) must be used. When this is not practical, specially trained persons or systems must be used (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 Spezialwerkzeugs, Schloß und Schlüssel oder anderer Sicherheitsvorkehrungen Zugang hat, und der von dem für die Anlage zuständigen Gremium kontrolliert wird.

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

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

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

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

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

Ramp Warning



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

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

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

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

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

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

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

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

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

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

Rack-Mounting and Cabinet-Mounting Warnings

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



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

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

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

- De Juniper Networks switch moet in een stellage worden geïnstalleerd die aan een bouwsel is verankerd.
- Dit toestel dient onderaan in het rek gemonteerd te worden als het toestel het enige in het rek is.

- Wanneer u dit toestel in een gedeeltelijk gevuld rek monteert, dient u het rek van onderen naar boven te laden met het zwaarste onderdeel onderaan in het rek.
- Als het rek voorzien is van stabiliseringshulpmiddelen, dient u de stabilisatoren te monteren voordat u het toestel in het rek monteert of het daar een servicebeurt geeft.

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

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

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 edificio.
- Esta unidade deverá ser montada na parte inferior da estante, caso seja esta a única unidade a ser montada.
- Ao montar esta unidade numa estante parcialmente ocupada, coloque os itens mais pesados na parte inferior da estante, arrumando-os de baixo para cima.
- Se a estante possuir um dispositivo de estabilização, instale-o antes de montar ou reparar a unidade.

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

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

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

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

Grounded Equipment Warning



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

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

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

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

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

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

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

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

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

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

Radiation from Open Port Apertures Warning



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

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

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

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

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

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

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

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

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

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

Laser and LED Safety Guidelines and Warnings

IN THIS SECTION

- General Laser Safety Guidelines | 157
- Class 1 Laser Product Warning | 158
- Class 1 LED Product Warning | 158
- Laser Beam Warning | 159

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 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.

Varning! 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 | 160
- Jewelry Removal Warning | 161
- Lightning Activity Warning | 163
- Operating Temperature Warning | 163
- Product Disposal Warning | 165

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

Battery Handling Warning



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

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

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

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

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

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

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

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

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

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

Jewelry Removal Warning



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

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

Varoitus Ennen kuin työskentelet voimavirtajohtoihin kytkettyjen laitteiden parissa, ota pois kaikki korut (sormukset, kaulakorut ja kellot mukaan lukien). Metalliesineet

kuumenevat, kun ne ovat yhteydessä sähkövirran ja maan kanssa, ja ne voivat aiheuttaa vakavia palovammoja tai hitsata metalliesineet kiinni liitäntänapoihin.

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

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

Avvertenza Prima di intervenire su apparecchiature collegate alle linee di alimentazione, togliersi qualsiasi monile (inclusi anelli, collane, braccialetti ed orologi). Gli oggetti metallici si riscaldano quando sono collegati tra punti di alimentazione e massa: possono causare ustioni gravi oppure il metallo può saldarsi ai terminali.

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

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

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

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

Lightning Activity Warning



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

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

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

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

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

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

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

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

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

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

Operating Temperature Warning



WARNING: To prevent the device from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature. To prevent airflow restriction, allow at least 6 in. (15.2 cm) of clearance around the ventilation openings.

Waarschuwing Om te voorkomen dat welke switch van de Juniper Networks router dan ook oververhit raakt, dient u deze niet te bedienen op een plaats waar de maximale aanbevolen omgevingstemperatuur van 40° C wordt overschreden. Om te voorkomen

dat de luchtstroom wordt beperkt, dient er minstens 15,2 cm speling rond de ventilatie-openingen te zijn.

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

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

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

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

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

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

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

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

Product Disposal Warning



WARNING: Disposal of this device must be handled according to all national laws and regulations.
Waarschuwing Dit produkt dient volgens alle landelijke wetten en voorschriften te worden afgedankt.

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

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

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

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

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

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

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

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

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 requirements and protect against lightning surges and commercial power disturbances, the intrabuilding ports *must not* be metallically connected to interfaces that connect to the OSP or its wiring. The intrabuilding ports on the device are suitable

for connection to intrabuilding or unexposed wiring or cabling only. The addition of primary protectors is not sufficient protection for connecting these interfaces metallically to OSP wiring.

Avertissement Certains ports de l'appareil sont destinés à un usage en intérieur uniquement (ports Type 2 ou Type 4 tels que décrits dans le document *GR-1089-CORE*) et doivent être isolés du câblage de l'installation extérieure exposée. Pour respecter les exigences NEBS et assurer une protection contre la foudre et les perturbations de tension secteur, les ports pour intérieur *ne doivent pas* être raccordés physiquement aux interfaces prévues pour la connexion à l'installation extérieure ou à son câblage. Les ports pour intérieur de l'appareil sont réservés au raccordement de câbles pour intérieur ou non exposés uniquement. L'ajout de protections ne constitue pas une précaution suffisante pour raccorder physiquement ces interfaces au câblage de l'installation extérieure.



CAUTION: Before removing or installing components of a device, connect an electrostatic discharge (ESD) grounding strap to an ESD point and wrap and fasten the other end of the strap around your bare wrist. Failure to use an ESD grounding strap could result in damage to the device.

Attention Avant de retirer ou d'installer des composants d'un appareil, raccordez un bracelet antistatique à un point de décharge électrostatique et fixez le bracelet à votre poignet nu. L'absence de port d'un bracelet antistatique pourrait provoquer des dégâts sur l'appareil.

- Install the device in compliance with the following local, national, and international electrical codes:
  - United States—National Fire Protection Association (NFPA 70), United States National Electrical Code.
  - Other countries—International Electromechanical Commission (IEC) 60364, Part 1 through Part 7.
  - Evaluated to the TN power system.
  - Canada—Canadian Electrical Code, Part 1, CSA C22.1.
  - Suitable for installation in Information Technology Rooms in accordance with Article 645 of the National Electrical Code and NFPA 75.

    Peut être installé dans des salles de matériel de traitement de l'information conformément à l'article 645 du National Electrical Code et à la NFPA 75.
- Locate the emergency power-off switch for the room in which you are working so that if an electrical accident occurs, you can quickly turn off the power.

- Make sure that grounding surfaces are cleaned and brought to a bright finish before grounding connections are made.
- Do not work alone if potentially hazardous conditions exist anywhere in your workspace.
- Never assume that power is disconnected from a circuit. Always check the circuit before starting to work.
- Carefully look for possible hazards in your work area, such as moist floors, ungrounded power extension cords, and missing safety grounds.
- Operate the device within marked electrical ratings and product usage instructions.
- To ensure that the device and peripheral equipment function safely and correctly, use the cables and connectors specified for the attached peripheral equipment, and make certain they are in good condition.

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

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, 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 33 on page 169) 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).

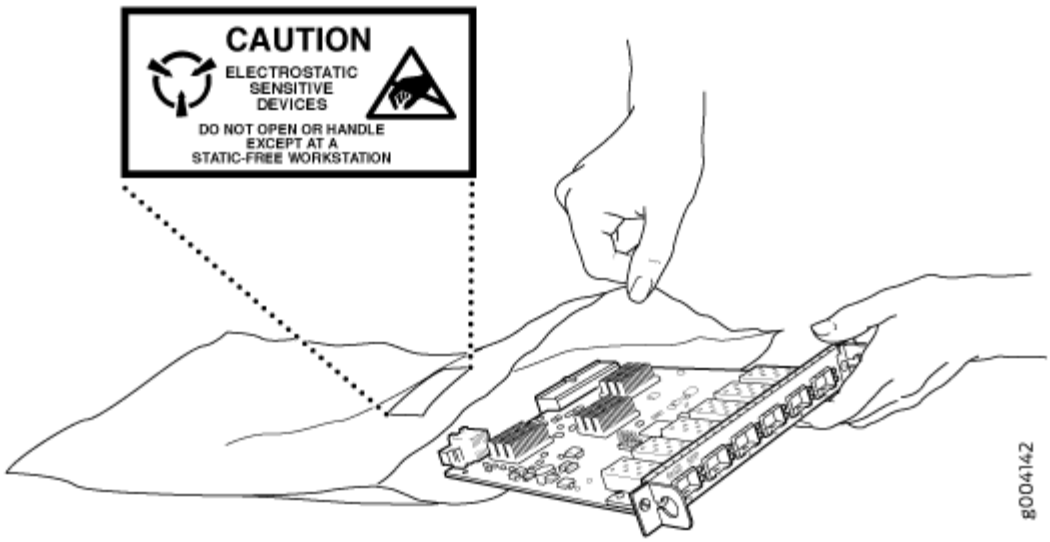
- When handling any component that is subject to ESD damage and that is removed from the device, make sure the equipment end of your ESD wrist strap is attached to the ESD point on the chassis.

  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 33 on page 169). If you are returning a component, place it in an antistatic bag before packing it.

Figure 33: 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.

ACX2100 AC Power Electrical Safety Guidelines

The following electrical safety guidelines apply to an AC-powered router:

- You can order three-wire electrical cords with a grounding-type plug that fits only a grounding-type power outlet. Do not circumvent this safety feature. Equipment grounding should comply with local and national electrical codes.

- Each AC power supply has one AC appliance inlet. Each inlet requires a dedicated AC power feed and a dedicated customer site circuit breaker. We recommend that you use a dedicated circuit breaker rated at 2 A (100 VAC) or 1 A (240 VAC), or as required by local code.

  WARNING: The router is pluggable type A equipment installed in a restricted-access location.

- 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.
- The cores in the main lead are colored in accordance with the following code:
  - Green and yellow—Earth
  - Blue—Neutral
  - Brown—Live
- When a router is equipped with two AC power supplies, both power cords (one for each power supply) must be unplugged to completely disconnect power to the router.

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

注意

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

RELATED DOCUMENTATION

ACX2100 AC Power Specifications | 64

ACX2100 AC Power Cord Specifications | 64

Connecting AC Power Cords to the ACX1100 Router

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.

ACX2000 and ACX2100 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 | **173**

DC Power Disconnection Warning | 173
DC Power Grounding Requirements and Warning | 175
DC Power Wiring Sequence Warning | 176
DC Power Wiring Terminations Warning | 177

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.

Varning! Vid installation av enheten måste jordledningen alltid anslutas först och kopplas bort sist.

DC Power Wiring Sequence Warning



WARNING: Wire the DC power supply using the appropriate lugs. When connecting power, the proper wiring sequence is ground to ground, +RTN to +RTN, then –48 V to –48 V. When disconnecting power, the proper wiring sequence is –48 V to –48 V, +RTN to +RTN, then ground to ground. Note that the ground wire must always be connected first and disconnected last.

Waarschuwing De juiste bedradingsvolgorde verbonden is aarde naar aarde, +RTN naar +RTN, en –48 V naar – 48 V. De juiste bedradingsvolgorde losgemaakt is en –48 naar –48 V, +RTN naar +RTN, aarde naar aarde.

Varoitus Oikea yhdistettava kytkentajarjestys on maajohto maajohtoon, +RTN varten +RTN, –48 V varten – 48 V. Oikea irrotettava kytkentajarjestys on –48 V varten – 48 V, +RTN varten +RTN, maajohto maajohtoon.

Avertissement Câblez l'approvisionnement d'alimentation CC En utilisant les crochets appropriés à l'extrémité de câblage. En reliant la puissance, l'ordre approprié de câblage est rectifié pour rectifier, +RTN à +RTN, puis –48 V à –48 V. En débranchant la puissance, l'ordre approprié de câblage est –48 V à –48 V, +RTN à +RTN, a alors rectifié pour rectifier. Notez que le fil de masse devrait toujours être relié d'abord et débranché pour la dernière fois. Notez que le fil de masse devrait toujours être relié d'abord et débranché pour la dernière fois.

Warnung Die Stromzufuhr ist nur mit geeigneten Ringösen an das DC Netzteil anzuschliessen. Die richtige Anschlusssequenz ist: Erdanschluss zu Erdanschluss, +RTN zu +RTN und dann -48V zu -48V. Die richtige Sequenz zum Abtrennen der Stromversorgung ist -48V zu -48V, +RTN zu +RTN und dann Erdanschluss zu Erdanschluss. Es ist zu beachten dass der Erdanschluss immer zuerst angeschlossen und als letztes abgetrennt wird.

Avvertenza Mostra la morsettiera dell alimentatore CC. Cablare l'alimentatore CC usando i connettori adatti all'estremità del cablaggio, come illustrato. La corretta sequenza di cablaggio è da massa a massa, da positivo a positivo (da linea ad L) e da

negativo a negativo (da neutro a N). Tenere presente che il filo di massa deve sempre venire collegato per primo e scollegato per ultimo.

Advarsel Riktig tilkoples tilkoplingssekvens er jord til jord, +RTN til +RTN, –48 V til –48 V. Riktig frakoples tilkoplingssekvens er –48 V til – 48 V, +RTN til +RTN, jord til jord.

Aviso Ate con alambre la fuente de potencia cc Usando los terminales apropiados en el extremo del cableado. Al conectar potencia, la secuencia apropiada del cableado se muele para moler, +RTN a +RTN, entonces –48 V a –48 V. Al desconectar potencia, la secuencia apropiada del cableado es –48 V a –48 V, +RTN a +RTN, entonces molió para moler. Observe que el alambre de tierra se debe conectar siempre primero y desconectar por último. Observe que el alambre de tierra se debe conectar siempre primero y desconectar por último.

¡Atención! Wire a fonte de alimentação de DC Usando os talões apropriados nan EXtremidade da fiação. Ao conectar a potência, a seqüência apropriada da fiação é moída para moer, +RTN a +RTN, então –48 V a –48 V. Ao desconectar a potência, a seqüência apropriada da fiação é –48 V a –48 V, +RTN a +RTN, moeu então para moer. Anote que o fio à terra deve sempre ser conectado primeiramente e desconectado por último. Anote que o fio à terra deve sempre ser conectado primeiramente e desconectado por último.

Varning! Korrekt kopplingssekvens ar jord till jord, +RTN till +RTN, –48 V till –48 V. Korrekt kopplas kopplingssekvens ar –48 V till –48 V, +RTN till +RTN, jord till jord.

DC Power Wiring Terminations Warning



WARNING: When stranded wiring is required, use approved wiring terminations, such as closed-loop or spade-type with upturned lugs. These terminations must be the appropriate size for the wires and must clamp both the insulation and conductor.

Waarschuwing Wanneer geslagen bedrading vereist is, dient u bedrading te gebruiken die voorzien is van goedgekeurde aansluitingspunten, zoals het gesloten-lus type of het grijperschop type waarbij de aansluitpunten omhoog wijzen. Deze aansluitpunten dienen de juiste maat voor de draden te hebben en dienen zowel de isolatie als de geleider vast te klemmen.

Varoitus Jos säikeellinen johdin on tarpeen, käytä hyväksyttyä johdinliitäntää, esimerkiksi suljettua silmukkaa tai kourumaista liitäntää, jossa on ylöspäin käännetyt

kiinnityskorvat. Tällaisten liitäntöjen tulee olla kooltaan johtimiin sopivia ja niiden tulee puristaa yhteen sekä eristeen että johdinosan.

Avertissement Quand des fils torsadés sont nécessaires, utiliser des douilles terminales homologuées telles que celles à circuit fermé ou du type à plage ouverte avec cosses rebroussées. Ces douilles terminales doivent être de la taille qui convient aux fils et doivent être refermées sur la gaine isolante et sur le conducteur.

Warnung Wenn Litzenverdrahtung erforderlich ist, sind zugelassene Verdrahtungsabschlüsse, z.B. für einen geschlossenen Regelkreis oder gabelförmig, mit nach oben gerichteten Kabelschuhen zu verwenden. Diese Abschlüsse sollten die angemessene Größe für die Drähte haben und sowohl die Isolierung als auch den Leiter festklemmen.

Avvertenza Quando occorre usare trecce, usare connettori omologati, come quelli a occhiello o a forcella con linguette rivolte verso l'alto. I connettori devono avere la misura adatta per il cablaggio e devono serrare sia l'isolante che il conduttore.

Advarsel Hvis det er nødvendig med flertrådede ledninger, brukes godkjente ledningsavslutninger, som for eksempel lukket sløyfe eller spadetype med oppoverbøyde kabelsko. Disse avslutningene skal ha riktig størrelse i forhold til ledningene, og skal klemme sammen både isolasjonen og lederen.

Aviso Quando forem requeridas montagens de instalação eléctrica de cabo torcido, use terminações de cabo aprovadas, tais como, terminações de cabo em circuito fechado e planas com terminais de orelha voltados para cima. Estas terminações de cabo deverão ser do tamanho apropriado para os respectivos cabos, e deverão prender simultaneamente o isolamento e o fio condutor.

¡Atención! Cuando se necesite hilo trenzado, utilizar terminales para cables homologados, tales como las de tipo "bucle cerrado" o "espada", con las lengüetas de conexión vueltas hacia arriba. Estos terminales deberán ser del tamaño apropiado para los cables que se utilicen, y tendrán que sujetar tanto el aislante como el conductor.

Varning! När flertrådiga ledningar krävs måste godkända ledningskontakter användas, t.ex. kabelsko av sluten eller öppen typ med uppåtvänd tapp. Storleken på dessa kontakter måste vara avpassad till ledningarna och måste kunna hålla både isoleringen och ledaren fastklämda.

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.

Varning! Denna enhet har mer än en strömförsörjningsanslutning; alla anslutningar måste vara helt avlägsnade innan strömtillförseln till enheten är fullständigt bruten.

TN Power Warning



WARNING: The device is designed to work with a TN power system.
Waarschuwing Het apparaat is ontworpen om te functioneren met TN energiesystemen.

Varoitus Koje on suunniteltu toimimaan TN-sähkövoimajärjestelmien yhteydessä.

Avertissement Ce dispositif a été conçu pour fonctionner avec des systèmes d'alimentation TN.

Warnung Das Gerät ist für die Verwendung mit TN-Stromsystemen ausgelegt.

Avvertenza Il dispositivo è stato progettato per l'uso con sistemi di alimentazione TN.

Advarsel Utstyret er utfomet til bruk med TN-strømsystemer.

Aviso O dispositivo foi criado para operar com sistemas de corrente TN.

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

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

Agency Approvals for ACX2000 and ACX2100 Routers

IN THIS SECTION

- Compliance Statement for Argentina | **182**

ACX2000 and ACX2100 routers comply 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 for ACX2000 and ACX2100 Routers | **183**

Compliance Statements for NEBS for ACX2000 and ACX2100 Routers | **183**

Compliance Statements for Acoustic Noise for ACX2000 and ACX2100 Routers | **185**

Compliance Statements for Environmental Requirements | **185**

Compliance Statements for NEBS for ACX2000 and ACX2100 Routers

- 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 (i.e. DC-I), as defined in GR-1089-CORE.

RELATED DOCUMENTATION

Agency Approvals for ACX2000 and ACX2100 Routers | 180
Compliance Statements for Acoustic Noise for ACX2000 and ACX2100 Routers | 185
Compliance Statements for Environmental Requirements | 185

Compliance Statements for EMC Requirements for ACX2000 and ACX2100 Routers

IN THIS SECTION

Canada | 184
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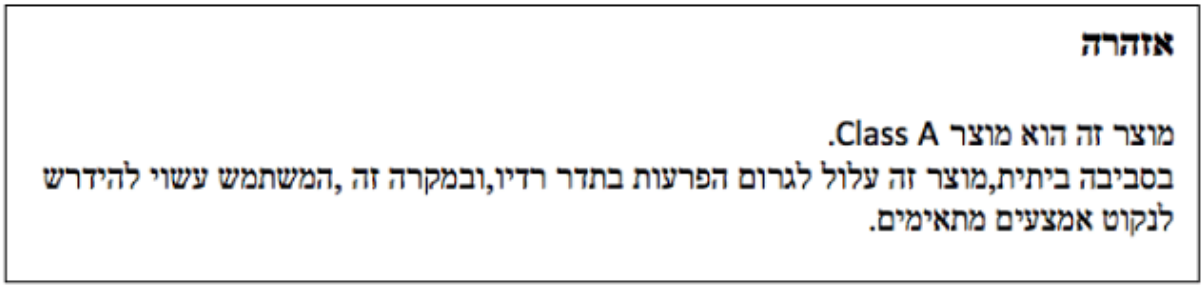
Canada

CAN ICES-3 (A)/NMB-3(A)

European Community

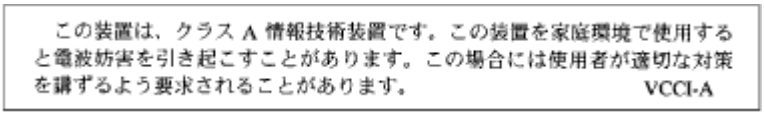
This is a Class A product. In a domestic environment, this product might cause radio interference in which case the user might be required to take adequate measures.

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.

RELATED DOCUMENTATION

- Agency Approvals for ACX2000 and ACX2100 Routers | 180
- Compliance Statements for NEBS for ACX2000 and ACX2100 Routers | 183
- Compliance Statements for Acoustic Noise for ACX2000 and ACX2100 Routers | 185
- Compliance Statements for Environmental Requirements | 185

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 ACX2000 and ACX2100 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

Compliance Statements for NEBS for ACX2000 and ACX2100 Routers | **183**

Compliance Statements for EMC Requirements for ACX2000 and ACX2100 Routers | **183**

Compliance Statements for Environmental Requirements | **185**