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ACX500 Universal Metro Router Hardware Guide

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ACX500 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 ACX500 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

- ACX500 Indoor Router Quick Start
- ACX500 Outdoor Router Quick Start
- ACX500 Outdoor Router with PoE Quick Start

CHAPTER 1

Overview

ACX500 System Overview

IN THIS SECTION

ACX500 Universal Metro Router Overview

IN THIS SECTION

Juniper Networks ACX500 Universal Metro Routers are principally designed to provide superior management for rapid provisioning to the access network. The ACX500 routers support rich Gigabit Ethernet capabilities for uplink, along with support for Gigabit Ethernet interfaces, 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 routers have a built-in Routing Engine and one Packet Forwarding Engine. The Packet Forwarding Engine has one “pseudo” Flexible PIC Concentrator (FPC 0). Because there is no switching fabric, the single Packet Forwarding Engine takes care of packet forwarding.

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

The Juniper Networks ACX Series Universal MetroRouters are powered by the Junos operating system (Junos OS), which supports extensive Layer 2 and Layer 3 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 enables 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, an ACX Series router at the cell site and an 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 ACX500 routers can be installed indoors as well as outdoors:

- **ACX500 indoor**—The compact ACX500 indoor 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 of the ACX500 indoor router 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.

- **ACX500 outdoor**—The compact ACX500 outdoor routers are environmental hardened, and can be deployed in an outdoor environment, such as on walls and poles. The chassis of the ACX500 indoor router measures 1.75 in. (4.45 cm) high, 9.4 in. (24 cm) deep, and 17.5 in. (44.5 cm) wide. The chassis of the ACX500 outdoor router with the Power over Ethernet (PoE) unit measures 16 in. (40.64 cm) high, 4.7 in. (11.93 cm) deep, and 10 in. (25.4 cm) wide. You need to purchase the pole-mounting kit or the wall-mounting kit from Juniper Networks to mount the router in an outdoor environment.

Benefits of the ACX500 Router

- **Zero Touch Provisioning (ZTP)—**ZTP enables quick deployment of a large number of ACX 500 routers. As the ACX500 supports ZTP, it can be production-ready with little or no manual intervention. As installation and provisioning is faster, overall operational efficiency is improved, and the MPLS deployment in the access layer is simplified.

- **Integrated high-precision timing (Synchronous Ethernet and Precision Time Protocol)—** You can use the ACX500 routers for Synchronous Ethernet and PTP in a hybrid mode for the highest level of frequency (10 ppb) and phase (<500 nS) accuracy required for LTE-A. The ACX500, ACX500-O, and ACX500-O-PoE routers also provide an integrated GPS receiver and can act as a grandmaster (GM) clock for a distributed PTP implementation, used for the aggregation of small cell traffic when the backhaul is transported over the Internet.

- **Advanced security services—** ACX500 routers support IPsec, Media Access Control Security (MACsec), Network Address Translation (NAT), and Trusted Platform Module (TPM) features to protect against potential vulnerabilities to the network as well as subscriber traffic.

- **Environmentally hardened design—**ACX500 routers are temperature hardened and support passive cooling for outdoor deployments in extreme weather conditions. The ACX500-O and ACX500-O-PoE routers are based on environmentally hardened, ruggedized chassis and are IP65-compliant for outdoor deployments (pole mount or stand mount) with no need for an enclosure or cabinet.
- **High availability and reliability—** Junos Continuity on ACX500 eliminates OS upgrades and system reboots when new hardware is added to ACX500 routers. A plug-in package provides the drivers and support files needed to bring the hardware online.

  Unified in-service software upgrade (unified ISSU), provides software upgrades between two different Junos OS releases (major or minor) without disrupting network traffic.

ACX500 Routers Hardware and CLI Terminology Mapping

IN THIS SECTION

ACX500 Indoor Routers Hardware and CLI Terminology Mapping

Table 1 on page 5 describes the hardware terms used in ACX500 indoor router documentation and the corresponding terms used in the Junos OS CLI. Figure 1 on page 7 shows the port locations of the interfaces.

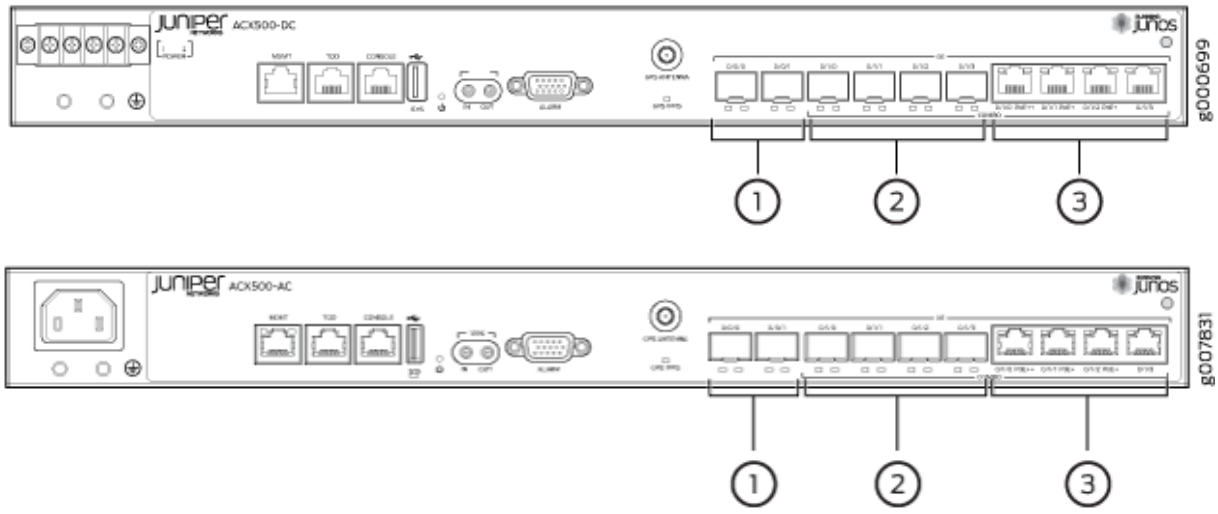
Table 1: CLI Equivalents of Terms Used in Documentation for ACX500 Indoor Routers

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	ACX500	–	Router chassis	"Chassis Physical Specifications for ACX500 Routers" on page 84
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 0–1.	The router does not have actual PIC devices; see entries for PIC 0 through PIC 1 for the equivalent item on the router.	Interface Naming Conventions Used in the Junos OS Operational Commands
	2x 1GE (SFP)	PIC 0	Built-in uplink ports on the front panel of the router	"ACX500 Universal Metro Router Overview" on page 2
	One of the following (**COMBO** PIC): • 4x 1GE (RJ-45 with PoE+ support) • 4x 1GE (SFP)	PIC 1	Built-in uplink ports on the front panel of the router	"ACX500 Universal Metro Router Overview" on page 2

Table 1: CLI Equivalents of Terms Used in Documentation for ACX500 Indoor 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
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 ACX500 Routers" on page 61
Power supply (*n*)	Built-in power supply	Value of *n* is always 0.	DC power supply	"ACX500 Power Overview" on page 67
Fan	Fan **NOTE**: ACX500 routers are fanless models.	"ACX500 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 ACX500 Routers" on page 61
Power supply (*n*)	Built-in power supply	Value of *n* is always 0.	DC power supply	"ACX500 Power Overview" on page 67
Fan	Fan **NOTE**: ACX500 routers are fanless.	–	Fan	"Cooling System and Airflow in ACX500 Routers" on page 65

Figure 1: ACX500 Indoor Router Interface Port Mapping—DC and AC Chassis



1– FPC 0, PIC 0: **0/0/0–0/0/1** (2x1GE SFP)	3– FPC 0, PIC 1: **0/1/0 PoE++**, **0/1/1 PoE+**, **0/1/2 PoE+**, and **0/1/3** (4x1GE RJ-45)
2– FPC 0, PIC 1: **0/1/0–0/1/3** (4x1GE SFP)	

ACX500 Outdoor Routers Hardware and CLI Terminology Mapping

Table 2 on page 7 describes the hardware terms used in ACX500 outdoor router documentation and the corresponding terms used in the Junos OS CLI. Figure 2 on page 9 shows the port locations of the interfaces.

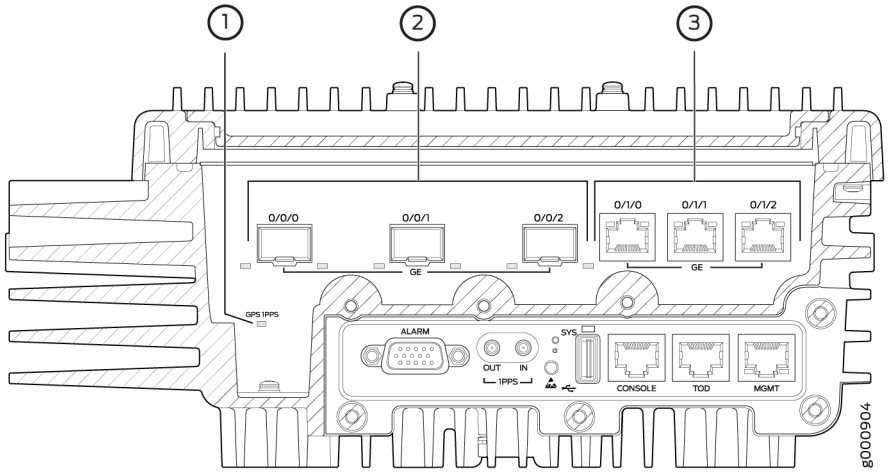
Table 2: CLI Equivalents of Terms Used in Documentation for ACX500 Outdoor Routers

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	ACX500	–	Router chassis	"Chassis Physical Specifications for ACX500 Routers" on page 84

Table 2: CLI Equivalents of Terms Used in Documentation for ACX500 Outdoor 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
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 0–1.	The router does not have actual PIC devices; see entries for PIC 0 through PIC 1 for the equivalent item on the router.	Interface Naming Conventions Used in the Junos OS Operational Commands
	3x 1GE (SFP)	PIC 0	Built-in uplink ports on the front panel of the router	"ACX500 Universal Metro Router Overview" on page 2
	3x 1GE (RJ-45)	PIC 1	Built-in uplink ports on the front panel of the router	"ACX500 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 ACX500 Routers" on page 61
Power supply (*n*)	Built-in power supply	Value of *n* is always 0.	DC power supply	"ACX500 Power Overview" on page 67
Fan	Fan **NOTE**: ACX500 routers are fanless.	–	Fan	"Cooling System and Airflow in ACX500 Routers" on page 65

Figure 2: ACX500 Outdoor Router Interface Port Mapping



1– GPS LED	3– FPC 0, PIC 1: **0/1/0–0/1/2** (3x1GE RJ-45)
2– FPC 0, PIC 0: **0/0/0–0/0/2** (3x1GE SFP)	

ACX500 Outdoor Routers with PoE Hardware and CLI Terminology Mapping

Table 3 on page 9 describes the hardware terms used in ACX500 outdoor router with PoE documentation and the corresponding terms used in the Junos OS CLI. Figure 3 on page 11 shows the port locations of the interfaces.

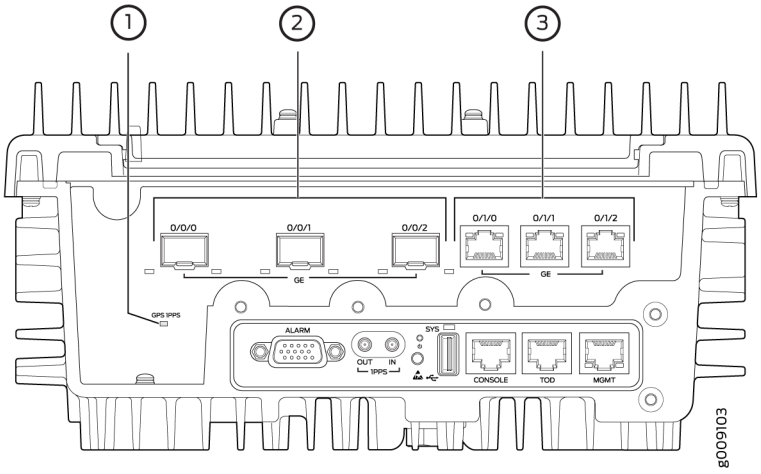
Table 3: CLI Equivalents of Terms Used in Documentation for ACX500 Outdoor Routers with PoE

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	ACX500	–	Router chassis	"Chassis Physical Specifications for ACX500 Routers" on page 84
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

Table 3: CLI Equivalents of Terms Used in Documentation for ACX500 Outdoor Routers with PoE *(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
PIC (*n*)	Abbreviated name of the Physical Interface Card (PIC)	*n* is a value in the range of 0–1.	The router does not have actual PIC devices; see entries for PIC 0 through PIC 1 for the equivalent item on the router.	Interface Naming Conventions Used in the Junos OS Operational Commands
	3x 1GE (SFP)	PIC 0	Built-in uplink ports on the front panel of the router	"ACX500 Universal Metro Router Overview" on page 2
	3x 1GE (RJ-45 with PoE+ support)	PIC 1	Built-in uplink ports on the front panel of the router	"ACX500 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 ACX500 Routers" on page 61
Power supply (*n*)	Built-in power supply	Value of *n* is always 0.	DC power supply	"ACX500 Power Overview" on page 67
Fan	Fan **NOTE**: ACX500 routers are fanless.	–	Fan	"Cooling System and Airflow in ACX500 Routers" on page 65

Figure 3: ACX500 Outdoor Router Interface Port Mapping

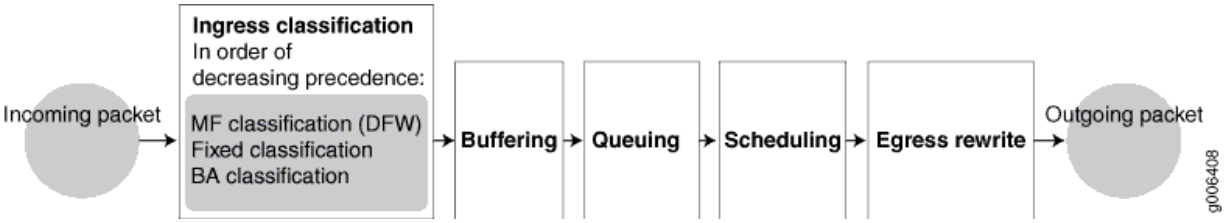


1– GPS LED	3– FPC 0, PIC 1: **0/1/0–0/1/2** (3x1GE RJ-45 with PoE+ support)
2– FPC 0, PIC 0: **0/0/0–0/0/2** (3x1GE SFP)	

Packet Flow on ACX Series Routers

The class-of-service (CoS) architecture for ACX Series routers is in concept similar to that for MX Series routers. The general architecture for ACX Series routers is shown in Figure 4 on page 11.

Figure 4: ACX Series Router Packet Forwarding and Data Flow



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

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

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

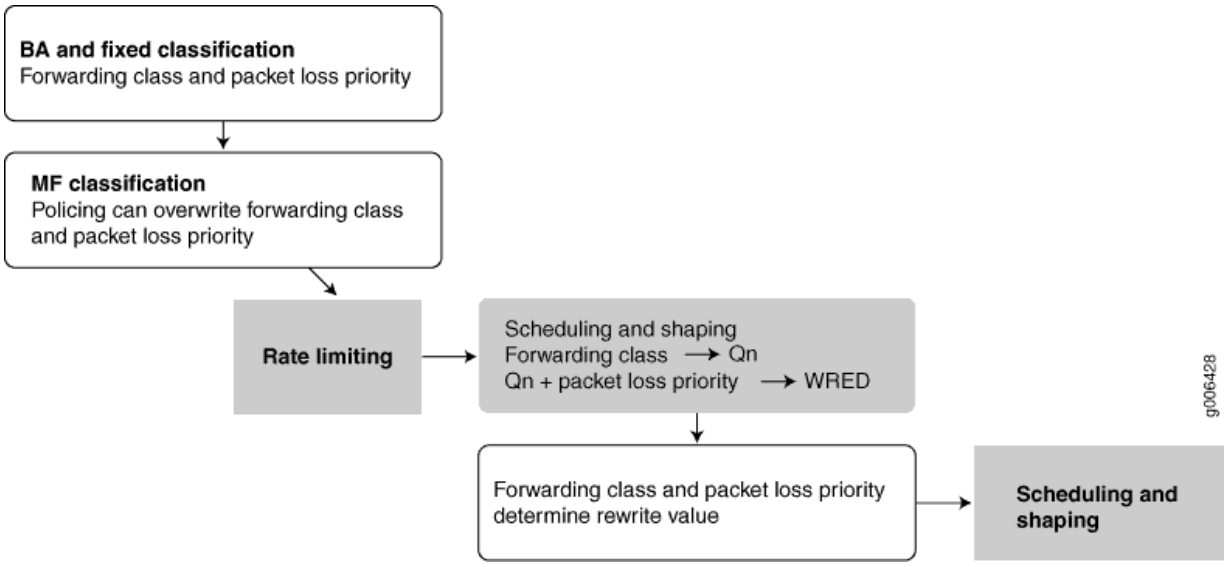
However, the ACX Series routers can also employ multiple BA classifiers on the same physical interface. The physical interfaces do not have to employ the same type of BA classifier. For example, a single physical interface can use classifiers based on IP precedence as well as IEEE 802.1p. If the CoS bits of interest are on the inner VLAN tag of a dual-tagged VLAN interface, the classifier can examine either the inner or outer bits. (By default, the classification is done based on the outer VLAN tag.)

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

All CoS features are supported at line rate.

The packet pipeline through an ACX Series router is shown in Figure 5 on page 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 5: ACX Series Router Packet Handling



SEE ALSO

ACX Series Universal Metro Router Configuration Guide

Protocols and Applications Supported by ACX Series Routers

Table 4 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 4: Protocols and Applications Supported by ACX Series Routers

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX5000	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

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
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	–	–	–	–	–	–
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										

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
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
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

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
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
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

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
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
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

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
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
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

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
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										
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

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
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
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

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
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
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										

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
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
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										

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
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
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

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
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
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

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
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
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

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
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
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

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
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
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

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
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
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

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
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
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

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
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										
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

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX5000	ACX5448
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)	-
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

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
Grand Primary Clock	–	–	–	–	–	–	–	–	12.3X54–D20 and 17.3R1 (Indoor) 12.3X54–D25 (Outdoor)	-
OAM, Troubleshooting, Manageability, Lawful Intercept										
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

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
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
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

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
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
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

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
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
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

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX5000	ACX5448
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
Ethernet loopback	12.2	12.2R2	12.2	12.2R2	12.3X54–D15	12.3x51-D10	–	–	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	-

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
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
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

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
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
Multipacket mirror	–	–	–	–	–	–	–	–	12.3X54–D20 (Indoor) 12.3X54–D25 (Outdoor)	-
Security										

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
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
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										

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX500	ACX5448
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										
ATM over PWE3	12.2	–	12.2	12.2R2	12.3X54–D15	12.3x51-D10	–	–	–	-

Table 4: Protocols and Applications Supported by ACX Series Routers *(Continued)*

Protocol or Application	ACX1000	ACX1100	ACX2000	ACX2100	ACX2200	ACX4000	ACX5048	ACX5096	ACX5000	ACX5448
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 4: 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 4: 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 4: 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 4: 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 4: 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

ACX500 Chassis

IN THIS SECTION

ACX500 Indoor Router Description

The ACX500 indoor routers contain a total of 10 ports that support 1-Gbps speed, eight of which are labeled **COMBO**. At any point of time, you can use a maximum of six ports.

The ports labeled **COMBO** (combination ports) consist of four Gigabit Ethernet ports that support RJ-45 connectors and four Gigabit Ethernet ports that support small form-factor pluggable (SFP) transceivers. Out of the four RJ-45 ports, three ports support Power over Ethernet (PoE+ and PoE++).

The two ports that are not part of the **COMBO** ports are Gigabit Ethernet SFP ports.

On the ACX500, the six ports that you can use at any point of time can be two Gigabit Ethernet SFP ports (non-combination) and four ports from the **COMBO** ports.

NOTE: You can mix and match the four RJ-45 and SFP **COMBO** ports as long as the port numbers are unique.

For example, from the **COMBO** ports, you can use the **0/1/0** SFP port along with the **0/1/1 PoE +** RJ-45 port, but not the **0/1/0 PoE++** RJ-45 port, as the port numbers of the SFP and the RJ-45 ports are same (**0/1/0**).

Figure 6 on page 48 and Figure 7 on page 48 shows the front views of the AC-powered and the DC-powered ACX500 indoor routers.

Figure 6: Front View of the ACX500 Indoor Routers—AC Powered

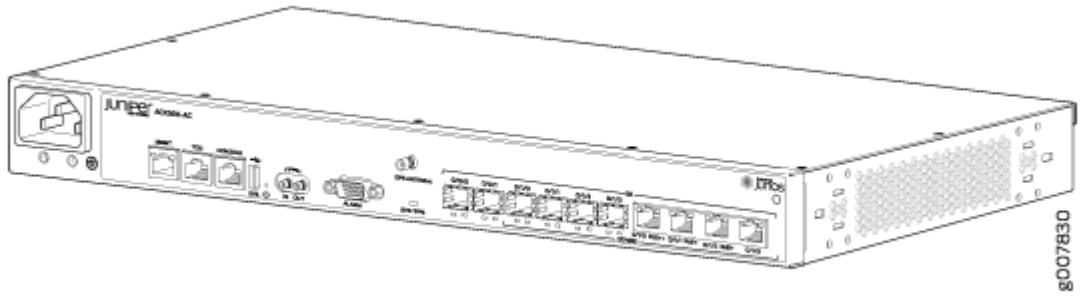


Figure 7: Front View of the ACX500 Indoor Routers—DC Powered

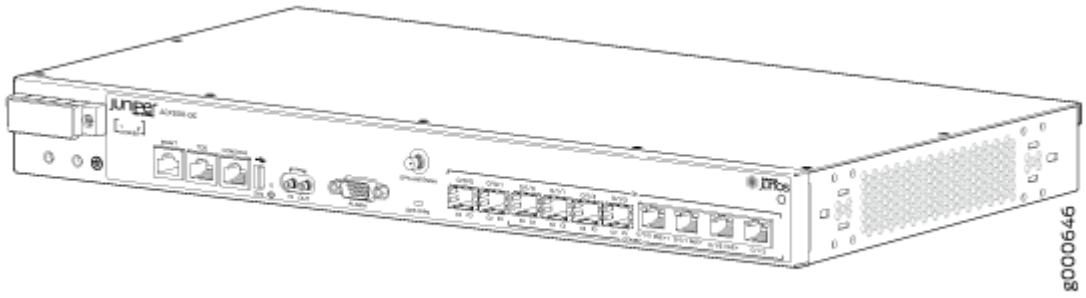


Figure 8 on page 49 shows the rear view of the AC-powered and the DC-powered ACX500 indoor routers.

Figure 8: Rear View of the ACX500 Indoor Router

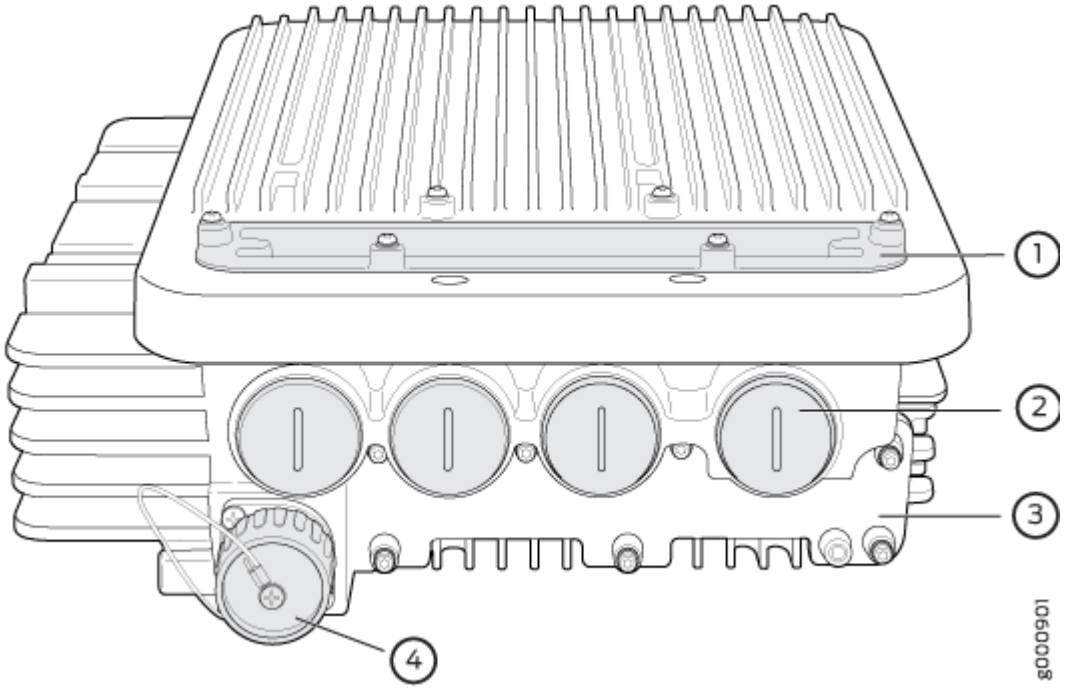
NOTE: The top view and bottom view of an AC-powered ACX500 router are respectively the same as those of a DC-powered router. The only component that appears different is the power inlet for the two routers.

ACX500 Outdoor Router Description

The ACX500 outdoor routers contain three Gigabit Ethernet ports that support SFP transceivers and three Gigabit Ethernet ports that support RJ-45 connectors. The ACX500 outdoor routers install on a pole or a wall, with the chassis installed in a vertical orientation with the cables pointing downward and the eye bolt for hoisting the router pointing upward.

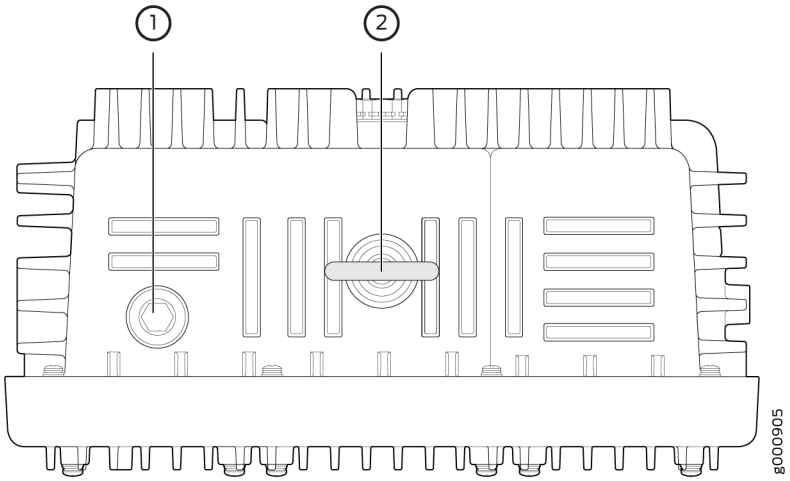
Figure 9 on page 50 and Figure 10 on page 50 show the ACX500 outdoor router from bottom and top.

Figure 9: Bottom View of the ACX500 Outdoor Router



1– Interface port chamber with weather seal cover	3– Management port chamber with weather seal cover
2– Cable connector ports with weather seal cap	4– Power port with weather seal cap

Figure 10: Top View of the ACX500 Outdoor Router



1– GPS antenna port	2– Eye bolt

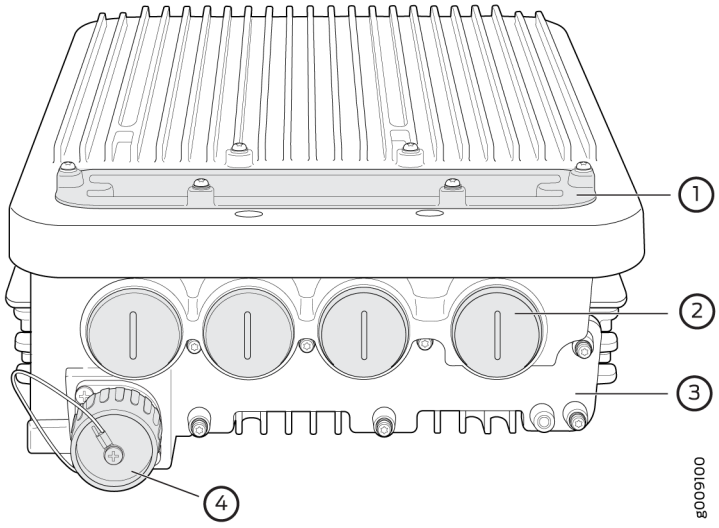
NOTE: The top view and bottom view of an AC-powered ACX500 router are respectively the same as those of a DC-powered router. The only component that appears different is the power inlet for the two routers.

ACX500 Outdoor Router with PoE Description

The ACX500 outdoor routers with Power over Ethernet (PoE) contain three Gigabit Ethernet RJ-45 ports that support PoE+ and three Gigabit Ethernet SFP ports. Out of the three RJ-45 ports, the port labeled **0/1/0** supports PoE++, and the ports labeled **0/1/1** and **0/1/2** support PoE+ with a maximum system PoE power limit of 80 W. The ACX500 outdoor routers with PoE install on a pole or a wall, with the chassis installed in a vertical orientation with the cables pointing downward and the eye bolt for hoisting the router pointing upward.

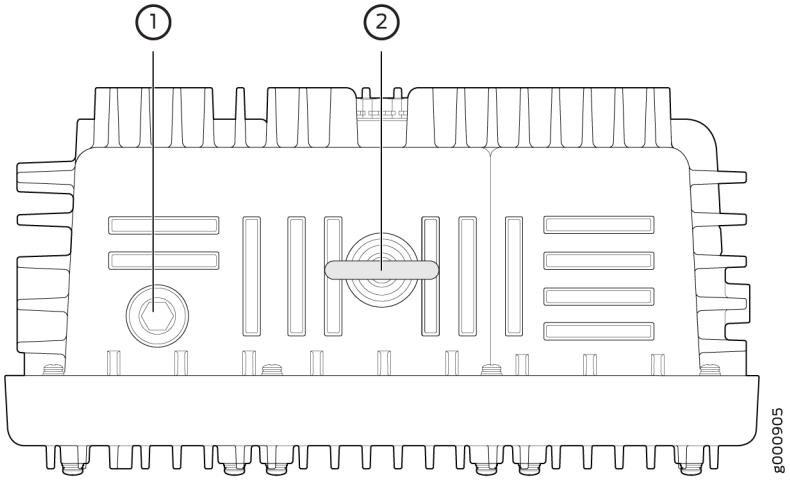
Figure 11 on page 51 and Figure 12 on page 52 show the ACX500 outdoor router with PoE from bottom and top.

Figure 11: Bottom View of the ACX500 Outdoor Router with PoE



1– Interface port chamber with weather seal cover	3– Management port chamber with weather seal cover
2– Cable connector ports with weather seal cap	4– Power port with weather seal cap

Figure 12: Top View of the ACX500 Outdoor Router with PoE



1– GPS antenna port	2– Eye bolt

NOTE: The top view and bottom view of an AC-powered ACX500 router are respectively the same as those of a DC-powered router. The only component that appears different is the power inlet for the two routers.

Front Panel of an ACX500 Indoor Router

The front panel of an ACX500 indoor router consists of the following components (see Figure 13 on page 53 and Figure 14 on page 54):

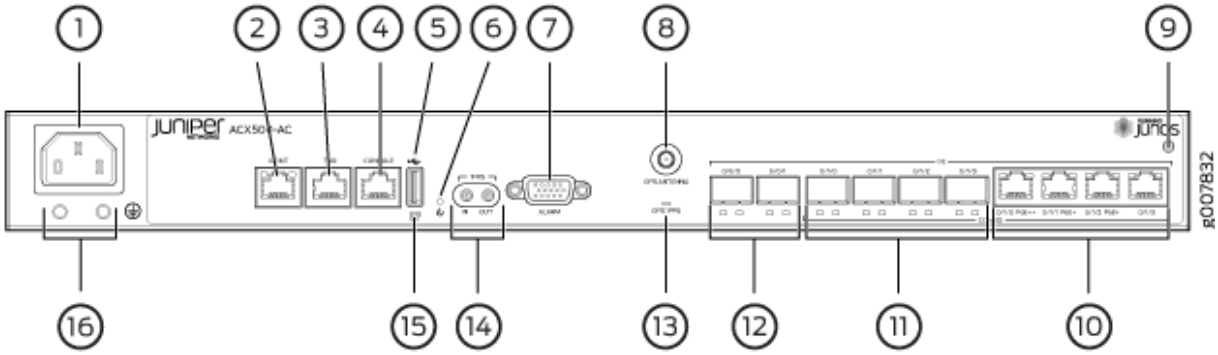
- Chassis status LED labeled **SYS**
- Power inlet
- USB port for upgrading Junos OS
- Management Ethernet port labeled **MGMT**
- Time of day (**TOD**) RJ-45 port
- Console port labeled **CONSOLE**
- Alarm contact port labeled **ALARM**—accepts a DE-15 alarm cable
- GPS antenna port labeled **GPS ANTENNA**

- External clocking 1 PPS input and output ports labeled **IN** and **OUT**
- GPS clocking LED labeled **GPS 1PPS**
- Network ports and corresponding status LEDs:
  - Two Gigabit Ethernet SFP ports labeled **0/0/0** and **0/0/1**
  - Combination Gigabit Ethernet ports labeled **0/1/0** through **0/1/3**, which can be either of the following configurations:
    - Four Gigabit Ethernet RJ-45 ports.

      Out of the four RJ-45 ports, three are PoE ports labeled **0/1/0 PoE++**, **0/1/1 PoE+** and **0/1/2 PoE+** that provide electrical current to devices through network cables. These ports comply with IEEE 802.3af (PoE) and IEEE 802.3at (PoE+). The PoE++ (ge-0/1/0) port support 65 W, and the PoE+ ports (ge-0/1/1 through ge-0/1/2) support 35 W power. The total PoE power supported for these three ports is 80 W.

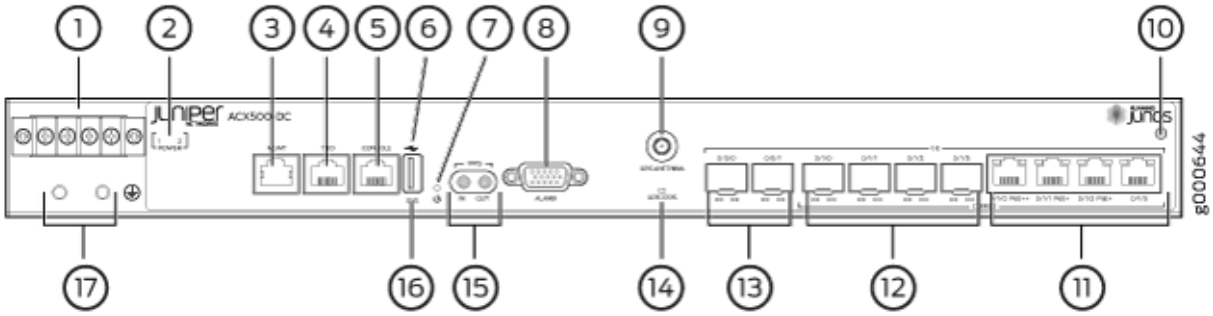
    - Four Gigabit Ethernet ports, labeled **0/1/0** through **0/1/3**, that accept SFP transceivers

Figure 13: Front Panel of the ACX500 Indoor Router—AC Chassis



1– AC appliance inlet	9– ESD point
2– Management Ethernet port (**MGMT**)	10– Gigabit Ethernet RJ-45 ports (**COMBO**)
3– Time of day (**TOD**) RJ-45 port	11– Gigabit Ethernet SFP ports (**COMBO**)
4– Console port (**CONSOLE**)	12– Gigabit Ethernet SFP ports
5– USB port	13– GPS LED (**GPS 1PPS**)
6– Recovery switch	14– External clocking ports
7– Alarm contact port	15– System status LED (**SYS**)
8– GPS antenna port	16– Grounding terminals

Figure 14: Front Panel of the ACX500 Indoor Router—DC Chassis



1– DC terminals	10– ESD point
2– DC power status LED	11– Gigabit Ethernet RJ-45 ports (**COMBO**)
3– Management Ethernet port (**MGMT**)	12– Gigabit Ethernet SFP ports (**COMBO**)
4– Time of day (**TOD**) RJ-45 port	13– Gigabit Ethernet SFP ports
5– Console port (**CONSOLE**)	14– GPS LED (**GPS 1PPS**)
6– USB port	15– External clocking ports
7– Recovery switch	16– System status LED (**SYS**)
8– Alarm contact port	17– Grounding terminals
9– GPS antenna port	

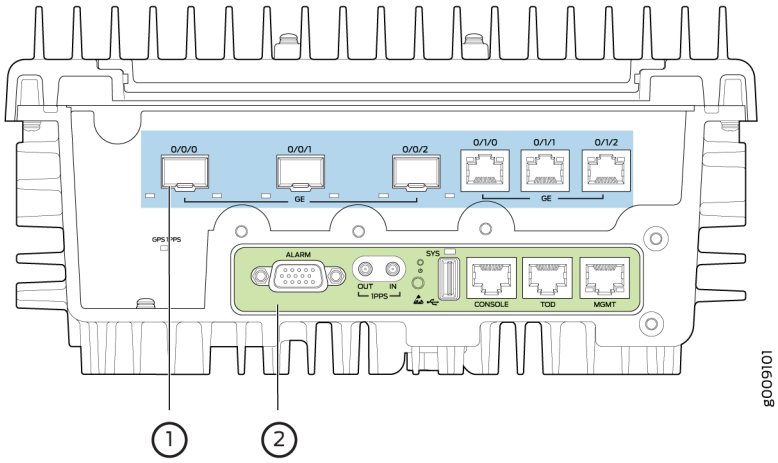
Front Panel of an ACX500 Outdoor Router with PoE

The front panel of an ACX500 outdoor router with PoE consists of the following components (see Figure 15 on page 55, Figure 16 on page 55, and Figure 17 on page 56):

- Chassis status LED labeled **SYS**
- USB port for upgrading Junos OS
- Management Ethernet port labeled **MGMT**
- Time of day (**TOD**) RJ-45 port
- Console port labeled **CONSOLE**
- Alarm contact port labeled **ALARM**—accepts a DE-15 alarm cable
- External clocking 1 PPS input and out ports labeled **IN** and **OUT**
- GPS clocking LED labeled **GPS 1PPS**

- Network ports and corresponding status LEDs:
  - Three Gigabit Ethernet SFP ports labeled **0/0/0** through **0/0/2**
  - Three Gigabit Ethernet RJ-45 ports (with PoE+ support) labeled **0/1/0** through **0/1/2**

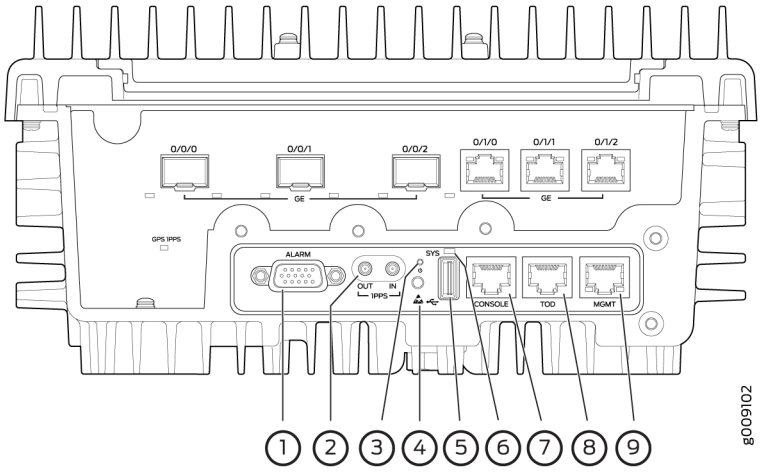
Figure 15: Front Panel of the ACX500 Outdoor Router with PoE



1– Interface ports	2– Management ports

Figure 16 on page 55 shows the ports that are available under the management port cover.

Figure 16: Front Panel of the ACX500 Outdoor Router with PoE—Management Ports

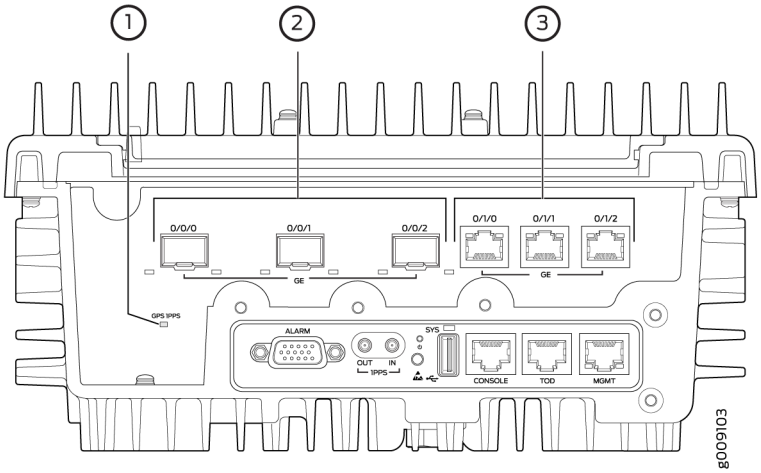


1– Alarm contact port	6– System status LED (**SYS**)
2– External clocking ports	7– Console port (**CONSOLE**)

3– Recovery switch	8– Time of day (**TOD**) RJ-45 port
4– ESD point	9– Management Ethernet port (**MGMT**)
5– USB port	

Figure 17 on page 56 shows the ports that are available under the interface port cover.

Figure 17: Front Panel of the ACX500 Outdoor Router with PoE—Interface Ports



1– GPS LED	3– Gigabit Ethernet RJ-45 ports (with PoE+ support) and LEDs
2– Gigabit Ethernet SFP ports and LEDs	

Alarm Contact Port on ACX500 Routers

The ACX500 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 ACX500 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 5 on page 57 describes the functions of the alarm contacts.

Table 5: Alarm Relay Contact Functions

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

Figure 18 on page 57 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 18: Sample Output Alarm-Reporting Device

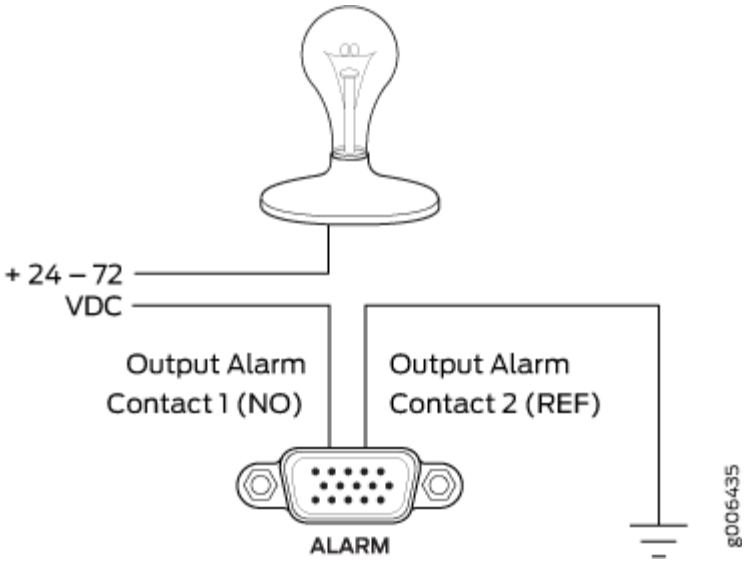
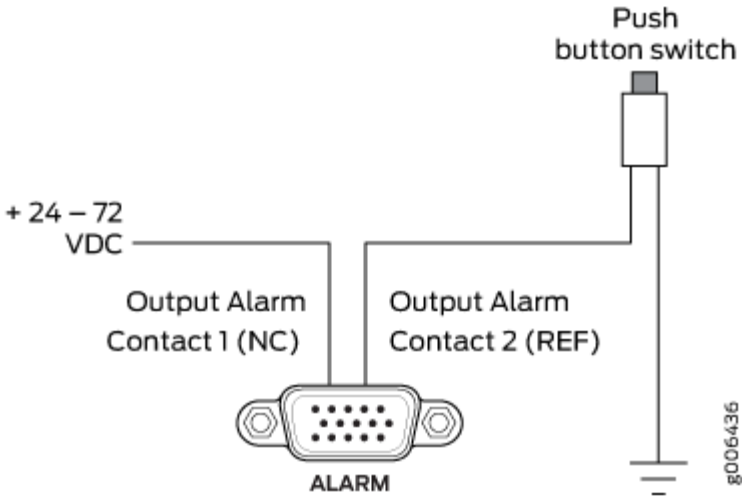


Figure 19 on page 58 shows an example of a wiring diagram for a simple input alarm-reporting device. In this case the push button switch is an alarm sensor that triggers an input alarm when a door-open condition occurs.

Figure 19: Sample Input Alarm-Reporting Device



SEE ALSO

- Alarm Contact Port on ACX500 Routers | 56

LEDs on ACX500 Routers

IN THIS SECTION

System LED on the Front Panel

One bicolor LED labeled **SYS** indicates the status of the router. Table 6 on page 59 describes the system LED in more detail.

Table 6: System LED on the Front Panel

Label	Color	State	Description
SYS	Green	Blinking	The router is transitioning online.
		On steadily	The router is functioning normally.
	Red	Blinking	The router has reported a yellow alarm.
		On steadily	The router has reported a red alarm.

Gigabit Ethernet SFP and RJ-45 Port LEDs

Each Gigabit Ethernet SFP and RJ-45 port on the front panel of the router has one pair of port LEDs. Table 7 on page 59 describes the LEDs in more detail.

Table 7: Ethernet Port LEDs

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

Management Port LEDs on the Front Panel

The RJ-45 port labeled **MGMT** has a pair of LEDs that display the status of the port. Table 8 on page 60 describes the LEDs in more detail.

Table 8: Management LEDs

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

GPS 1 PPS LED on the Front Panel

One green LED labeled **GPS 1PPS** indicates the status of the pulse per second (PPS) signal received from the GPS receiver. Table 9 on page 60 describes the LED in more detail.

Table 9: GPS 1 PPS LED on the Front Panel

Label	Color	State	Description
GPS 1PPS	Green	Off	PPS signal not received from GPS receiver.
		Blinking	PPS signal received from GPS receiver.

SEE ALSO

Troubleshooting Resources for ACX500 Routers | 192

Alarm Types and Severity Classes on ACX Series Routers | 194

Uplink Ports on ACX500 Routers

IN THIS SECTION

Unless otherwise specified, the information about the ports applies to both ACX500 indoor and outdoor 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 ACX500 is located at https://pathfinder.juniper.net/hct/product/#prd=ACX500.

Gigabit Ethernet RJ-45 Ports

The Table 10 on page 61 describes the Gigabit Ethernet RJ-45 ports of the ACX500 routers.

Table 10: RJ-45 Port Features

Feature	Description
Supported standards	• 10BASE-T Copper • 100BASE-T • 1000BASE-T

Table 10: RJ-45 Port Features *(Continued)*

Feature	Description
Cable	Category 5
Connector	RJ-45
Port numbering (hardware)	• ACX500 indoor: **0/1/0 PoE++**, **0/1/1 PoE+**, **0/1/2 PoE+**, and **0/1/3** • ACX500 outdoor: **0/1/0** through **0/1/2**
Port numbering (software)	• ACX500 indoor: `ge-0/1/0` through `ge-0/1/3` • ACX500 outdoor: `ge-0/1/0` through `ge-0/1/2`

Gigabit Ethernet SFP Ports

The Gigabit Ethernet SFP ports described inTable 11 on page 62 are located on the front of the chassis and enable you to install the small form-factor pluggable (SFP) transceivers.

Table 11: Gigabit Ethernet SFP Port Features

Feature	Description
Supported standards	See the Hardware Compatibility Tool for the specifications of transceivers supported on the ACX500. The list of supported transceivers for the ACX500 is located at https://pathfinder.juniper.net/hct/product/#prd=ACX500.
Cable	
Connector	
Port numbering (hardware)	• ACX500 indoor: **0/0/0** and **0/0/1**, and **0/1/0** through **0/1/3** • ACX500 outdoor: **0/0/0** through **0/0/2**

Table 11: Gigabit Ethernet SFP Port Features *(Continued)*

Feature	Description
Port numbering (software)	• ACX500 indoor: `ge-0/0/0` and `0/0/1`, and `0/1/0` through `ge-0/1/3` • ACX500 outdoor: `ge-0/0/0` through `ge-0/0/2`

PoE Ports

ACX500 indoor routers and outdoor routers with PoE have a fixed number of Gigabit Ethernet RJ-45 ports, out of which a few are PoE ports. These ports enable you to plug in devices, such as IP phones, wireless access points, and security cameras, that require both network connectivity and electric power. Table 12 on page 63 describes the Gigabit Ethernet PoE ports in more detail.

NOTE: PoE is supported only on the ACX500 indoor and the ACX500 outdoor router with PoE.

Table 12: RJ-45 PoE Port Features

Feature	Description
Supported standards	IEEE 802.3af (PoE) and IEEE 802.3at (PoE+)
Per port power limit	**PoE++**: 65 W **PoE+**: 35 W **NOTE**: Total power supported on the PoE ports of the ACX500 routers is 80 W.
Cable	Copper Ethernet LAN cable
Connector	RJ-45
Port numbering (hardware)	• ACX500 indoor: **0/1/0 PoE++**, **0/1/1 PoE+**, and **0/1/2 PoE+** • ACX500 outdoor with PoE: **0/1/0**–**0/1/2**

Table 12: RJ-45 PoE Port Features *(Continued)*

Feature	Description
Port numbering (software)	• ACX500 indoor: `ge-0/1/0`, `ge-0/1/1`, and `ge-0/1/2` • ACX500 outdoor with PoE: `ge-0/1/0`, `ge-0/1/1`, and `ge-0/1/2`

Clocking Ports on ACX500 Routers

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

Internal clock sources within the ACX500 routers include:

- 1 PPS SMB connectors (one output)
- Time of day (TOD) RJ-45 port (supports RS-422)
- Synchronous Ethernet support on RJ-45 and 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

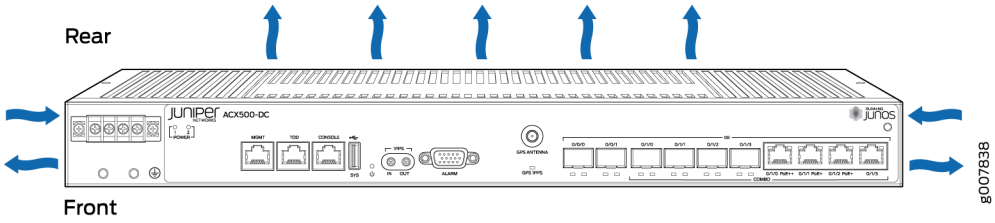
External Clocking Ports Specifications on ACX500 Routers | **103**

Connecting the ACX500 Router to External Clocking Devices | **173**

Cooling System and Airflow in ACX500 Routers

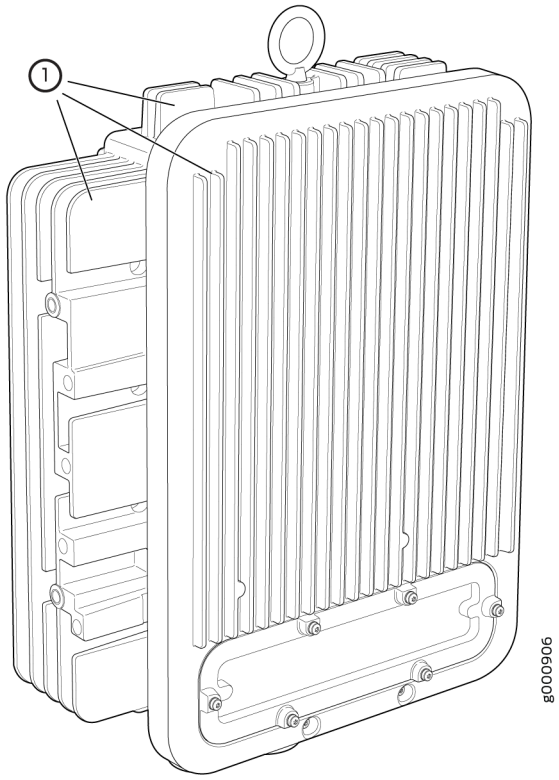
The ACX500 indoor routers do not contain fans, and are passively cooled through air vents. The air vents in the router are located on both the sides of the router and also on top of the router (see Figure 20 on page 65). Temperature sensors in the chassis monitor the temperature within the chassis. If the temperature inside the chassis rises above the threshold, the router shuts down automatically.

Figure 20: Cooling System and Airflow in the ACX500 Indoor Router



The ACX500 outdoor routers do not contain fans, and are passively cooled by internal heat sinks and external cooling fins (see Figure 21 on page 66). The external cooling fins on the body of the ACX500 outdoor router help to dissipate the heat. Unlike the ACX500 indoor routers, the ACX500 outdoor routers do not have air vents.

Figure 21: Cooling System in the ACX500 Outdoor Routers



1–	Cooling fins

RELATED DOCUMENTATION

- Site Preparation Checklist for ACX500 Routers | **74**
- Clearance Requirements for Airflow and Hardware Maintenance on ACX500 Routers | **78**
- ACX500 Router Environmental Specifications | **86**

ACX500 Power System

IN THIS SECTION

ACX500 Power Overview

The ACX500 router is available as DC-powered and AC-powered models. 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 13 on page 67 and Table 14 on page 67 lists the power consumed by the ACX500 routers.

Table 13: Power Consumed by ACX500 Indoor Routers

Description	Value
Maximum power consumed by the router	• 65 W without PoE • 145 W with maximum PoE load (80 W of PoE)

Table 14: Power Consumed by ACX500 Outdoor Routers

Description	Value
Maximum power consumed by the router	ACX500 outdoor (ACX500-O): • 55 W ACX500 outdoor with PoE (ACX500-O-POE): • 55 W without PoE • 135 W with maximum PoE load (80 W of PoE)

ACX500 AC Power Specifications

Table 15 on page 68 lists the AC power electrical specifications.

Table 15: AC Power Electrical Specifications

Item	Specification		
	ACX500 Indoor (ACX500-AC)	ACX500 Outdoor (ACX500-O-AC)	ACX500 Outdoor with PoE (ACX500-O-POE-AC)
AC input voltage	Operating range: 100 through 240 VAC	Operating range: 100 through 240 VAC	Operating range: 100 through 240 VAC
AC input line frequency	50 through 60 Hz (nominal)	50 through 60 Hz (nominal)	50 through 60 Hz (nominal)
AC system current rating	1.5 A (maximum)	0.6 A (maximum)	1.4 A (maximum)
AC system input power	145 W (80 W PoE)	55 W	135 W (80 W PoE)
Maximum AC power supply output	137 W (80 W PoE)	52 W	128 W (80 W PoE)

NOTE: We recommend that you use a dedicated customer-site circuit breaker rated for 20 A (100 VAC) or 16 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.

ACX500 Router 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.

NOTE: For the ACX500 outdoor routers, use the power cord that is purchased from Juniper Networks, and which is compatible with the ACX500 outdoor routers. Using a power cord other than that is provided by Juniper Networks with the router can damage the power terminal. The nominal rating of the DC power source are +24 VDC, –48 VDC, and –60 VDC. These power cords are specifically designed to be used only with the specified ACX500 outdoor routers.

Table 16 on page 69 provides specifications for the AC power cord provided for each country or region.

Table 16: AC Power Cord Specifications for the ACX500 Indoor Router

Country	Model Number	Electrical Specification	Plug Type	Design Standard
Argentina	CBL-PWR-C15M-HITEMP-AR	250 VAC, 10 A, 50 Hz	RA/3	IRAM 2073
Australia	CBL-PWR-C15M-HITEMP-AU	250 VAC, 10 A, 50 Hz	SAA/3	AS/NZZS 3112-2000
Brazil	CBL-PWR-C15M-HITEMP-BR	250 VAC, 10 A, 50 Hz	BR/3	NBR 14136
China	CBL-PWR-C15M-HITEMP-CH	250 VAC, 10 A, 50 Hz	PRC/3	GB2099, GB1002
Europe (except Italy, Switzerland, and United Kingdom)	CBL-PWR-C15M-HITEMP-EU	250 VAC, 10 A, 50 Hz	VIIG	CEE (7) VII

Table 16: AC Power Cord Specifications for the ACX500 Indoor Router *(Continued)*

Country	Model Number	Electrical Specification	Plug Type	Design Standard
India	CBL-PWR-C15M-HITEMP-IN	250 VAC, 10 A, 50 Hz	ZA/3	SABS 164/1:1992
Israel	CBL-PWR-C15M-HITEMP-IL	250 VAC, 10 A, 50 Hz	IL/3G	SI 32
Italy	CBL-PWR-C15M-HITEMP-IT	250 VAC, 10 A, 50 Hz	I/3G	CEI 23–16
Japan	CBL-PWR-C15M-HITEMP-JP	125 VAC, 15 A, 50 Hz or 60 Hz	498GJ	JIS 8303
Korea	CBL-PWR-C15M-HITEMP-KR	250 VAC, 10 A, 50 Hz	VIIG	CEE (7) VII
South Africa	CBL-PWR-C15M-HITEMP-SA	250 VAC, 10 A, 50 Hz	ZA/3	SABS 164/1:1992
Switzerland	CBL-PWR-C15M-HITEMP-SZ	250 VAC, 10 A, 50 Hz	12G	SEV 1011 / 6534-2
North America	CBL-PWR-C15M-HITEMP-US	125 VAC, 13 A, 60 Hz	498G	NEMA 5-15
United Kingdom	CBL-PWR-C15M-HITEMP-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.

NOTE: The router is rated for ambient temperature of 149° F (65° C). Use power cord of appropriate temperature rating.

ACX500 DC Power Specifications

The power supplies in ACX500 routers are built in along the front left panel of the chassis with DC power terminals to connect power to the router. The ACX500 indoor router power supply inputs are labeled **INPUT 1** and **INPUT 2**. On the ACX500 outdoor routers, there are no labels for the DC power supply inlet.

NOTE: For the ACX500 outdoor routers, use the power cord that is purchased from Juniper Networks, and which is compatible with the ACX500 outdoor routers. Using a power cord other than that is provided by Juniper Networks with the router can damage the power terminal. The nominal rating of the DC power source are +24 VDC, –48 VDC, and –60 VDC. These power cords are specifically designed to be used only with the specified ACX500 outdoor routers.

ACX500 routers support a wide range of voltage ranges as shown in Table 17 on page 72.

Table 17: DC Power Electrical Specifications

Item	Specification		
	ACX500 Indoor (ACX500-DC)	ACX500 Outdoor (ACX500-O-DC)	ACX500 Outdoor with PoE (ACX500-O-POE-DC)
DC input voltages	• 20 through 30 VDC: normal 24 VDC • –39 through –56 VDC: normal 48 VDC • –39 through –72 VDC: normal 60 VDC	• 20 through 30 VDC: nominal 24 VDC • –39 through –56 VDC: nominal –48 VDC • –39 through –72 VDC: nominal –60 VDC	• 20 through 30 VDC: nominal 24 VDC • –39 through –56 VDC: nominal –48 VDC • –39 through –72 VDC: nominal –60 VDC
DC input currents	• 6.5 A @ 24 VDC • 3.5 A @ –48 VDC • 2.5 A @ –60 VDC	• 2.5 A @ 24 VDC • 1.2 A @ –48 VDC • 1 A @ –60 VDC	• 6 A @ 24 VDC • 3 A @ –48 VDC • 2.5 A @ –60 VDC
Power supply output	145 W (80 W PoE)	55 W	135 W (80 W PoE)

NOTE: The router with DC power has more than one power source. Ensure proper care while connecting the DC power supply to the router.

To get power feed redundancy on the DC router, you must connect both the power feed from two different source.

RELATED DOCUMENTATION

ACX500 AC Power Electrical Safety Guidelines | **232**

ACX500 DC Power Electrical Safety Guidelines | **234**

General Electrical Safety Guidelines and Warnings | **229**

CHAPTER 2

Site Planning, Preparation, and Specifications

Site Preparation Checklist for ACX500 Routers

The checklist in Table 18 on page 74 summarizes the tasks you need to perform when preparing a site for ACX500 router installation.

Table 18: 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.	"ACX500 Router Environmental Specifications" on page 86		
Power			
Measure the distance between external power sources and router installation site.			
Locate sites for connection of system grounding.	"ACX500 Router Grounding Specifications" on page 88		
Calculate the power consumption and requirements.	"ACX500 DC Power Specifications" on page 71		
Hardware Configuration			
Choose the number and types of routers you want to install.	"ACX500 Universal Metro Router Overview" on page 2		
Rack, Cabinet, Wall or Pole			

Table 18: Site Preparation Checklist *(Continued)*

Item or Task	For More Information	Performed by	Date
Verify that your rack, cabinet, pole, or wall meets the minimum requirements for the installation of the router.	"Rack Requirements for ACX500 Indoor Routers" on page 96 "Cabinet Requirements for ACX500 Indoor Routers" on page 92 "Wall Requirements for ACX500 Outdoor Routers" on page 95 "Pole Requirements for ACX500 Outdoor Routers" on page 95		
Plan rack or cabinet location, including required space clearances.	"Clearance Requirements for Airflow and Hardware Maintenance on ACX500 Routers" on page 78		
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 ACX500 Indoor Router Overview | 119

Installing and Connecting an ACX500 Outdoor Router Overview | 119

General Site Guidelines | 76

ACX500 Site Guidelines and Requirements

IN THIS SECTION

General Site Guidelines

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

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

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

Site Electrical Wiring Guidelines

Table 19 on page 77 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 19: 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. Strong sources of electromagnetic interference (EMI) can cause: • 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 ACX500 Routers

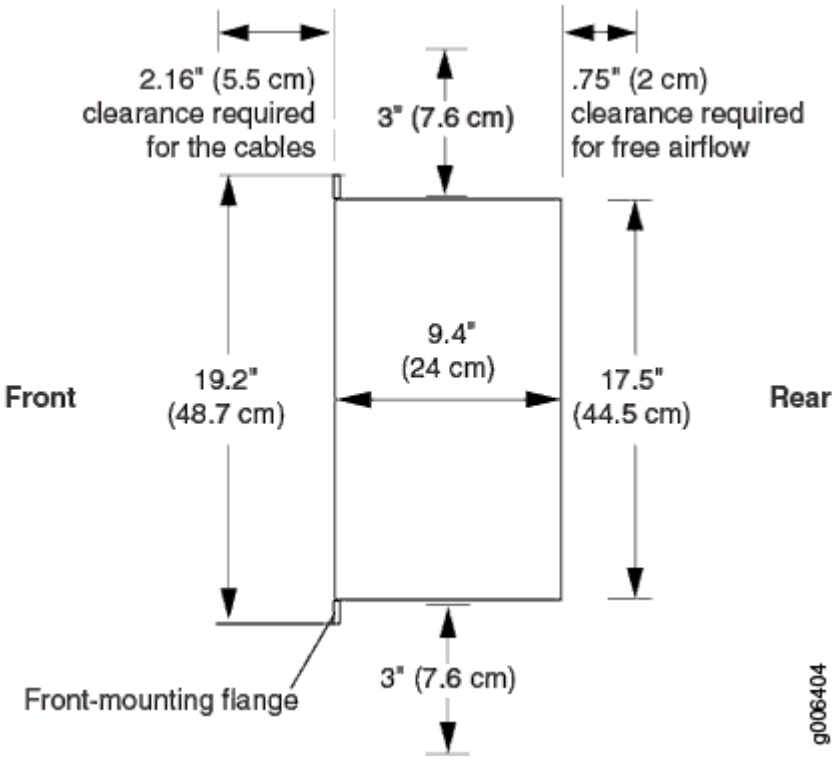
IN THIS SECTION

ACX500 Indoor Router Chassis Dimensions and Clearance Requirements

Prepare your site for installation by observing the following guidelines:

- When planning the installation site, allow sufficient clearance around the rack. See Figure 22 on page 79.
- 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 allow a 1–rack unit (U) gap above and below the router.
- Ensure minimum 1 meter/second airflow in any direction.

Figure 22: ACX500 Indoor Router Chassis Dimensions and Clearance Requirements



ACX500 Outdoor Router Chassis Dimensions and Clearance Requirements

Prepare your site for installation by observing the following guidelines:

- When installing the ACX500 outdoor routers on a pole or on a wall, the chassis must be installed in a vertical orientation with the cables pointing downward and the eye bolt for hoisting the router pointing upward.

  Figure 23 on page 80 and Figure 24 on page 81 show the orientation of the ACX500 outdoor router after installation.

- When choosing a location, allow at least 6 in. (15.2 cm) of clearance between the sides of the chassis (with the router in installed position) and adjacent equipment or walls. See Figure 23 on page 80.

- Ensure that the wall or the pole onto which the router is installed is stable and securely supported.

- Ensure that the wall or pole is able to carry the load of the fully configured router.

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

- The width of the pole must be within the range of 2 in. through 16 in. for the pole-mounting brackets to fit properly.
- To mount the router, use the pole-mounting kit or the wall-mounting kit from Juniper Networks.
- One person must be available to lift the router while another secures the router.
- For service personnel to remove and install hardware components, allow at least 24 in. (60.9 cm) on top of the router. See Figure 24 on page 81.

Figure 23: ACX500 Outdoor Router Chassis Dimensions and Clearance Requirements—Front View

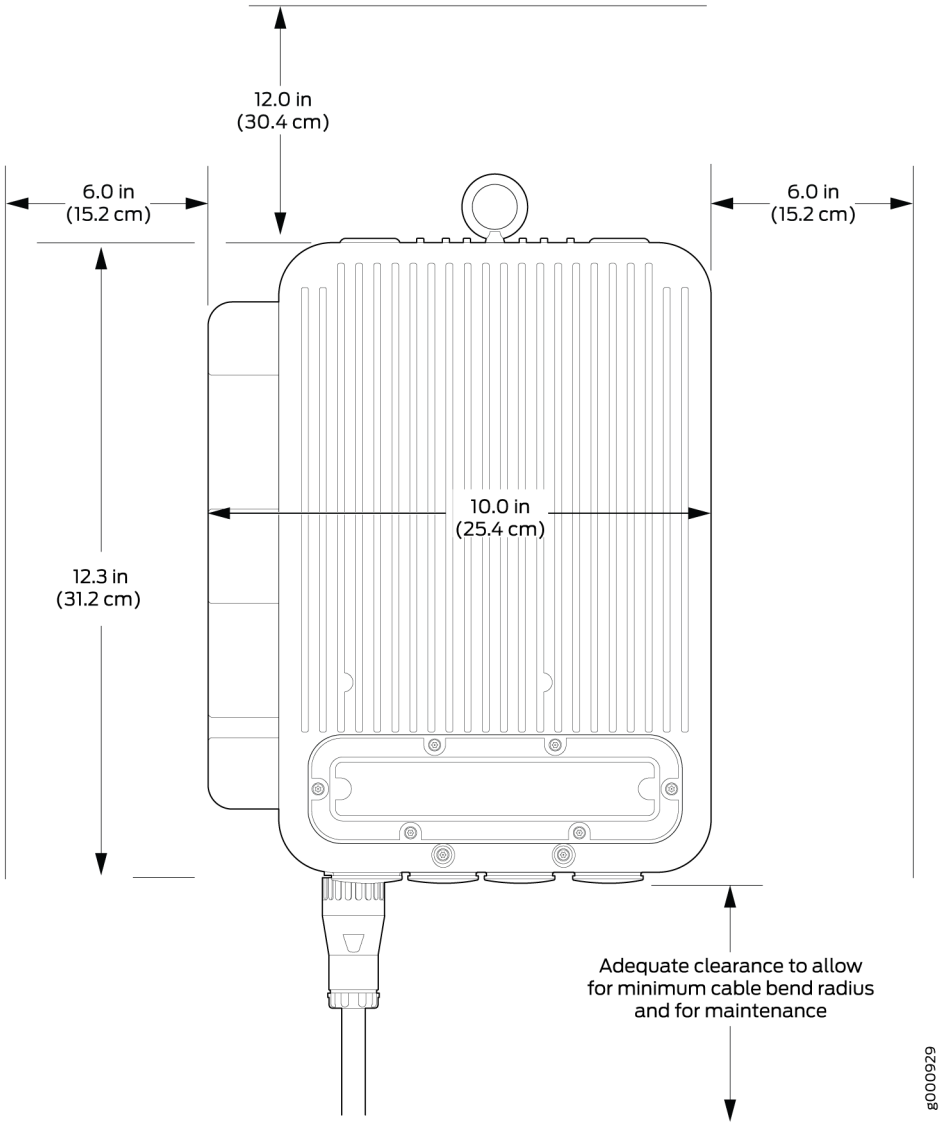
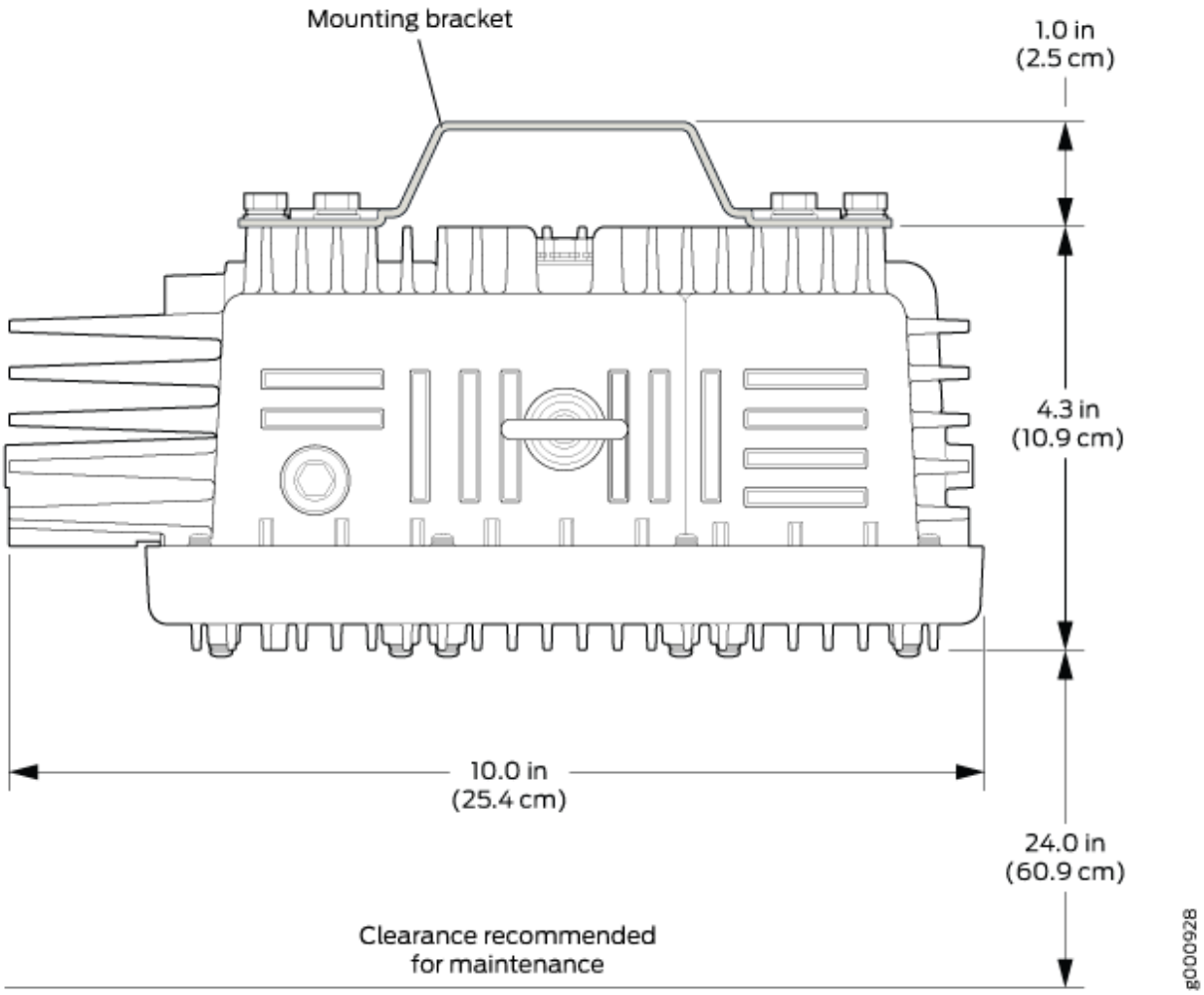


Figure 24: ACX500 Outdoor Router Chassis Dimensions and Clearance Requirements—Top View



ACX500 Outdoor Router with PoE Chassis Dimensions and Clearance Requirements

Prepare your site for installation by observing the following guidelines:

- When installing the ACX500 outdoor routers on a pole or on a wall, the chassis must be installed in a vertical orientation with the cables pointing downward and the eye bolt for hoisting the router pointing upward.

  Figure 25 on page 83 and Figure 26 on page 84 show the orientation of the ACX500 outdoor router after installation.

- When choosing a location, allow at least 6 in. (15.2 cm) of clearance between the sides of the chassis (with the router in installed position) and adjacent equipment or walls. See Figure 25 on page 83.

- Ensure that the wall or the pole onto which the router is installed is stable and securely supported.
- Ensure that the wall or pole is able to carry the load of the fully configured router.
- If you are mounting the router in wallboard with a gypsum plaster core or in wallboard not backed by wall studs, use hollow wall anchors capable of supporting the combined weight of two fully loaded chassis. Insert the screws into wall studs wherever possible to provide added support for the chassis.
- The width of the pole must be within the range of 2 in. through 16 in. for the pole-mounting brackets to fit properly.
- To mount the router, use the pole-mounting kit or the wall-mounting kit from Juniper Networks.
- One person must be available to lift the router while another secures the router.
- For service personnel to remove and install hardware components, allow at least 24 in. (60.9 cm) on top of the router. See Figure 26 on page 84.

Figure 25: ACX500 Outdoor Router with PoE Chassis Dimensions and Clearance Requirements—Front View

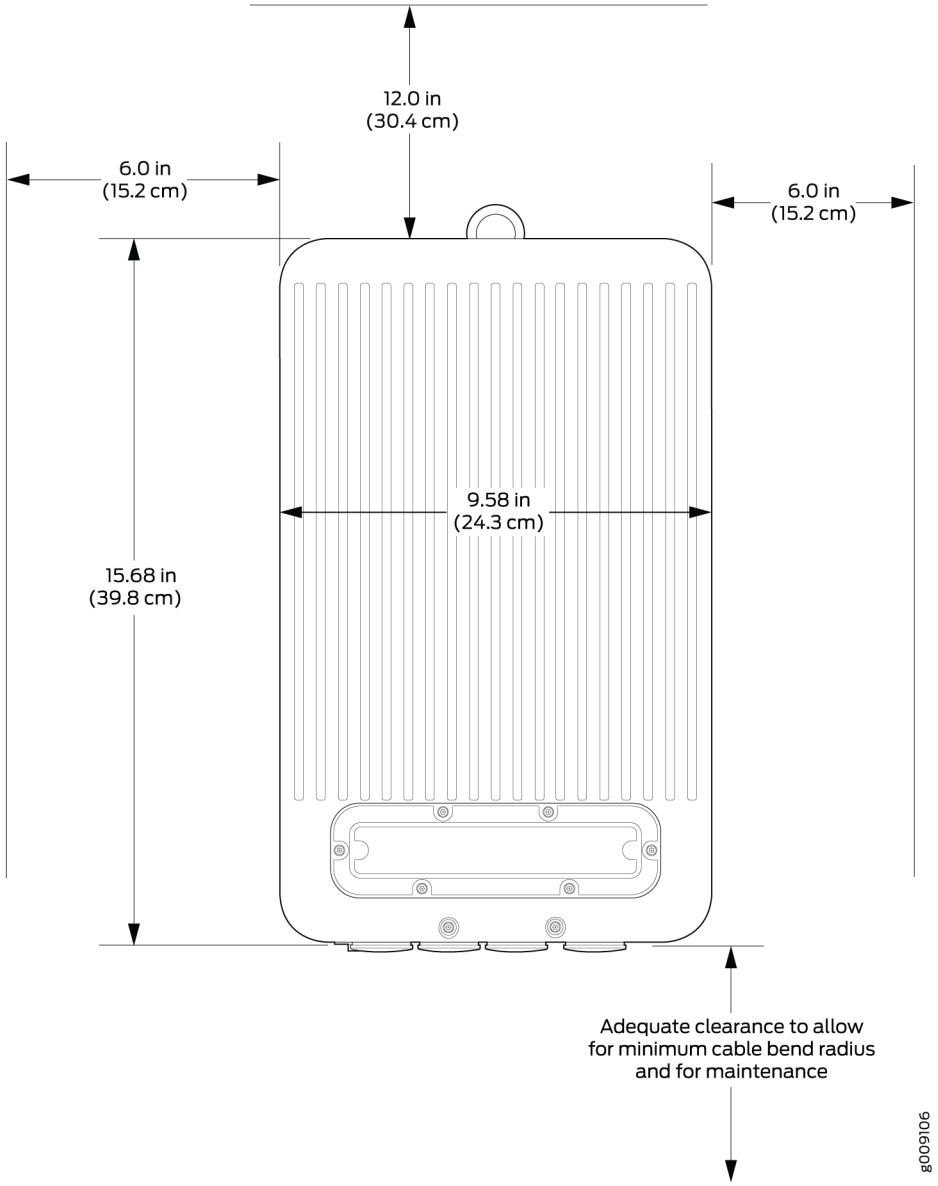
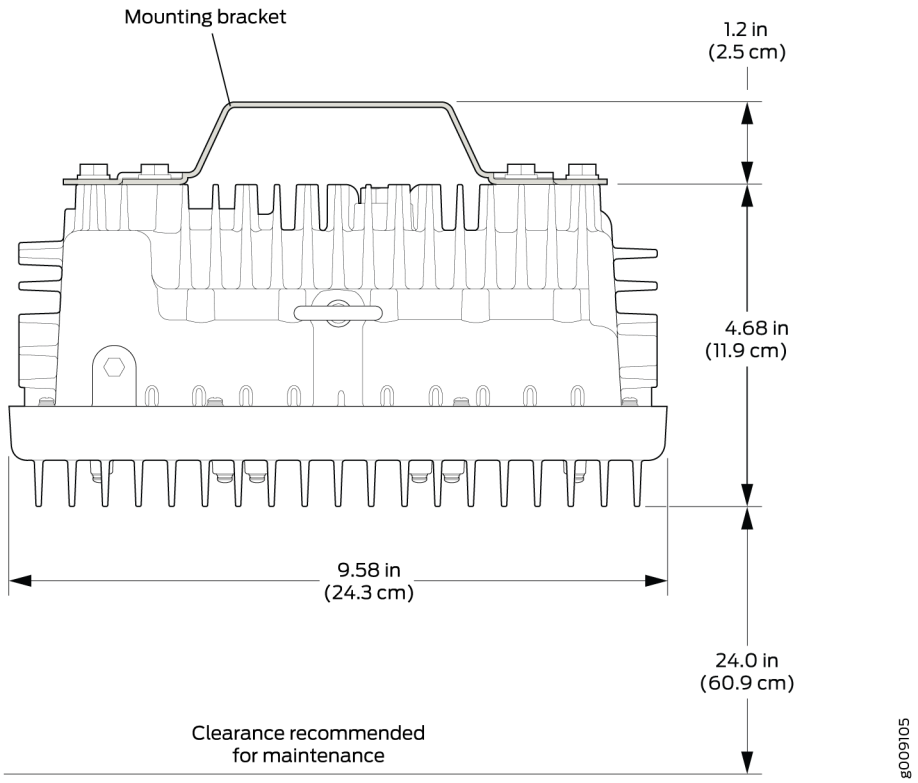


Figure 26: ACX500 Outdoor Router with PoE Chassis Dimensions and Clearance Requirements—Top View



SEE ALSO

- Site Preparation Checklist for ACX500 Routers | **74**
- ACX500 Mounting Requirements | **92**
- Cabinet Requirements for ACX500 Indoor Routers | **92**
- General Site Guidelines | **76**
- ACX500 Installation Overview | **119**

Chassis Physical Specifications for ACX500 Routers

The ACX500 router is a rigid sheet-metal structure that houses the hardware components. Table 20 on page 85, Table 21 on page 85, and Table 22 on page 85 summarize the physical specifications of the ACX500 routers.

Table 20: Physical Specifications of the ACX500 Indoor Router Chassis

Description	Value
Height	1.75 in. (4.45 cm)
Width	• 17.5 in. (44.5 cm) • 19 in. (48.2 cm) with mounting brackets attached
Depth	9.4 in. (24 cm)
Weight	8.6 lb (3.9 kg)

Table 21: Physical Specifications of the ACX500 Outdoor Router Chassis

Description	Value
Height	12.3 in. (31.24 cm)
Width	10 in. (25.4 cm)
Depth	4.3 in. (10.92 cm)
Weight	AC-powered: 18.2 lb (8.3 kg) DC-powered: 17.5 lb (7.9 kg)

Table 22: Physical Specifications of the ACX500 Outdoor Router with PoE Chassis

Description	Value
Height	16 in. (40.64 cm)
Width	10 in. (25.4 cm)

Table 22: Physical Specifications of the ACX500 Outdoor Router with PoE Chassis *(Continued)*

Description	Value
Depth	4.7 in. (11.93 cm)
Weight	AC-powered: 18.7 lb (8.5 kg) DC-powered: 18.6 lb (8.4 kg)

Table 23 on page 86 summarize the weight of the pole-mounting kit and wall-mounting kit.

Table 23: Weight of the Mounting Kits

Description	Value
Pole-mounting kit	2.8 lb (1.3 kg)
Wall-mounting kit	2.8 lb (1.3 kg)

SEE ALSO

- ACX500 Router Models

ACX500 Router Environmental Specifications

The ACX500 indoor router must be installed in a rack or cabinet housed in a dry, clean, well-ventilated, and temperature-controlled environment.

Ensure that the following environmental guidelines are followed for the ACX500 indoor router:

- 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.

- The rack or cabinet must have an adequate supply of cooling air. Allow a minimum of 1 meter/second of airflow over the ACX500 indoor router.

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

Table 24 on page 87 provides the required environmental conditions for normal operation of the ACX500 indoor and outdoor routers.

Table 24: Environmental Specifications

Description	Value
Altitude	No performance degradation up to 3,000 ft (914.4 m)
Relative humidity	Normal operation ensured in relative humidity range of 5% through 95%, noncondensing
Temperature	• Harsh environment: –40°F (–40°C) through 149°F (65°C), de-rate 1°C for every 1000 ft • Central office environment: 23°F (–5°C) through 131°F (55°C) • ACX500 outdoor router with solar loading: 114.8°F (46°C)
Commercial grade SFP temperature	• Harsh environment: 32°F (0°C) through 122°F (50°C) • Central office environment: 32°F (0°C) through 104°F (40°C)
Seismic	Designed to meet Telcordia Technologies Zone 4 earthquake requirements

Table 24: Environmental Specifications *(Continued)*

Description	Value

Configuration	• Harsh environment:
	  • PoE Power:
	  • PoE++: 65 W
	  • PoE+: 35 W
	  NOTE: Total power supported on the PoE ports of the ACX500 routers is 80W.
	  • 1GB ports: Full traffic
	  • SFP/RJ-45 ports: Full traffic
	  • SFP: Industrial grade
	• Central office environment:
	  • 1GB ports: Full traffic
	  • SFP/RJ-45 ports: Full traffic
	  • SFP: Industrial grade

ACX500 Router Grounding Specifications

IN THIS SECTION

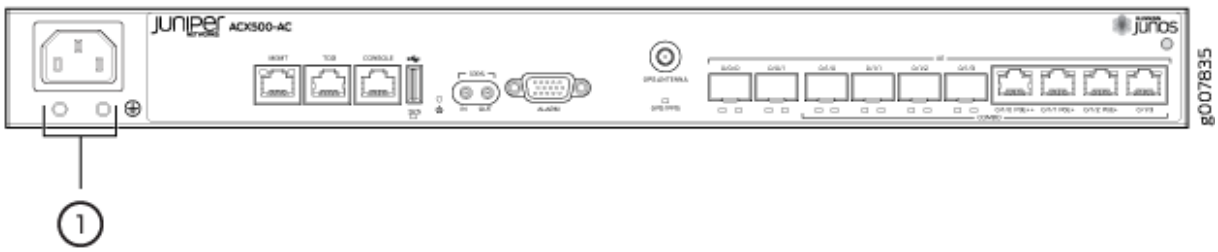
Grounding Points Specifications

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 the routers, you must connect a grounding cable to earth ground and then attach it to the chassis grounding points by using the two screws provided. Figure 27 on page 89 shows the grounding points on the ACX500 indoor router, and Figure 28 on page 90 shows the grounding points on the ACX500 outdoor router. The location of the grounding points for the ACX500 routers is the same for both the AC and the DC variants.

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 ACX500 router in a restricted-access location and ensure that the chassis is always properly grounded. The ACX500 router has a two-hole protective grounding terminal provided on the chassis. See Figure 27 on page 89 and Figure 28 on page 90. 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.

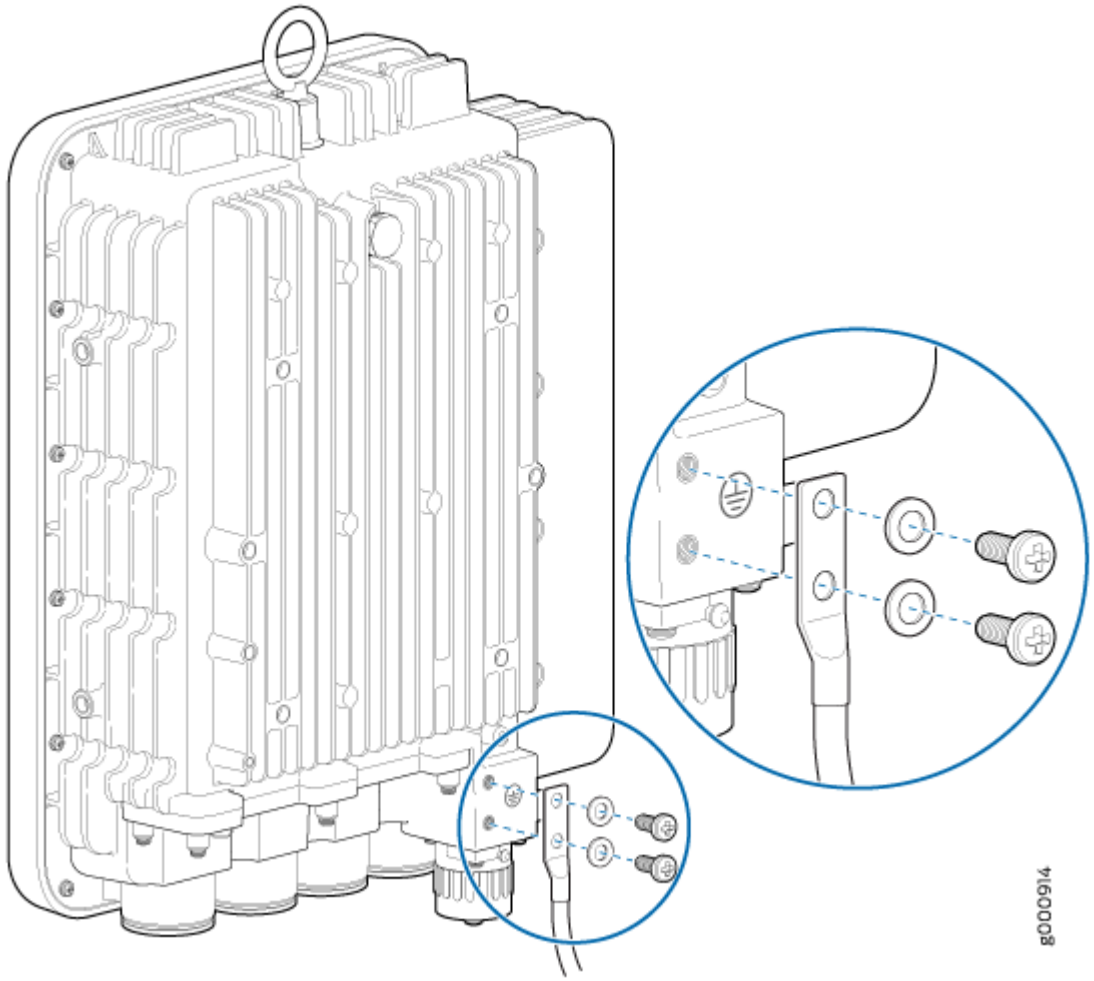
Figure 27: Grounding Points on the ACX500 Indoor Routers



1– Grounding points

NOTE: The location of the grounding points on the ACX500 is the same for both AC-powered and DC-powered models.

Figure 28: Grounding Points on the ACX500 Outdoor Router



NOTE: The location of the grounding points on the ACX500 is the same for both AC-powered and DC-powered models. The grounding point is located just below the power appliance inlet.

NOTE:

- All bare grounding connection points to the ACX500 router must be cleaned and coated with an antioxidant solution before grounding the router.
- All surfaces on the ACX500 router that are unplated must be brought to a bright finish and treated with an antioxidant solution before connecting the router.

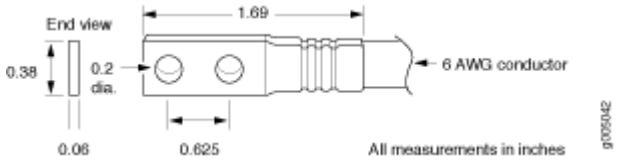
- All nonconductive surfaces on the ACX500 must be removed from all threads and connection points to ensure electrical continuity.
- All AC-powered and DC-powered ACX500 routers must be grounded.

Grounding Cable Lug Specifications

The grounding cable lug is used to secure the grounding cable to the grounding points on the ACX Series router chassis. The grounding cable lug attaches to the grounding cable (see Figure 29 on page 91) and is secured to the router by two SAE 10–32 screws of length between 0.25 in. and 0.5 in. The grounding cable lug and screws are not supplied with the router.

Use grounding lug, Panduit LCD6-10A-L or equivalent for the ACX500 indoor router, and Panduit LCCF6-14A-L for the ACX500 outdoor router (not provided).

Figure 29: Grounding Cable Lug



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

Grounding Cable Specifications

You must provide one grounding cable that meets the following specifications: 6-AWG (13.3 mm^2), minimum 90°C wire, or as required by the local code.

SEE ALSO

Connecting the ACX500 Router to Earth Ground | 152

Prevention of Electrostatic Discharge Damage | 231

ACX500 Mounting Requirements

IN THIS SECTION

Cabinet Requirements for ACX500 Indoor Routers

You can mount the indoor 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 25 on page 93 provides the cabinet requirements and specifications for the router.

Table 25: Cabinet Requirements and Specifications for the ACX500 Indoor 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 25: Cabinet Requirements and Specifications for the ACX500 Indoor 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. • When deploying the router in harsh environments, allow a 1–rack unit (U) gap above and below the router. • Minimum 1 meter/second airflow in any direction • Ensure that the cabinet allows the hot exhaust air from the chassis 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 ACX500 Indoor Router Overview | 119

Wall Requirements for ACX500 Outdoor Routers

> **NOTE**: The information provided in this topic is applicable for both the ACX500 outdoor router variants—ACX500 outdoor router and ACX500 outdoor router with PoE.

You can install the ACX500 outdoor router on a wall. When choosing a location, allow at least 6 in. (15.2 cm) of clearance between the sides of the chassis (with the router in installed position) and adjacent equipment or walls. Ensure that the wall onto which the router is installed is stable and securely supported. If you are mounting the router in sheetrock (wall board with a gypsum plaster core) or in wall board not backed by wall studs, use hollow wall anchors capable of supporting the combined weight of two fully loaded chassis. Insert the screws into wall studs wherever possible to provide added support for the chassis.

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

SEE ALSO

- ACX500 Router Models

Pole Requirements for ACX500 Outdoor Routers

> **NOTE**: The information provided in this topic is applicable for both the ACX500 outdoor router variants—ACX500 outdoor router and ACX500 outdoor router with PoE.

You can install the ACX500 outdoor router on a pole. When choosing a location, allow at least 6 in. (15.2 cm) of clearance between the sides of the chassis (with the router in installed position) and adjacent equipment or walls. Ensure that the pole onto which the router is installed is stable and securely supported. Ensure that the pole should be able to carry the load of the fully configured router. The width of the pole must be within the range of 2 in. (5 cm) through 16 in. (40.6 cm) for the pole-mounting brackets to fit properly.

Use the pole-mounting kit from Juniper Networks to mount the router on a pole. The pole-mounting kit is not part of the standard package and needs to be ordered separately.

SEE ALSO

ACX500 Router Models

Rack Requirements for ACX500 Indoor Routers

You can mount the indoor 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 26 on page 96 provides the rack requirements and specifications for the router.

Table 26: Rack Requirements and Specifications for the ACX500 Indoor 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 26: Rack Requirements and Specifications for the ACX500 Indoor 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 mounting kit separately.

SEE ALSO

Installing and Connecting an ACX500 Indoor Router Overview | 119

ACX500 Alarm and Management Cable Specifications and Pinouts

IN THIS SECTION

Alarm Contact Port Pinouts for ACX500 Routers

You can independently configure alarm input ports (0 through 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) 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 98 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 24 V to 72 V 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 24 V to 72 V 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 24 V to 72 V 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 24 V to 72 V 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)

Console Port Connector Pinout on ACX500 Routers

The port labeled **CONSOLE** on the front panel is an asynchronous serial interface that accepts an RJ-45 connector. Use a cable with the pinouts described in Table 28 on page 101 to connect the Routing Engine to a console management device.

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

Table 28: Connector Pinout for the Console Port

Pin	Signal	Description	CPU	Direction
1	RTS	Request to Send	Routing Engine	Out
2	NC	No Connect	–	–
3	TXD	Transmit Data	Routing Engine	Out
4	Ground	Signal Ground	–	–
5	Ground	Signal Ground	–	–
6	RXD	Receive Data	Routing Engine	In
7	NC	No Connect	–	–
8	CTS	Clear to Send	Routing Engine	In

Management Port Connector Pinout Information for ACX500 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 10/100/1000BASE-T connection. Two LEDs indicate link and /activity on the port and the administrative status of the port.

Table 29 on page 102 provides the pinout information for the RJ-45 connector for the management port.

Table 29: 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[2]+	In/Out
5	TRD[2]-	In/Out
6	Pin6 TRD[1]-	In/Out
7	TRD[3]+	In/Out
8	TRD[3]-	In/Out

USB Port Specifications for ACX500 Routers

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. 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 have the following features:

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

SEE ALSO

Configuring Junos OS on the ACX500 Router | 174

External Clocking Ports Specifications on ACX500 Routers

The external clocking port on the ACX500 router contains four SMB connectors that support 1 pulse-per-second (PPS) signal. 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.

SEE ALSO

Clocking Ports on ACX500 Routers | 64

ToD RS-422 and 1 PPS RS-422 Port Connector Pinout on ACX500 Routers

The port labeled **TOD** on the front panel is an asynchronous serial interface that accepts an RJ-45 connector (supports RS-422). Use a cable with the pinouts described in Table 30 on page 104 to connect the Routing Engine to a console management device.

Table 30: Connector Pinout for the TOD RS-422 and 1 PPS RS-422 Ports

RJ-45 Pin	Signals	Description	Direction
1	Reserve	No Connect	–
2	Reserve	No Connect	–
3	1PPS_OUT-	Tx 1PPS negative	Out
4	GND	RS-422 level GND	–
5	GND	RS-422 level GND	–
6	1PPS_OUT+	Tx 1PPS positive	Out
7	TX-	Tx TOD Time message negative	Out
8	TX+	Tx TOD time message positive	OUT

RELATED DOCUMENTATION

ACX500 Universal Metro Router Overview | **2**

Front Panel of an ACX500 Indoor Router | **52**

LEDs on ACX500 Routers | **58**

Alarm Contact Port on ACX500 Routers | **56**

Alarm Types and Severity Classes on ACX Series Routers | **194**

ACX500 Timing Server Specifications

IN THIS SECTION

Requirements and Specifications for Installing a GNSS Antenna

IN THIS SECTION

This section describes the guidelines and procedure for installing a global navigation satellite system (GNSS) antenna to ensure an optimal signal reception. The ACX500 routers use the GNSS signals for timing and synchronization features.

NOTE: The GNSS port and LEDs on the ACX500 router chassis are labeled **GPS**.

Consider the following guidelines before you install the GNSS antenna:

- RF site survey for antenna location
- RF environment details, such as transmission source and proximity

- Grounding plane
- Cable routing

We recommend the guidelines and procedure described in this chapter to ensure optimum GNSS signal reception for the ACX500 router.

Requirements for Installing a GNSS Antenna

This section describes the requirements to correctly install a GNSS antenna on an ACX500 router. Table 31 on page 106 lists the items that you must provide to install the GNSS antenna.

Table 31: Antenna Mounting Requirements

Item
GNSS L1/G1 antenna with a frequency band of 1575 to 1610 MHz +/-10 MHz, 3 dB bandwidth
Antenna mount that is used to secure the GNSS antenna
Mounting area clear for at least two meters of any metal or other material that could act as a shield and block the GNSS signal
360° unobstructed clear view of the sky from 15° above horizon
Clamps, cable ties, and so on, to secure cable

ACX500 Router GNSS Antenna Signal Gain Requirements

The ACX500 router requires an active GNSS antenna with built-in low-noise amplifier (LNA) for optimal performance. The LNA amplifies the received satellite signals first to compensate the loss due to the cable, and second to lift the signal amplitude to a range that is required by the receiver.

The cables and connectors that are used to connect the GNSS antenna to the receiver cause signal loss, which can be up to 13 dB. The signal gain due to the LNA amplification can be up to 30 dB.

When calculating the required signal for the router, keep in mind the loss due to the cables and connectors, and the gain due to the LNA amplification. Therefore, if the loss due to the cables and connectors is 13 dB and the LNA signal gain is 30 dB, then the signal gain available to the receiver is 17 dB. We recommend that you limit the available gain to less than 35 dB. Also, ensure that the LNA you select has a low noise profile.

The recommended range of the LNA signal gain, after compensating the loss due to the cables and connectors, at the receiver is 22 dB through 30 dB (with a minimum of 17 dB and a maximum of 35 dB).

General ACX500 GNSS Antenna Mounting and Installation Recommendations

Ideally, the GNSS antenna should be mounted where a 360° unobstructed clear view of the sky (at 15° angle from horizontal) is available to enable a connection to visible GNSS satellites. The ideal mounting location is a roof, tower, or an antenna mast, high above any obstruction or any device that can cause signal interference. We recommend a location that has the following characteristics:

- Clear unobstructed view of the sky in all directions—360° view.
- Away from high-power transmitters and radar antennas.
- At least 3 feet (1 m) away from any metallic objects, such as radio tower, other antenna mast, electrical poles, and so on.
- At least 3 feet (1 m) below the highest point of a lightning rod.
- Convenient path for running the outdoor coaxial cable from the GNSS antenna to the network.
- Install the router in compliance with the local, national, or international electrical codes:
  - United States—National Fire Protection Association (NFPA 70), United States National Electrical Code, Article 810
  - Canada—Canadian Electrical Code, Section 54
- Protect the GNSS antenna from environmental conditions such as foot traffic, standing water, and any mechanical stressor that might compromise the cable integrity. Wherever applicable, run smaller size cabling through dedicated outdoor-rated electrical conduit.

WARNING:

- Locate the GNSS antenna away from power lines, lighting systems, HVACs (heating, ventilation and air conditioning), and power circuits.
- When installing the GNSS antenna, do not touch power lines or other sources of “live” power.
- Have a qualified technician or a certified electrician perform the installation.
- Observe all local and regulatory standards and ordinances.

- Grounding the unit (metal mast or ground cable to the unit's base) is required for the lightning protection to work properly.

The ACX500 Timing Server can maintain accurate time even if an antenna is mounted in a location that has limited visibility of GNSS satellites; however, we recommend obstructions should be minimized. Limitations to satellite visibility for an antenna include overhanging foliage or tall structures. Such structures can block the GNSS signal from the antenna and cause gaps in the GNSS satellite signal reception. In locations where satellite visibility is limited, keep in mind the following guidelines:

- Position the antenna on the side of the structure with good visibility toward the equator where more satellites are visible. For example, if you are in the northern hemisphere, place the unit on the southern side of the structure unless that view is restricted or blocked. If that view is restricted or blocked, place the unit on the east or west side of the structure. Avoid the polar side where there are fewer visible satellites.
- Ensure that the GMT time zone parameter is set while you configure the Timing Server.
- To avoid any potential damage to the GNSS antenna and the router, do not install the antenna in the proximity of any transmitting RF or high-voltage power sources. This is both a hardware precaution as well as a personnel safety precaution. Follow all local building code requirements, as well as the local building electrical codes for power and grounding.
- You must mount the antenna above and away from any electrical systems such as lift mechanisms, air handlers, HVACs, and other electrical or mechanical machinery.
- The GNSS signals can be reflected by objects such as metal, walls, and shielded glass parts. Do not install the antenna near good light-reflecting surfaces. Failing to do so might result in distorted GNSS signals.
- To avoid multipath reflections, do not place the antenna near a wall, window, or other large vertical objects.
- To prevent damage from lightning, do not place the GNSS antenna at the highest point of the building.
- You must locate the GNSS antenna at least 3 feet (1 m) away from any metallic objects such as radio tower, other antenna mast, electrical poles, and so on. See Figure 30 on page 109.
- Allow at least 6 feet (2 m) of separation between GNSS antennas. See Figure 30 on page 109.
- The antenna must have an unobstructed 360° view of the sky from 15° above the horizon. See Figure 31 on page 110.
- Locate the antenna within a reasonable distance of the building cable entry point.

- Mount the antenna to any fixed surface by using the GNSS antenna mast or stanchion clamp. You may install the antenna to a vertical or horizontal surface based on the surface availability as long as the other antenna placement requirements are met.
- You must connect the GNSS antenna to a surge or lightning arrestor. The surge arrester must be near the antenna location or at the building entrance, and must be grounded to the building ground. This ensures that the antenna has a direct path to ground and is away from any sensitive electrical or electronic GNSS equipment.
- You must protect the GNSS antenna cabling from environmental conditions such as foot traffic, standing water, and any mechanical stress that might compromise or affect the cable integrity. We recommend, where applicable, to run smaller-size cabling through a dedicated outdoor-rated electrical conduit.

Figure 30: Antenna Clearance Requirement—Peripheral

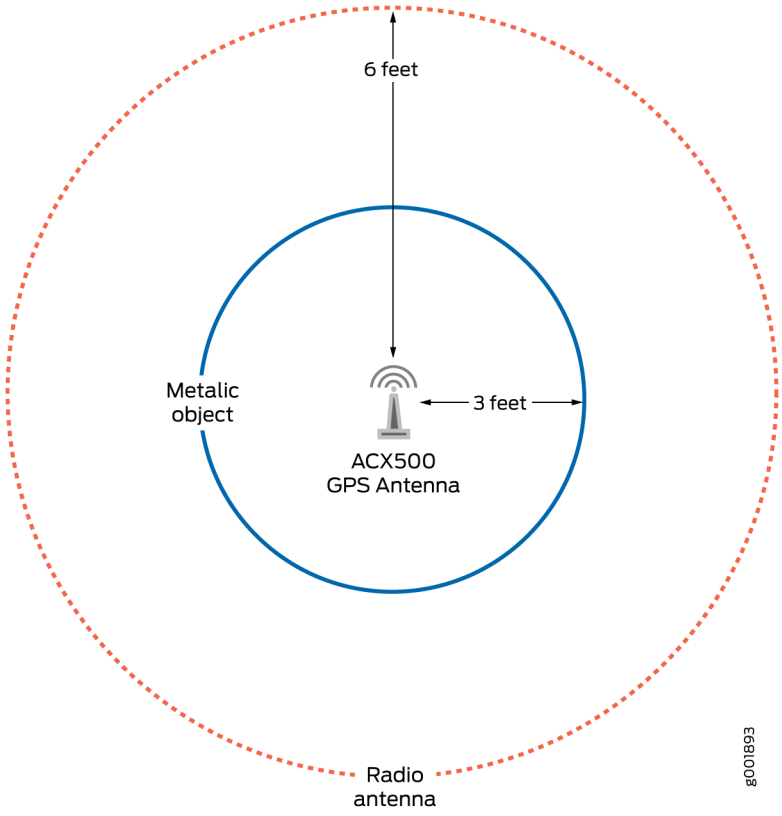
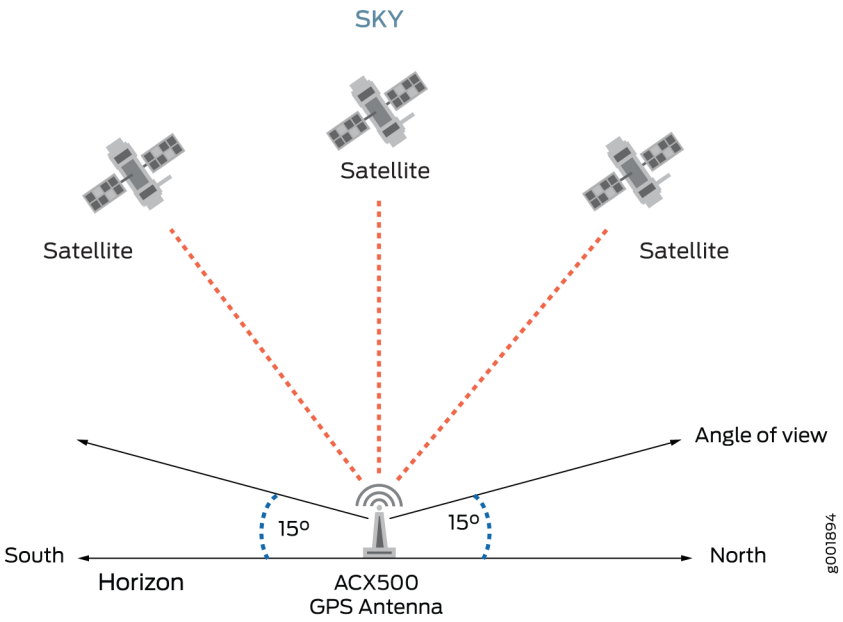


Figure 31: Antenna Clearance Requirement—Field of View



Tools and Parts Required to Install the GNSS Antenna

Table 32 on page 110 lists the parts of a standard GNSS antenna kit and other items required to install the GNSS antenna.

Table 32: Standard Antenna Parts, Tools, and Other Required Items

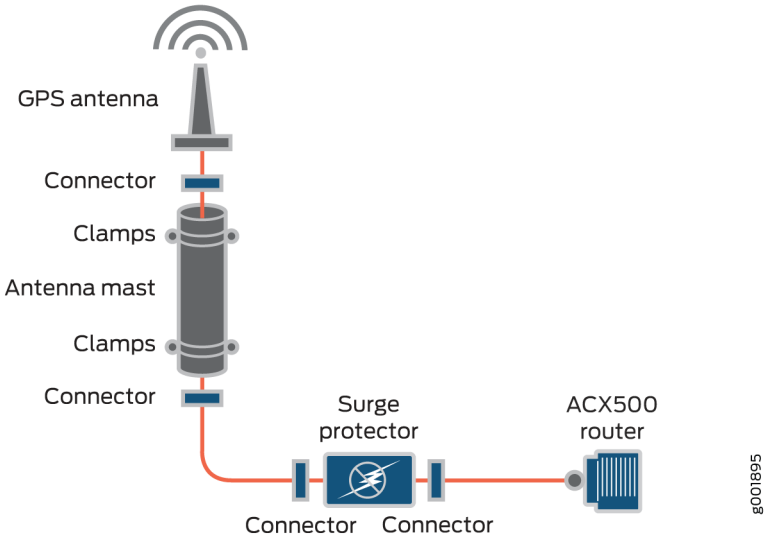
Item
GNSS L1/G1 antenna with a frequency band of 1575 to 1610 MHz +/-10 MHz, 3 dB bandwidth
Antenna mount that is used to secure the GNSS antenna
Antenna specific base adaptor
Antenna stanchion or mast
Antenna-specific cable connector
Cable continuity tester

Table 32: Standard Antenna Parts, Tools, and Other Required Items *(Continued)*

Item
Lightning arrestor and grounding strap
RF antenna installation kit
NO-OX anti-corrosion compound (for cable connections, grounding connector, and ground lugs)
Clamps, cable ties, and so on, to secure cable

Figure 32 on page 111 shows the GNSS antenna parts in a typical installation.

Figure 32: Standard GNSS Antenna Parts



Installing the ACX500 GNSS Antenna

To install the GNSS antenna, follow the guidelines specific to the selected GNSS antenna.

The following steps are part of a general procedure for installing any standard GNSS antenna:

1. Mount the antenna to any fixed surface by using the GNSS antenna mast or stanchion clamp in an area with clear and open view of the sky.
2. Route the coaxial cable from the newly installed antenna into the building following the manufacturer's antenna safety guidelines.
3. Route the coaxial cable from the building's head-end to the server's installation site, and connect it to the router's GNSS port (RF input). See "Front Panel of an ACX500 Indoor Router" on page 52 and Top View of the ACX500 Outdoor Router for the GNSS antenna port location on the ACX500 routers.
4. Verify that the router is receiving good signal through the GNSS antenna by observing the **GPA 1PPS** LED on the ACX500 router.

WARNING:

- Have a qualified technician and or certified electrician perform the installation.
- Observe all local and regulatory standards and ordinances.
- Grounding the unit (metal mast or ground cable to the unit's base) is required for the lightning protection to work properly.

WARNING: Do not install the GNSS antenna near overhead power lines or other electric light or power circuits, or where it can come into contact with such circuits. When you install the antenna, take extreme care not to come into contact with such circuits, because they might cause serious injury or death. For proper installation and grounding of the antenna, refer to local, national, and international electrical codes (for example, U.S.: NFPA 70, National Electrical Code, Article 810; Canada: Canadian Electrical Code, Section 54; and so on).

Warnung Installieren Sie die GNSS-Antenne nicht in der Nähe von Überlandleitungen oder anderen elektrischen Licht- oder Stromkreisen, wo sie mit solchen Schaltungen in Kontakt kommen können. Gehen Sie bei der Installation der Antenne mit äußerster Vorsicht vor, damit Sie mit diesen Schaltkreisen nicht in Kontakt kommen, da dies zu schweren Verletzungen oder zum Tod führen könnte. Informationen zur ordnungsgemäßen Installation und Erdung der Antenne entnehmen Sie den örtlichen, nationalen und internationalen elektrischen Richtlinien (zum Beispiel US: NFPA 70, National Electrical Code, Article 810; Kanada: Canadian Electrical Code, Abschnitt 54 usw.)

ACX500 GNSS Antenna Power Specification

Table 33 on page 113 lists the electrical power specification for the ACX500 GNSS antenna.

Table 33: Electrical Power Specifications of ACX500 GNSS Output Connector for Antenna Power

Output Current (mAmp) (I-Load)	Output Voltage (V)
45 mAmp (maximum)	Vout = 3.3 V (+/-5%) – 22 ohm x I-Load

NOTE: ACX500 GNSS output current supports only 3 V antenna voltage, which work with maximum current and supports voltage tolerance as calculated in Table 33 on page 113.

For antennas that do not have a voltage rating of 3 V DC, we recommend that you use an active splitter or amplifier as required (DC block from ACX500 and antenna power from external power source) that supports the antenna voltage.

ACX500 GNSS Antenna Surge Protection

For a roof antenna, we recommend that you provide additional surge protection in accordance to the regulations and standards for lightning protection in the country where the ACX500 router is installed.

NOTE: We recommend that you use an external first-level fast lightning protector that has clamping voltages of 15 V and 20 V.

WARNING: Make sure that grounding is available and that it meets local and national electrical codes. For additional lightning protection, use lightning rods, lightning arrestors, or surge suppressors.

Antenna Installation Verification

After installing the GNSS antenna, verify that the installation is properly done:

- Verify that all the cables and connectors are installed correctly and securely fastened. Ensure that all connectors have been protected from weather by using the latest RF cabling installation and protection guidelines.
- Verify that the GNSS antenna interface status is good in the respective GPS monitoring application. Also, verify the status of the **GPS 1PPS** LED on the ACX500 router.

- Verify that the cable service loop or the drip loop is utilized and is sufficient.
- Unlike other radio device, do not apply any tape or chemical protection to the connectors. The recommended connectors are weatherproof, and adding any protection makes the warranty void and can lead to expensive repairs.

SEE ALSO

Prevention of Electrostatic Discharge Damage | 231

Requirements and Specifications for Installing a GNSS Antenna

Requirements and Specifications for the Recommended GNSS Antenna

IN THIS SECTION

Antenna Selection Guidelines

Keep the following points in mind while selecting the appropriate GPS antenna for the ACX500 router:

- The ACX500 router requires an active GPS antenna with built-in low-noise amplifier (LNA) for optimal performance.
- The ACX500 router supports only 3 V DC voltage. For antennas that do not have a voltage rating of 3 V DC, we recommend that you use an active splitter or amplifier as required (DC block from ACX500 and antenna power from external power source) that supports the antenna voltage. See Electrical Power Specifications of ACX500 GNSS Output Connector for Antenna Power for more details on available voltage and current for 3 V antenna application.
- An active splitter or amplifier (DC block from ACX500 and antenna power from external power source) can also be inserted into the antenna path near the receiver for additional gain or added voltage support range. The use of a parasitic nonactive amplifier is not recommend.

Recommended GNSS Antenna Specifications

To use a GNSS antenna with the ACX500 router, the antenna must be a GNSS L1/G1 antenna (1575–1610 MHz). At present there are several GNSS antennas available in the market that meet the ACX500 router criteria.

We recommend that you use the following GNSS antenna with the ACX500 routers:

Trimble Bullet 38dB GPS L1 Antenna Specifications

The Trimble Bullet III GPS L1 antenna boosts the signal from the antenna with a gain of 38 dB. The antenna receives power, rated at 3.3 VDC, from the ACX500 router through the antenna's coaxial cable connections.

Table 34 on page 115 lists the Trimble Bullet GPS antenna specifications.

Table 34: Trimble Bullet 38dB GPS L1 Antenna Specifications

Parameter	Specification
Electrical Specifications	
Prime power	+3.3 VDC (+/-10%)
Power consumption	< 30 mA maximum
Gain	38 dB +/- 3 dB
Output impedance	50 ohms
Frequency	1575.42 MHz +/- 3 MHz
Polarization	Right-hand circular polarization (RHCP)
Voltage standing wave ratio (VSWR)	≤ 2.0:1
Axial ratio	< 3 dB maximum

Table 34: Trimble Bullet 38dB GPS L1 Antenna Specifications *(Continued)*

Parameter	Specification
Noise	2.0 dB (typical)
Bandwidth (10dB RL)	25 MHz (min)
Out-of-band rejection	fo = 1575.42 MHz fo +/-50 MHz: 30 dB typical fo +/-100 MHz: 40 dB typical
Azimuth coverage	360° (omnidirectional)
Elevation coverage	0° through 90° elevation (hemispherical)
Environmental Specifications	
Operating temperature	–40 °C through +90 °C
Storage temperature	–40 °C through +90 °C
Vibration	10–200 Hz log sweep
3 g (Sweep time 30 minutes)	3 axes
Shock	50 g vertical, 30 g all axes
Humidity	+60° C @ 95% RH
Corrosion	5% salt spray
Waterproof	Immersion to 1 meter
Physical Specifications	

Table 34: Trimble Bullet 38dB GPS L1 Antenna Specifications *(Continued)*

Parameter	Specification
Dimensions	3.05 in. (77.5 mm) deep × 2.61 in. (66.2 mm)high
Weight	0.44 lb (0.2 kg)
Connector	TNC (3.3 VDC)
Mounting	3/4 in. pipe thread or 1–14 in. thread

Table 35 on page 117 lists the specifications of the cable to be used with the Trimble GPS antenna.

Table 35: Antenna Cable Specification for Trimble Bullet 38dB GPS L1 Antenna

Antenna	Coaxial Cable Type	Maximum Length	Loss Budget
Trimble Bullet 38dB GPS L1 Antenna 3V (38dB gain)	LMR-240 (RG-213)	150 feet (50 meters)	10 dB/100 feet
	LMR400	300 feet (100 meters)	5.2 dB/100 feet

NOTE: Do not use coaxial cable type RG-58 for GNSS antenna. Use coaxial cable type RG-6 or the cables mentioned in Table 35 on page 117.

SEE ALSO

Prevention of Electrostatic Discharge Damage | **231**

Requirements and Specifications for the Recommended GNSS Antenna

CHAPTER 3

Initial Installation and Configuration

ACX500 Installation Overview

IN THIS SECTION

Installing and Connecting an ACX500 Indoor Router Overview

To install and connect an ACX500 indoor router:

1. Unpack the router and verify the parts received. See "Unpacking the ACX500" on page 121.
2. Install the router. See "Installing the ACX500 Indoor Router in a Rack" on page 125.
3. Ground the router. See "Connecting the ACX500 Router to Earth Ground" on page 152.
4. Connect power to the router.
   - AC-powered models—See "Connecting an AC Power Cord to the ACX500 Indoor Router" on page 157.
   - DC-powered models—See "Connecting DC Power Cables to the ACX500 Indoor Router" on page 158
5. Connect the router to external devices. See:
   - "Connecting ACX500 Routers to Management Devices" on page 169
   - "Connecting the ACX500 Router to an External Alarm-Reporting Device" on page 172
   - "Connecting the ACX500 Router to External Clocking Devices" on page 173
   - Requirements and Specifications for Installing a GNSS Antenna
6. Perform initial configuration of the router. See "Configuring Junos OS on the ACX500 Router" on page 174.

Installing and Connecting an ACX500 Outdoor Router Overview

Based on your need, you can install the ACX500 outdoor router in one of the following ways:

- "Mounting the ACX500 Outdoor Router on a Pole" on page 133 — You can mount the ACX500 outdoor router on a suitable telephone or an electrical pole with help of the pole-mounting kit. The pole-mounting kit is sold separately. It is not shipped with the ACX500 outdoor router.
- "Mounting the ACX500 Outdoor Router on a Wall" on page 128 — You can mount the ACX500 outdoor router on a suitable wall with the help of a wall-mounting kit. The wall-mounting kit is sold separately. It is not shipped with the ACX500 outdoor router.

NOTE: The information provided in this topic is applicable for both the ACX500 outdoor router variants—ACX500 outdoor router and ACX500 outdoor router with PoE.

To install and connect an ACX500 outdoor router:

1. Unpack the router and verify the parts received. See "Unpacking the ACX500" on page 121.
2. Install the router.
   - On a pole—See "Mounting the ACX500 Outdoor Router on a Pole" on page 133.
   - On a wall—See "Mounting the ACX500 Outdoor Router on a Wall" on page 128.
3. Ground the router. See "Connecting the ACX500 Router to Earth Ground" on page 152.
4. Connect power to the router.
   - AC-powered models—See "Connecting an AC Power Cord to the ACX500 Indoor Router" on page 157.
   - DC-powered models—See "Connecting DC Power Cables to the ACX500 Indoor Router" on page 158.
5. Connect and secure the interface cables to the router. See "Weatherproofing the ACX500 Outdoor Router" on page 138.
6. Connect the router to external devices. See:
   - "Connecting ACX500 Routers to Management Devices" on page 169
   - "Connecting the ACX500 Router to an External Alarm-Reporting Device" on page 172
   - "Connecting the ACX500 Router to External Clocking Devices" on page 173
7. Perform initial configuration of the router. See "Configuring Junos OS on the ACX500 Router" on page 174.

RELATED DOCUMENTATION

Site Preparation Checklist for ACX500 Routers | 74

General Site Guidelines | 76

Unpacking the ACX500

IN THIS SECTION

Unpacking the ACX500 Router

The ACX500 routers are shipped in a cardboard carton, secured with foam packing material. The carton also contains an accessory box.

CAUTION: ACX500 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 ACX500 Routers" on page 122.
7. Save the shipping carton and packing materials in case you need to move or ship the router later.

SEE ALSO

ACX500 Universal Metro Router Overview | 2

Site Preparation Checklist for ACX500 Routers | 74

Parts Inventory (Packing List) for ACX500 Routers

The ACX500 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 36 on page 122 and Table 37 on page 123 list the parts and their quantities in the packing list.

NOTE: You must provide additional mounting screws if needed that are appropriate for your rack or cabinet to mount the ACX500 indoor chassis on a rack or a cabinet.

Table 36: Parts List for an ACX500 Indoor 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	6
Quick Start installation instructions	1

Table 36: Parts List for an ACX500 Indoor Router *(Continued)*

Component	Quantity
Juniper Networks Product Warranty	1
End User License Agreement	1

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

Table 37: Parts List for an ACX500 Outdoor Router

Component	Quantity
Router with built-in power supply	1
SFP dust cover	6
Quick Start installation instructions	1
Juniper Networks Product Warranty	1
End User License Agreement	1

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

NOTE: The AC power cord or the DC power cord for the ACX500 outdoor routers is not shipped with the router. You need to purchase it separately.

Use the power cord that is purchased from Juniper Networks, and that is compatible with the ACX500 outdoor routers. Using a power cord other than that is provided by Juniper Networks with the router can damage the power terminal.

Table 38 on page 124 and Table 39 on page 124 list the parts and their quantities in the wall-mounting and pole-mounting kits required for installing the outdoor router.

NOTE: The wall-mounting and the pole-mounting kits are not provided with the router. You need to purchase the mounting kits separately.

Table 38: Parts List for the Wall-Mounting Kit

Component	Quantity
Wall-mounting bracket	1
Chassis-mounting bracket	1
Nuts	4
Screws	10
Washers	14

Table 39: Parts List for the Pole-Mounting Kit

Component	Quantity
Pole-mounting bracket	1
Chassis-mounting bracket	1

Table 39: Parts List for the Pole-Mounting Kit *(Continued)*

Component	Quantity
Nuts	4
Screws	10
Washers	14
Pole-mounting strap and screw	3

RELATED DOCUMENTATION

- ACX500 Universal Metro Router Overview | 2

Installing the ACX500 Router

IN THIS SECTION

Installing the ACX500 Indoor Router in a Rack

Ensure that you have the following parts and tools available:

- Phillips (+) screwdriver, number 2

- Two mounting brackets for front or rear mounting are shipped with the router (see Figure 33 on page 126 and Figure 34 on page 127).

NOTE: The router must be installed horizontally in a rack or cabinet. The term *rack* is used to mean *rack* or *cabinet*.

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 8.6 lb (3.9 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.

To install the router in the rack:

1. Install both mounting brackets to either the front or rear of the chassis:
   a. Align the bracket with the two sets of mounting holes.
   b. Insert the four screws at the top and bottom of the bracket, and tighten each partially.
   c. Tighten the four screws completely.
   d. Repeat the procedure for the other bracket.

Figure 33: Installing the Mounting Brackets to the Front of the ACX500 Router

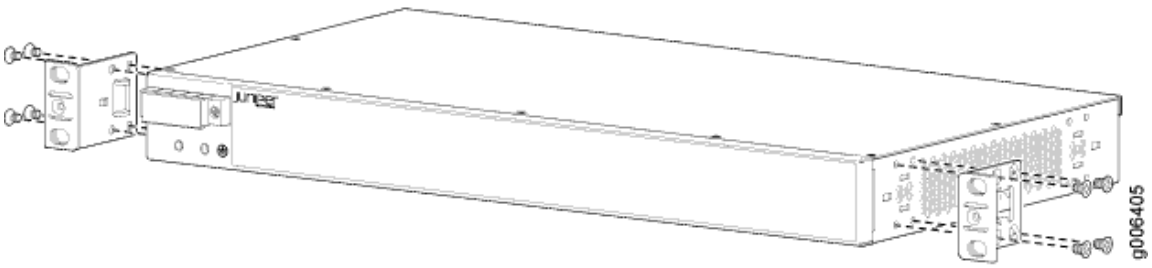
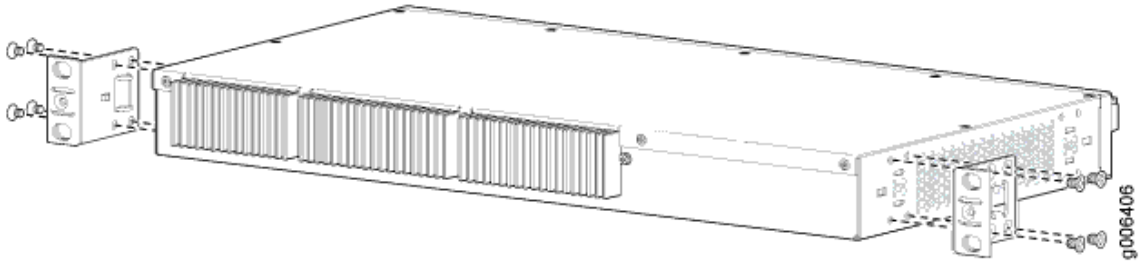


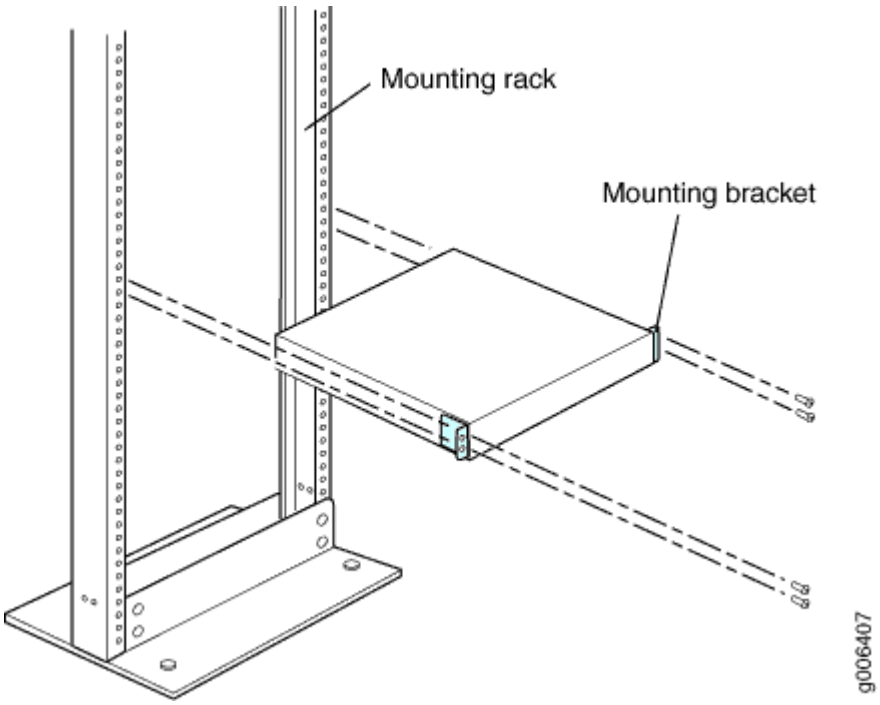
Figure 34: Installing the Mounting Brackets to the Rear of the ACX500 Router



2. 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.
3. Position the router in front of the rack or cabinet.
4. Hold onto the bottom of the chassis, and carefully lift it so that the mounting brackets contact the rack rails. See Figure 35 on page 127.

> **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.

Figure 35: Installing the ACX500 Indoor Router in the Rack



5. Align the mounting brackets with the holes in the rack rails.
6. Install a mounting screw into each of the open mounting holes on the mounting bracket aligned with the rack, starting from the bottom.
7. 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.

Mounting the ACX500 Outdoor Router on a Wall

You can mount the ACX500 outdoor router on the wall with the help of a wall-mounting kit. The ACX500 wall-mounting kit consists of two mounting brackets (one is attached to the rear of the ACX500 outdoor router and the other to the wall).

The ACX500 outdoor router meets the requirement of the International Protection Code (IP65) for dust-tight environments and ingress of water jets.

The wall on which you want to install the ACX500 outdoor router along with the wall-mounting kit must have the following:

- When installing the ACX500 outdoor routers on a wall, the chassis must be installed in a vertical orientation with the cables pointing downward and the eye bolt for hoisting the router pointing upward.
- The strength and thickness of the wall must safely support the total weight of the router chassis, including the mounting brackets and cables, and must comply with local standards and practices.
- The wall must be able to support the weight of the fully configured router (router chassis and mounting kit).

  The AC-powered ACX500 outdoor router weighs 18.2 lb (8.3 kg), and the DC-powered router weighs 17.5 lb (7.9 kg). The AC-powered ACX500 outdoor router with PoE weighs 18.7 lb (8.5 kg), and the DC-powered router with PoE weighs 18.6 lb (8.4 kg). The wall-mounting kit weighs 2.8 lb (1.3 kg).
- When choosing a location, allow at least 6 in. (15.2 cm) of clearance between the sides of the chassis (with the router in the installed position) and adjacent equipment or walls.
- Ensure that the wall is stable and securely supported.
- If you are mounting the router in wallboard with a gypsum plaster core or in wallboard not backed by wall studs, use hollow wall anchors capable of supporting the combined weight of two fully loaded chassis. Insert the screws into wall studs wherever possible to provide added support for the chassis.
- To mount the router, use the wall-mounting kit from Juniper Networks.

- The wall-mounting kit is not part of the standard package and must be ordered separately.
- For service personnel to remove and install hardware components, allow at least 24 in. (60.9 cm) on top of the router.

Ensure that you have the following parts and tools available:

- Phillips (+) screwdriver with a minimum shaft length of 6 in. (150 mm)
- 10 mm ratchet driver set
- An electrostatic discharge (ESD) grounding strap
- Wall-mounting kit (to be purchased separately)
- Based on the wall type, appropriate screws to secure the wall-mounting bracket on the wall (not provided)
- Ground label and ground lug provided with the wall-mounting kit
- Marker pen
- Drilling machine

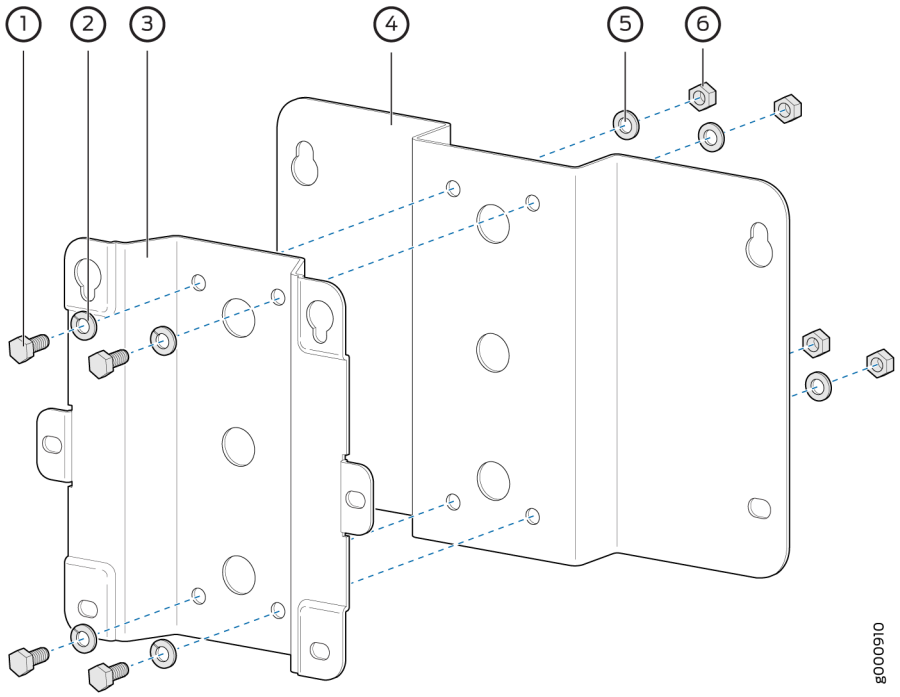
NOTE: The information provided in this topic is applicable for both the ACX500 outdoor router variants—ACX500 outdoor router and ACX500 outdoor router with PoE.

To mount the ACX500 outdoor router on a wall:

1. Attach an ESD grounding strap to your bare wrist, and connect the strap to one of the ESD points on the chassis.
2. Align and attach the chassis-mounting bracket and the wall-mounting bracket provided with the wall-mounting kit, and secure the two brackets with the set of four bracket screws, washers, and nuts. See Figure 36 on page 130.

   NOTE: Apply between 50 lb-in. (5.7 Nm) and 60 lb-in. (6.8 Nm) of torque on the screws to ensure that both the brackets are held tightly.

Figure 36: Wall-Mounting Kit



1– Screw	4– Wall-mounting bracket
2– Split washer	5– Flat washer
3– Chassis-mounting bracket	6– Nut

3. Place the joined brackets on the wall where you want to install the outdoor router with the wall-mounting bracket facing the wall, and mark the four wall-mounting screw hole points on the wall.

> **NOTE**: The router must be mounted keeping in mind the basic clearance requirement for the ACX500 outdoor router. See "Clearance Requirements for Airflow and Hardware Maintenance on ACX500 Routers" on page 78 for more information.

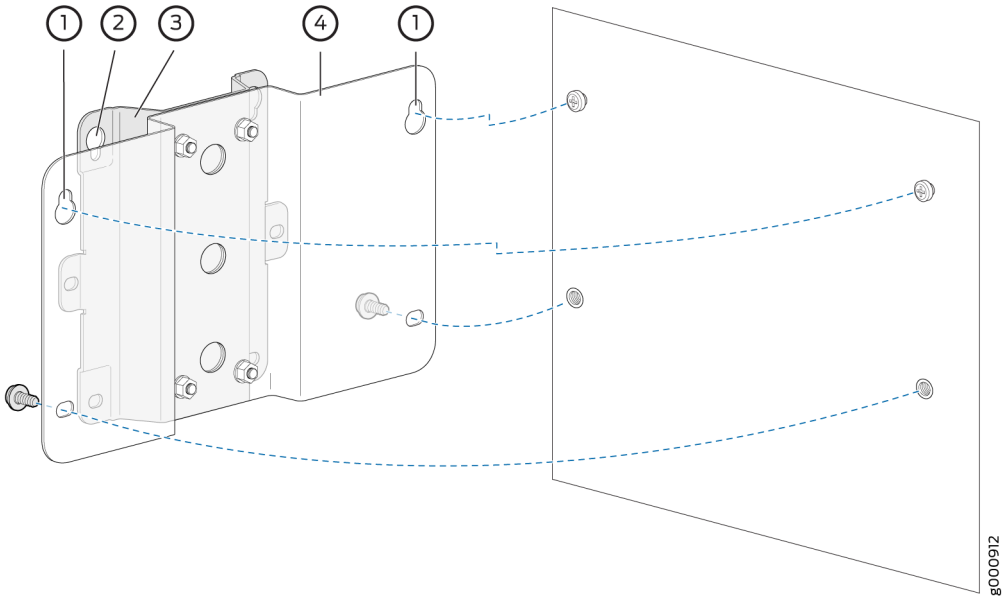
4. Remove the bracket, and drill four holes at the points marked on the wall.
5. Install mounting screws (to anchor the router) into the top two drill holes until you have 1/4 in. of the screws left.

> **NOTE**:

- The mounting screws are not provided. The size and strength of the mounting screws must safely support the total weight of the router chassis, including the mounting brackets and cables, and must comply with the local standards and practices.
- It is important to leave 1/4 in. of the screw. The keyholes on the wall-mounting bracket align with these screws and help hang the wall-mounting kit on the wall.

6. Carefully align the wall-mounting bracket keyholes of the joined brackets and hang it on the two screws that were secured on the wall in step 5. See Figure 37 on page 131.

Figure 37: Installing the Wall-Mounting Kit



1– Wall-mounting bracket keyhole	3– Chassis-mounting bracket
2– Chassis-mounting bracket keyhole	4– Wall-mounting bracket

7. Pull the wall-mounting kit gently down so that it sits tightly on the screws.
8. Insert two mounting screws onto the bottom wall-mounting holes to completely secure the wall-mounting kit to the wall.
9. Lift and carry the ACX500 outdoor router to the wall where the wall-mounting kit is attached.

   The small eye bolt at the top of the ACX500 outdoor router can be used to lift the chassis. Use an appropriate rope and lifting tool to hoist the router at the desired height.

   One person must be available to lift the router while another secures the router.
10. Insert two mounting screws on the top of the outdoor router and secure the screws.

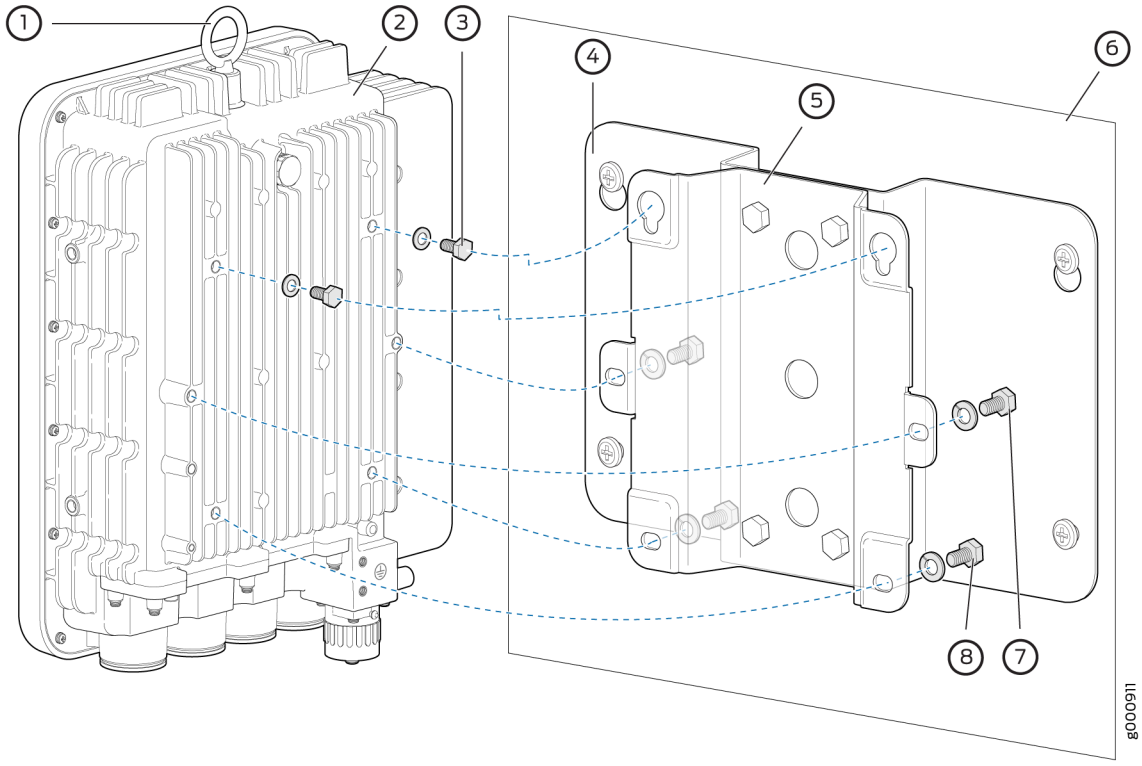
    The ACX500 outdoor router is secured onto the wall-mounting kit with the help of six screws. The top two screws are inserted first into the keyholes on the wall-mounting kit. These screws help to

first hang the router on the wall-mounting kit by taking the weight out, and when the router comfortably hangs on the unit, secure it by using the other four screws.

11. Align the router carefully and then insert the top two chassis-mounting screws attached to the router in step 10 into the chassis-mounting bracket keyholes. See Figure 38 on page 132.

> **NOTE**: Ensure that the chassis-mounting screws sit properly in the chassis-mounting bracket keyholes.

Figure 38: Installing the ACX500 Outdoor Router onto the Wall-Mounting Kit



1– Eye bolt	5– Chassis-mounting bracket
2– Router	6– Wall
3– Top chassis-mounting screw	7– Middle chassis-mounting screw
4– Wall-mounting bracket	8– Bottom chassis-mounting screw

12. After the router comfortably hangs on the wall-mounting kit, secure it by using the other four chassis-mounting screws (two screws on the middle and two on the bottom of the outdoor router).

The ACX500 outdoor router is now securely mounted on the wall and ready to use. Connect the power supply and cabling as required.

Mounting the ACX500 Outdoor Router on a Pole

You can mount the ACX500 outdoor router on a pole with the help of a pole-mounting kit. The ACX500 pole-mounting kit consists of two mounting brackets (one is attached to the rear of the ACX500 outdoor router and the other to the pole), 5/8-in. through bolts, and pole straps.

The ACX500 outdoor router meets the requirement of the International Protection Code (IP65) for dust-tight environments and ingress of water jets.

The pole on which you want to install the ACX500 outdoor router along with the pole-mounting kit must satisfy the following requirements:

- When installing the ACX500 outdoor router on a pole, the chassis must be installed in a vertical orientation with the cables pointing downward and the eye bolt for hoisting the router pointing upward.
- The strength and thickness of the pole must safely support the total weight of the router chassis, including the mounting brackets and cables, and must comply with local standards and practices.
- The pole must be able to support the weight of the fully configured router (router chassis and mounting kit).

  The AC-powered ACX500 outdoor router weighs 18.2 lb (8.3 kg), and the DC-powered weighs 17.5 lb (7.9 kg). AC-powered ACX500 outdoor router with PoE weighs 18.7 lb (8.5 kg), and the DC-powered router weighs 18.6 lb (8.4 kg). The pole-mounting kit weighs 2.8 lb (1.3 kg).
- Ensure that the pole is stable and securely supported.
- The width of the pole must be within the range of 2 in. through 16 in. to hold the pole-mounting kit.
- To mount the router, use the pole-mounting kit from Juniper Networks.

Ensure that you have the following parts and tools available:

- Phillips (+) screwdriver with a minimum shaft length of 6 in. (150 mm)
- 10 mm ratchet driver set
- An electrostatic discharge (ESD) grounding strap
- Pole-mounting kit (to be purchased separately)
- Ground label and ground lug provided with the pole-mounting kit

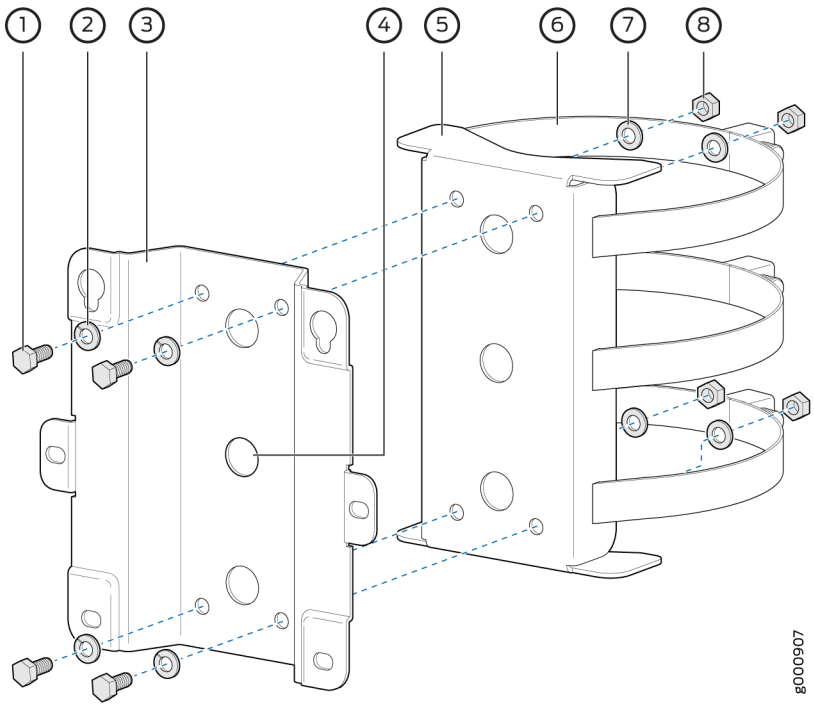
NOTE: The information provided in this topic is applicable for both the ACX500 outdoor router variants—ACX500 outdoor router and ACX500 outdoor router with PoE.

To mount the ACX500 outdoor router on a pole:

1. Attach an ESD grounding strap to your bare wrist, and connect the strap to one of the ESD points on the chassis.
2. Align and attach the chassis-mounting bracket and the pole-mounting bracket provided with the pole-mounting kit, and secure the two brackets with the set of four bracket screws, washers, and nuts. See Figure 39 on page 134.

NOTE: Apply between 50 lb-in. (5.7 Nm) and 60 lb-in. (6.8 Nm) of torque on the screws to ensure that both the brackets are held tightly.

Figure 39: Pole-Mounting Kit

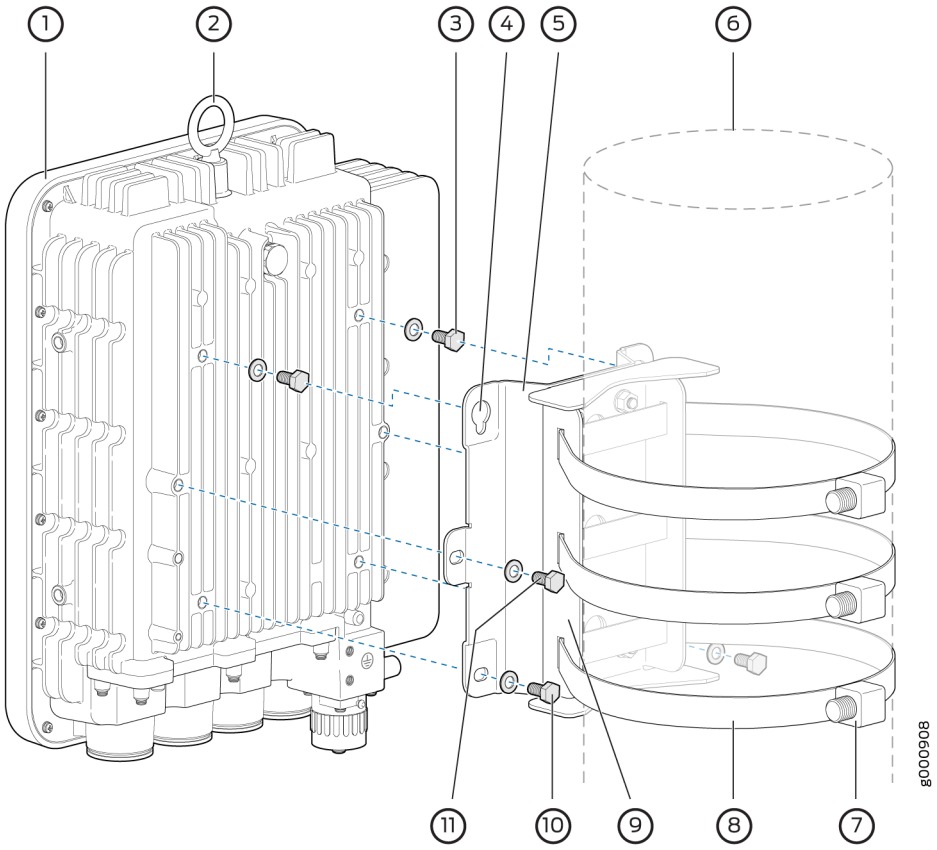


1– Screw	5– Pole-mounting bracket
2– Split washer	6– Pole-mounting straps
3– Chassis-mounting bracket	7– Flat washer

4– Hole for through bolt	8– Nut

3. Insert the pole-mounting straps through the pole-mounting strap holes on the pole-mounting bracket. See Figure 40 on page 135.

Figure 40: Installing the ACX500 Outdoor Router onto the Pole-Mounting Kit



1– Router	7– Pole-mounting strap screw
2– Eye bolt	8– Pole-mounting strap
3– Top chassis-mounting screw	9– Pole-mounting bracket
4– Chassis-mounting bracket keyhole	10– Bottom chassis-mounting screw
5– Chassis-mounting bracket	11– Middle chassis-mounting screw
6– Pole	

4. Place the joined brackets on the pole where you want to install the ACX500 outdoor router with the pole-mounting bracket facing the pole, and secure the joined brackets with the three 5/8-in. through bolts provided.

   The three holes present on the pole-mounting brackets are for the through bolts.

5. Wrap the pole-mounting straps across the pole, and secure the straps with the pole-mounting strap screws.

   NOTE: Apply 20 lb-in. (2.3 Nm) of torque on the screws to ensure that both the brackets are held tightly.

6. On the bottom of the router (that is, the surface that will face the pole), secure two keyhole mounting screws in to the top two chassis-mounting screw holes.

   The ACX500 outdoor routers has six screw holes at the bottom of the chassis—two on top, two on center, and two on bottom. The center and bottom screw holes are for normal screws while the top screw holes are for keyhole screws.

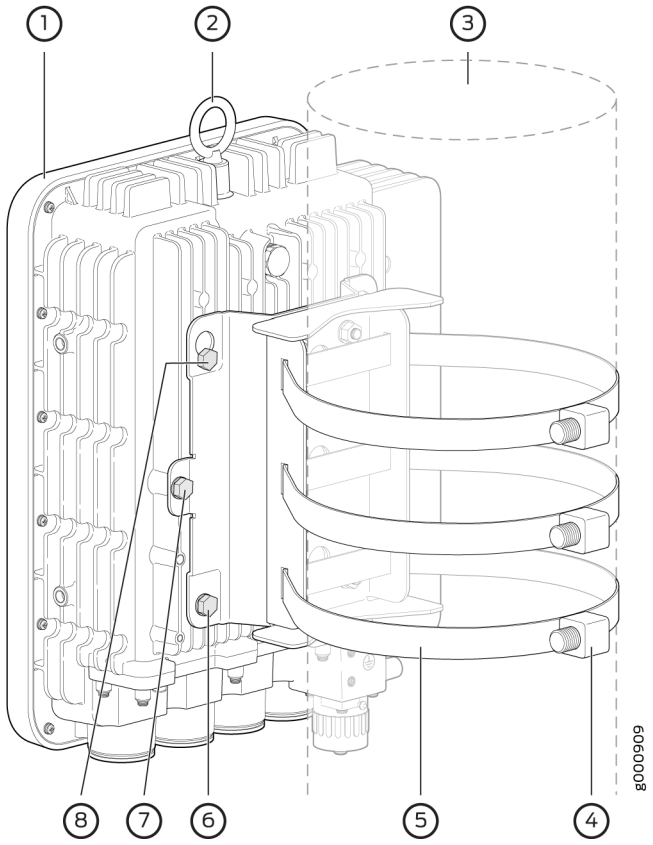
   NOTE: Ensure that the top two chassis-mounting screws are secured tightly in to the chassis as these screws will hold the entire weight of the chassis initially when attached to the wall.

7. Lift and carry the ACX500 outdoor router to the pole where the pole-mounting kit is attached. See Figure 41 on page 137.

   The small eye bolt at the rear of the ACX500 outdoor router can be used to lift the chassis. Use an appropriate rope and lifting tool to hoist the router at the planned height.

   One person must be available to lift the router while another secures the router.

Figure 41: Securing the ACX500 Outdoor Router on the Pole



1– Router	5– Pole-mounting strap
2– Eye bolt	6– Bottom chassis-mounting screw
3– Pole	7– Middle chassis-mounting screw
4– Pole-mounting strap screw	8– Top chassis-mounting screw

8. Align and insert the top two chassis-mounting screws attached to the router in step 6 into the chassis-mounting bracket keyholes.

> **NOTE**: Ensure that the chassis-mounting screws sit properly in the chassis-mounting bracket keyholes.

9. Insert and secure the router by using the center and bottom chassis-mounting screws.
10. Tighten the screws to secure the ACX500 outdoor router to the pole-mounting kit.

The ACX500 outdoor router is now securely mounted on the pole and ready for use. Connect the power supply and cabling as required.

Weatherproofing the ACX500 Outdoor Router

IN THIS SECTION

NOTE: The information provided in this topic is applicable for both the ACX500 outdoor router variants—ACX500 outdoor router and ACX500 outdoor router with PoE.

Weatherproofing Overview

The ACX500 outdoor router meets the requirement of the International Protection Code (IP65) for dust-tight environments and ingress against water jetting environment.

To protect the router's inner components from external environmental factors, the router is environmentally hardened and the chassis is ruggedized. The router is fanless and ventless, and supports passive cooling for outdoor deployments in extreme weather conditions.

Ensure that you have the following parts available:

- Cable connector units (provided)
- Hex screwdriver
- Slotted screwdriver

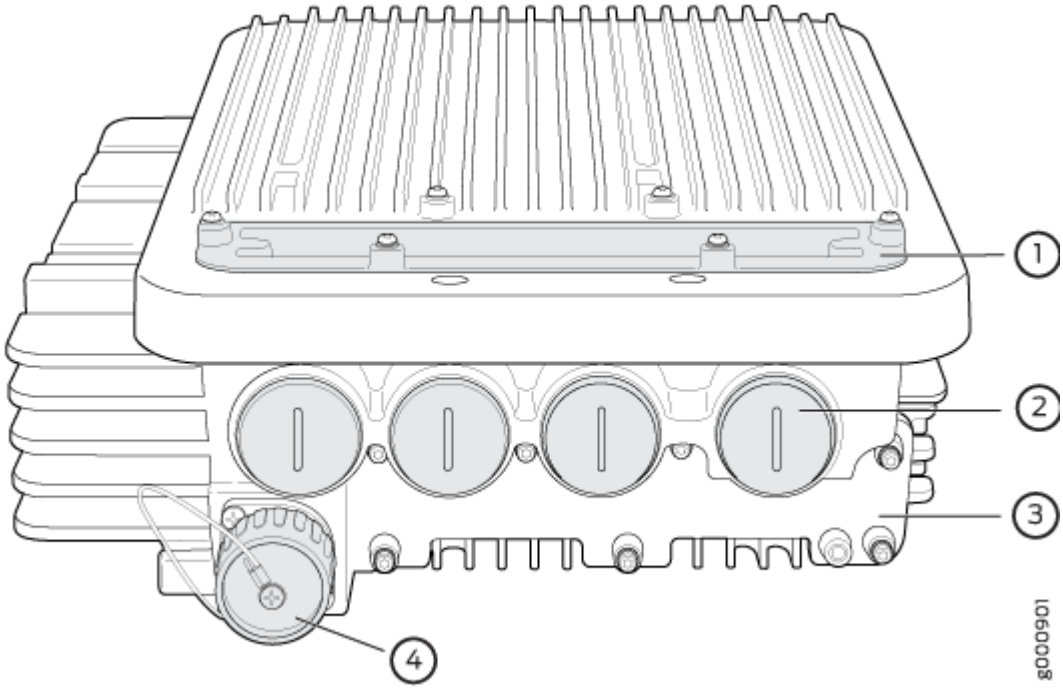
There are two parts to securing and weatherproofing the ACX500 outdoor router—weatherproofing the interface ports and cables, and weatherproofing the management components.

The interface cables are arranged inside the cable connector unit (see Figure 15 and Figure 19), which makes them waterproof and dustproof. The metal interface and management port covers on the router lock and seal the respective port chambers from external environmental factors.

NOTE: The ACX500 outdoor router do not power on if the interface and the management port chambers are open. Ensure that the interface and the management port chambers are closed before you power on the router. This is an IP65 requirement for weatherproofing the router.

Figure 10 shows the ACX500 outdoor router along with the weatherproofing caps, also called weather seal caps. The figure also shows the weatherproofing port covers, also called weather seal covers, protecting the interface and management port components from external environment.

Figure 42: Interface Port and Cable Inlet Cover



1– Interface port chamber with weather seal cover	3– Management port chamber with weather seal cover
2– Cable connector ports with weather seal cap	4– Power port with weather seal cap

To know which components are housed inside the interface and the management port covers, see Front Panel of an ACX500 Outdoor Router.

Accessing and Weatherproofing the Interface Ports

IN THIS SECTION

In the ACX500 outdoor router, all the interface ports (Gigabit Ethernet SFP and RJ-45 ports) are located in a small chamber on the front top of the router. You can access the interface ports to install the transceivers and check LED status through this interface port chamber. The metal cover locks and seals the chamber from external environmental factors. See Figure 10.

Weatherproofing the Interface Ports—Gigabit Ethernet SFP

To access and weatherproof the Gigabit Ethernet SFP interface ports and cables:

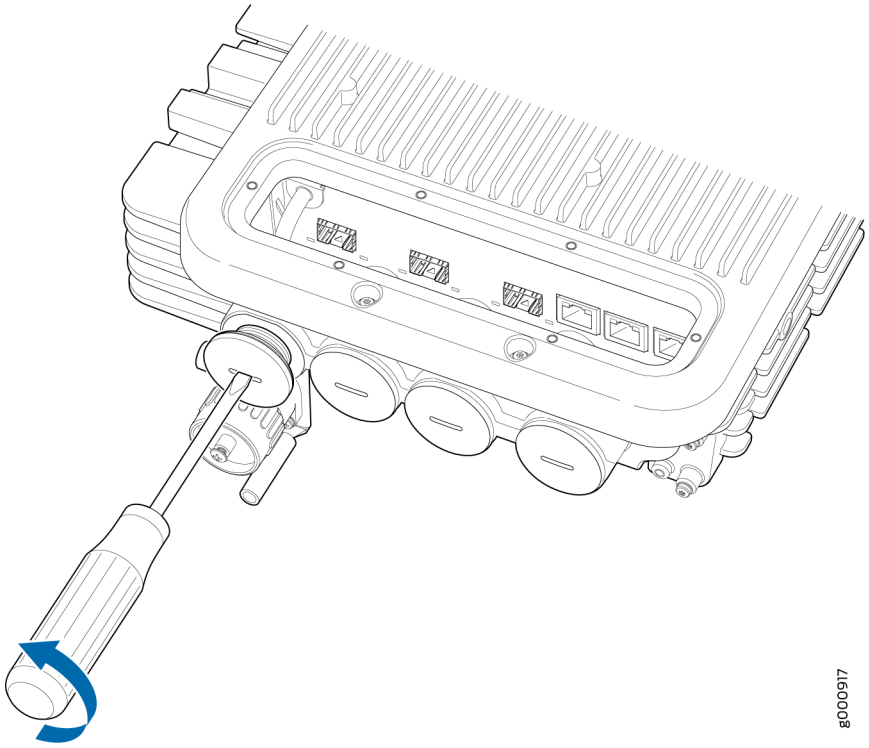
1. Unscrew and remove the six screws from the metal cover on top of the router that covers the interface port chamber. Keep the screws for later use.

   In Figure 10 from left to right, the first three cable connector inlets are for the three Gigabit Ethernet ports supporting SFP transceivers. The fourth inlet is for the cables for the three Gigabit Ethernet RJ-45 ports.

2. Remove the weather seal cap from the cable inlet port on the router by using a slotted screwdriver. See Figure 11. Keep the weather seal cap in a safe place for future use.

   The weather seal caps prevent dust and water from entering into the router when the router or the interface port is not in use.

Figure 43: Removing the Weather Seal Cap



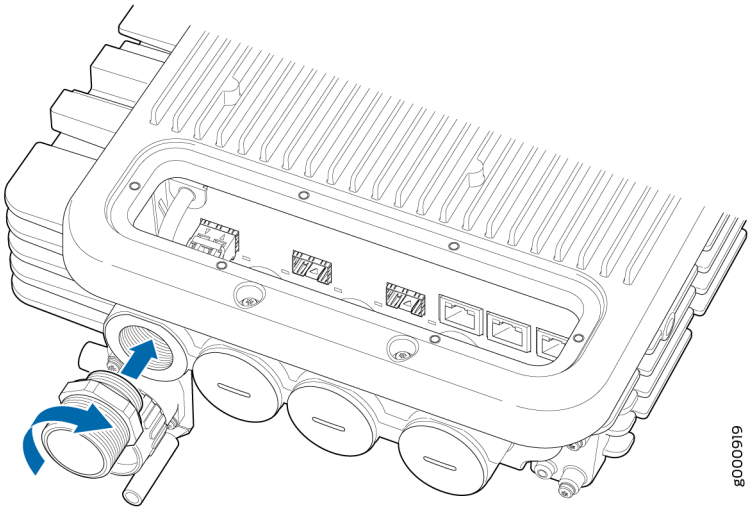
WARNING: Ensure that you have the weather seal caps on the cable inlet ports that are not in use. Failing to do so might allow water and dust to enter the router, resulting in router failure.

3. Unscrew and remove the corresponding cable connector unit from the cable inlet port. See Figure 12.

   The cable connector unit consists of three components—the outer connector enclosure, the connector screw, and the cable seal. The front end of the outer cable connector enclosure is from where the interface cable enters the router, and the rear end with screw thread connects directly to the chassis cable port on the router. The connector screw houses a rubber cable seal, and screws fit tightly in the cable connector enclosure. The cable seal is a small cylindrical rubber structure with grooves or holes for the cables to pass through. The cable seal sits tightly in the connector screw and prevents water and dust particles from entering the router.

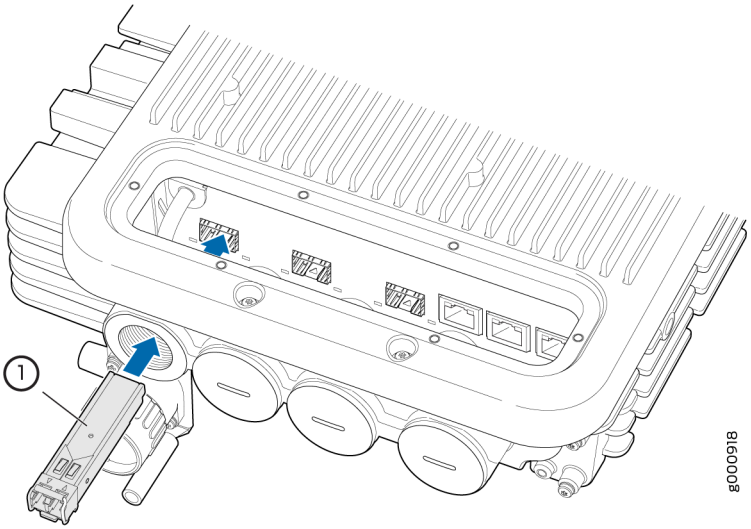
   NOTE: The cable seal with single groove must be used for the SFP cables, and that with three grooves must be used for the RJ-45 cables.

Figure 44: Removing the ACX500 Outdoor Router Cable Connector Unit



4. Carefully align the transceiver with the cable inlet hole of the SFP port where you want to insert the interface cable, and slide the transceiver until the connector is seated in the corresponding port. See Figure 13.

Figure 45: Installing a Transceiver on the ACX500 Outdoor Router



1– Transceiver

To install a transceiver:

a. Take each transceiver to be installed out of its electrostatic bag, and identify the slot on the component where it will be installed.

b. Verify that each transceiver is covered by a rubber safety cap. If it is not, cover the transceiver with a safety cap.

c. Carefully align the transceiver with the slots in the component. The connectors must face the component.

d. Slide the transceiver until the connector is seated in the component slot. If you are unable to fully insert the transceiver, make sure that the connector is facing the right way.

e. Close the ejector handle of the transceiver.

5. Remove the cable seal from the cable connector unit (also known as cable gland unit) by loosening the connector screw and pushing the cable seal out. See Figure 15. Keep the cable seal and the cable connector unit for later use.
6. Pass the interface cable through the front end of the outer cable connector enclosure.

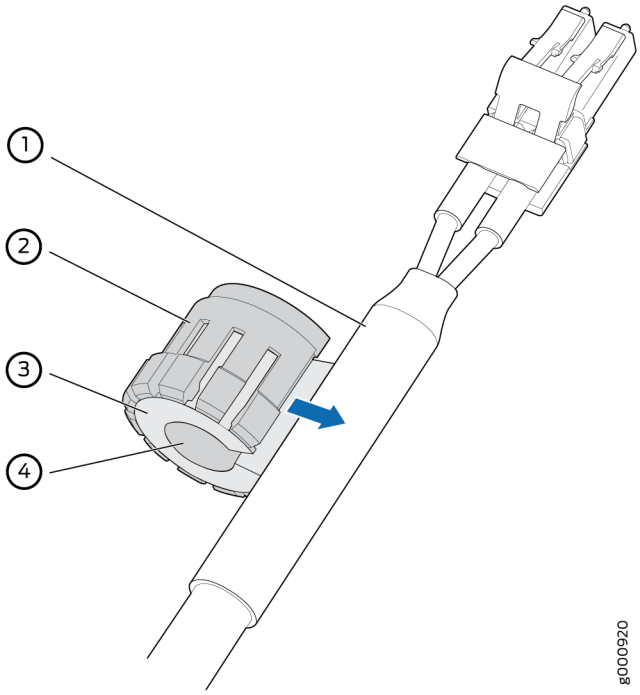
> **NOTE**: Ensure that you use an outdoor installation rated and IP65-compliant waterproof fiber-optic cable with an outer diameter of 10 mm for the SFP ports, and that with an outer diameter of 6.5 mm for the RJ-45 ports for the ACX500 outdoor routers.

7. Slide the interface cable up to at least 2 in. (5.08 cm) into the cable seal groove. See Figure 14.

The groove in the cable seal has slits that help push the cables easily into the groove.

> **NOTE**:
>
> - The cable seal with single groove must be used for the SFP interface cables, and the one with three grooves must be used for the RJ-45 interface cables.
> - Ensure that each groove on the rubber cable seal accommodates only one cable through it.
> - Leave at least 2 in. (5.08 cm) of interface cable for connecting it to the transceiver.

Figure 46: Installing the ACX500 Outdoor Router Cable Seal on the Interface Cable

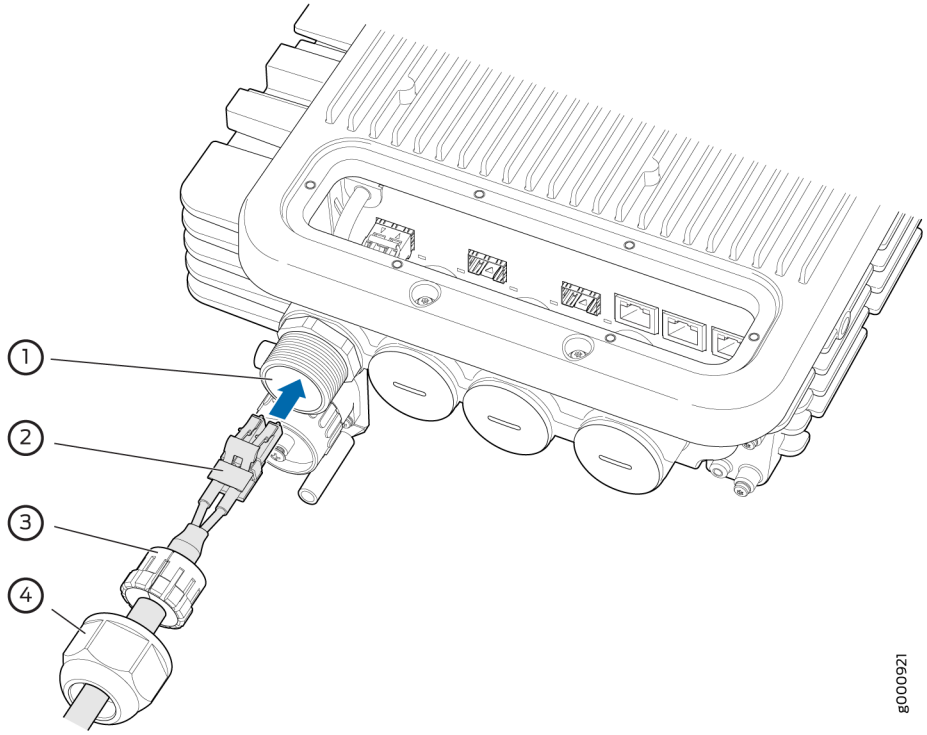


1– Interface cable	3– Rubber cable seal with groove
2– Outer cover of cable seal	4– Hole-plugs

8. Push back the cable seal enclosing the interface cable back into the cable connector unit. See Figure 15.

   The connector enclosure connects directly to the router's cable inlet port. The cable seal wraps the interface cable and, along with the connector screw on top of it, makes the whole unit watertight and dustproof.

Figure 47: ACX500 Outdoor Router Cable Connector Unit

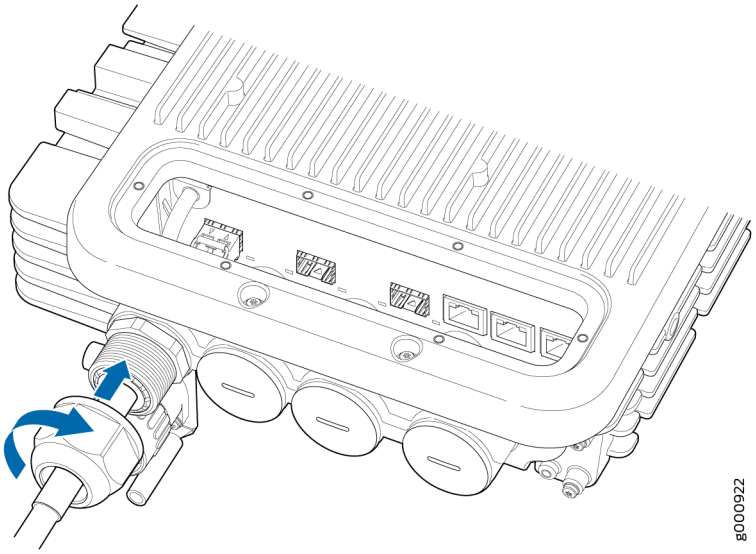


1– Connector enclosure	3– Cable seal
2– Interface SFP cable	4– Connector screw

9. Push the connector screw back on top of the cable seal until the whole unit fits tightly.
10. Tighten the connector screw's thread end along with the cable seal inside it back into the connector enclosure port on the router. See Figure 16.

    Pull the cable with a torque of 16 lb-in. (1.8 Nm) to ensure that the cable sits tightly inside the cable connector unit. Also, visually examine the cable and the groove to ensure that there is no gap left, and that the cable sits properly in the groove.

Figure 48: Installing the ACX500 Outdoor Router Connector Screw



11. Repeat steps 3 through step 10 for the remaining interface cables, as required.
12. Insert the interface cables into the respective transceivers. See "Replacing a Fiber-Optic Cable" on page 186. Use the interface port chamber to snap in the SFP cable into the transceiver.
13. Verify that the status LEDs on the front panel indicate that the transceiver is functioning correctly. For more information about the component LEDs, see "LEDs on ACX500 Routers" on page 58.
14. Replace the metal cover of the interface port chamber back to its original place, and secure it with the six screws that were removed in step 1.

> **NOTE**: Ensure that the metal cover sits tightly on top of the router. Failing to do so might allow dust and water to enter the router.

The Gigabit Ethernet SFP ports are now weatherproof and are ready to use.

Weatherproofing the Interface Ports—Gigabit Ethernet RJ-45

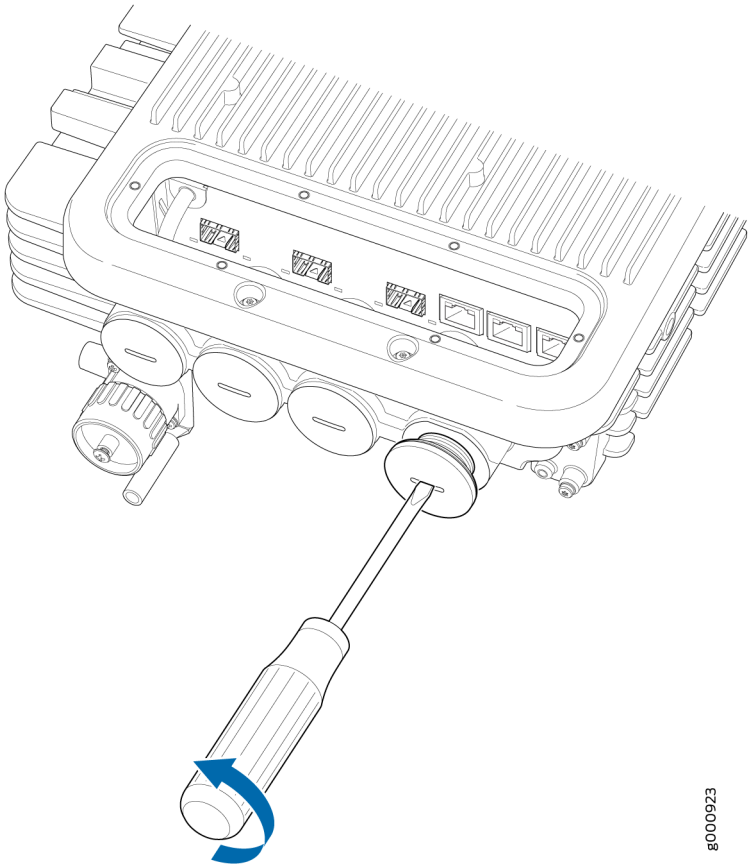
To access and weatherproof the Gigabit Ethernet RJ-45 interface ports and cables:

1. Unscrew and remove the six screws from the metal cover on top of the router that covers the interface port chamber. Keep the screws for later use.

   As shown in Figure 10 from left to right, the first three cable connector inlets are for the three Gigabit Ethernet ports supporting SFP transceivers. The fourth inlet is for the cables for the three Gigabit Ethernet RJ-45 ports.
2. Remove the weather seal cap from the cable inlet port on the router by using a slotted screwdriver. See Figure 17. Keep the weather seal cap in a safe place for future use.

Weather seal caps prevent dust and water from entering the router when the router or the interface port is not in use.

Figure 49: Removing the ACX500 Outdoor Router Weather Seal Cap



WARNING: Ensure that you have the weather seal caps on the cable inlet ports that are not in use. Failing to do so might allow water and dust to enter the router resulting in router failure.

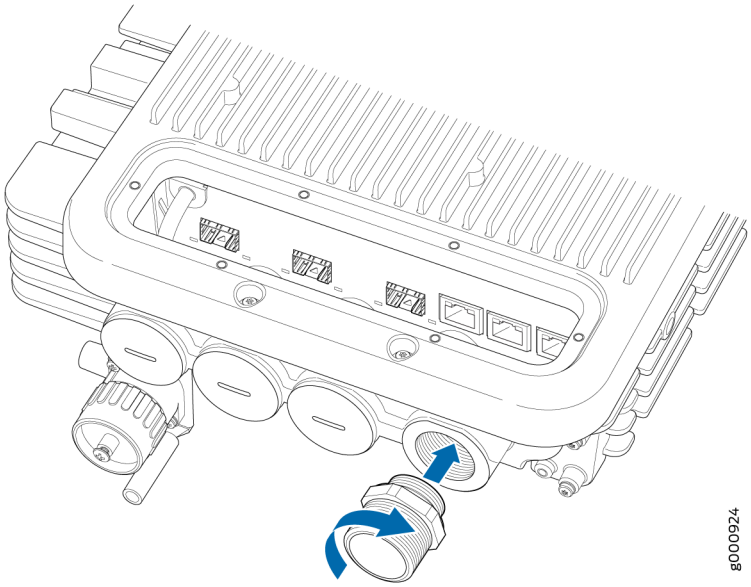
3. Unscrew and remove the corresponding cable connector unit from the cable inlet port. see Figure 18.

   The cable connector unit consists of three components—the outer connector enclosure, the connector screw, and the cable seal. The front end of the outer cable connector enclosure is from where the interface cable enters the router, and the rear end with screw thread connects directly to the chassis cable port on the router. The connector screw houses the rubber cable seal, and the screw fits tightly in the cable connector enclosure. The cable seal is a small cylindrical rubber

structure with grooves or holes for the cables to pass through. The cable seal sits tightly in the connector screw and prevents water and dust particles from entering the router.

NOTE: The cable seal with single groove must be used for the SFP cables, and that with three grooves must be used for the RJ-45 cables.

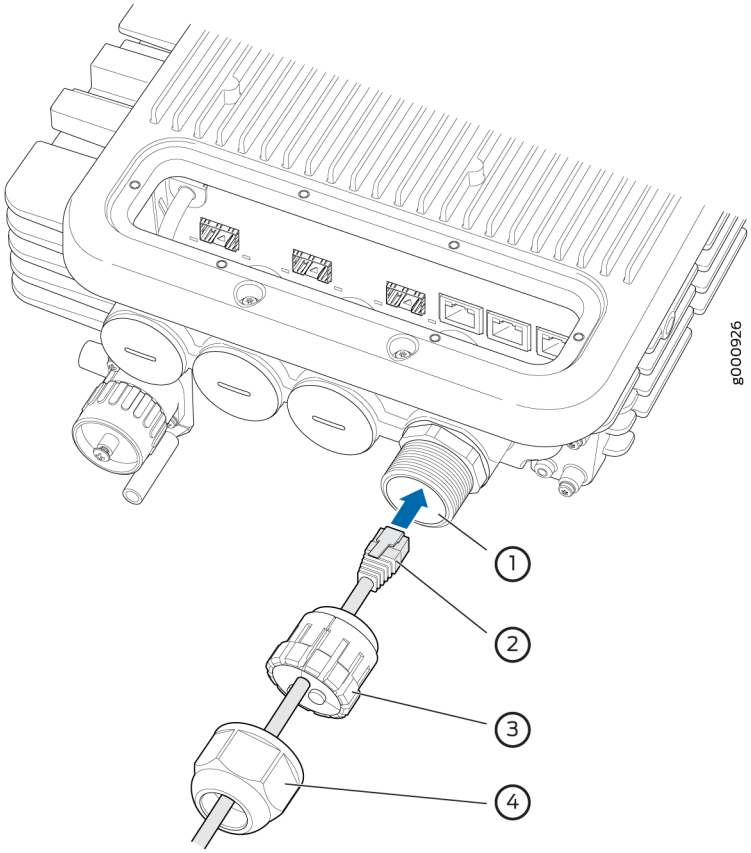
Figure 50: Removing the Cable Connector Unit



4. Remove the cable seal from the cable connector unit (also known as cable gland unit) by loosening the connector screw and pushing the cable seal out. See Figure 19. Keep the cable seal and the cable connector unit for later use.
5. Pass the interface cable through the front end of the outer cable connector enclosure.

NOTE: Ensure that you use an outdoor installation rated and IP65-compliant waterproof fiber-optic cable with an outer diameter of 10 mm for the SFP ports, and that with an outer diameter of 6.5 mm for the RJ-45 ports for the ACX500 outdoor routers.

Figure 51: Cable Connector Unit



1– Connector enclosure	3– Cable seal
2– Interface RJ-45 cable	4– Connector screw

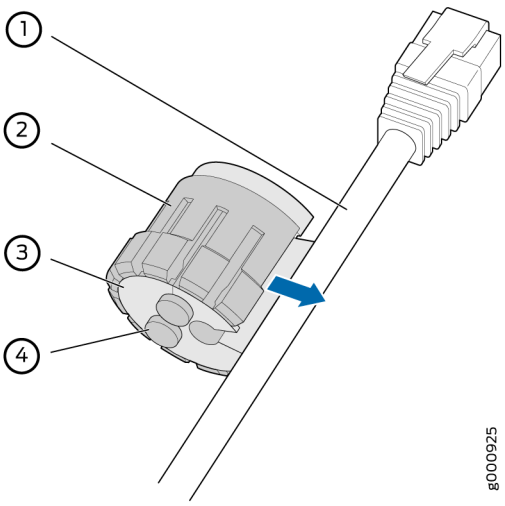
6. Slide the interface cable up to at least 2 in. (5 cm). into the cable seal groove. See Figure 20.

The grooves in the cable seal have slits that help push the cables easily into the groove.

NOTE:

- The cable seal with single groove must be used for the SFP interface cables, and the one with three grooves must be used for the RJ-45 interface cables.
- Ensure that each groove on the rubber cable seal accommodates only one cable through it.
- Leave at least 2 in. (5 cm) of interface cable for connecting it to the transceiver.
- Leave in place the hole-plugs for the unused cable seal groove holes.

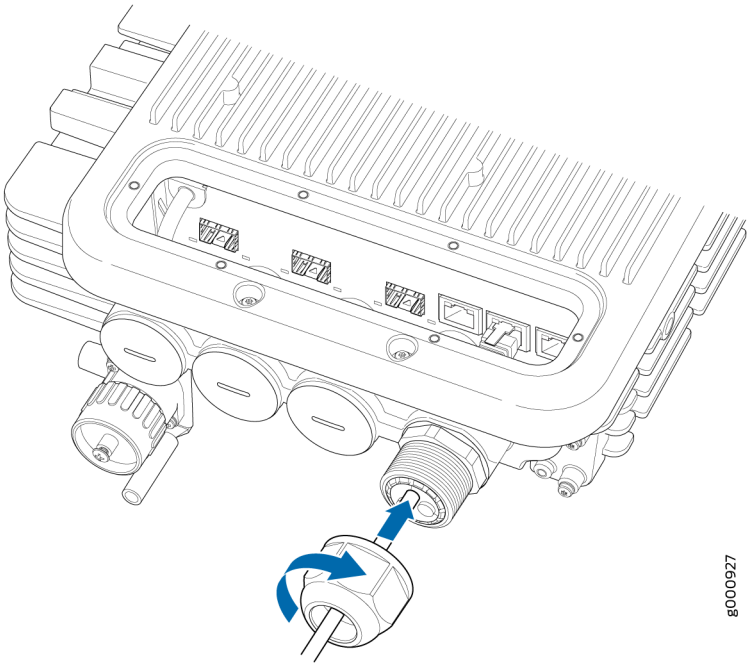
Figure 52: Installing the ACX500 Outdoor Router Cable Seal on the Interface Cable



1– Interface cable	3– Rubber cable seal with grooves
2– Outer cover of cable seal	4– Hole-plugs

7. Repeat steps 5 through step 6 for the remaining RJ-45 interface cables, as required. Leave in place the hole-plugs for the unused cable seal groove holes.
8. Push back the cable seal enclosing the interface cable back into the cable connector unit.
9. Provide enough cable slack to reach the connector.
10. Tighten the connector screw's thread end along with the cable seal inside it back into the connector enclosure port on the router. See Figure 21.

Figure 53: Installing the ACX500 Outdoor Router Connector Screw



11. Insert the respective interface cable into the port. Use the interface port chamber to snap in the RJ-45 cable into the RJ-45 port.
12. Verify that the status LEDs on the front panel indicate that the transceiver is functioning correctly. For more information about the component LEDs, see "LEDs on ACX500 Routers" on page 58.
13. Replace the metal cover of the interface port chamber back to its original place, and secure it with the six screws that were removed in step 1.

> **NOTE**: Ensure that the metal cover sits tightly on top of the router. Failing to do so might allow dust and water to enter the router.

The Gigabit Ethernet RJ-45 ports are now weatherproof and are now ready to use.

Accessing and Weatherproofing the Management Ports

In the ACX500 outdoor router, all the management ports (console, ToD, management, alarm, external clocking 1 PPS, and USB ports) are located in a small chamber on the front bottom of the router. You can access the management ports to access the router, to perform tasks such as monitoring, upgrading, and so on. The metal cover locks and seals the chamber from external environmental factors. See Figure 10.

NOTE: You need access to the management components only when there is a need to perform any monitoring or upgradation task on the router. Other than that, the management port chamber must always be kept closed and sealed to protect the internal ports from dust and water, and to meet the IP65 requirement.

To access and weatherproof the management ports:

1. Unscrew and remove the seven screws from the metal cover on the front of the router that covers the management port chamber. Keep the screws and the cover for later use.
2. Perform the management task as required. See "Connecting ACX500 Routers to Management Devices" on page 169.
3. Replace the metal cover of the management port chamber back to its original place, and secure it with the seven screws that were removed in step 1.

NOTE: Ensure that the metal cover sits tightly on top of the router. Failing to do so might allow dust and water to enter the router.

RELATED DOCUMENTATION

- Front Panel of an ACX500 Outdoor Router

RELATED DOCUMENTATION

- Site Preparation Checklist for ACX500 Routers | 74
- Connecting the ACX500 Router to Earth Ground | 152
- Chassis Physical Specifications for ACX500 Routers | 84

Connecting the ACX500 Router to Earth Ground

You must ground both the AC-powered and the DC-powered routers before connecting them to power. Failing to ground the router properly might result in shock hazard.

To ground the router, you need the following tools:

- Phillips (+) screwdriver, number 2
- Electrostatic discharge (ESD) grounding wrist strap
- Two 0.5-in. long stainless steel SS 316 SAE 10-32 screws, and flat washers (not provided)
- Grounding lug, Panduit LCD6-10A-L or equivalent for the ACX500 indoor router, and Panduit LCCF6-14A-L for the ACX500 outdoor router (not provided)
- Grounding cable, minimum 6 AWG (13.3 mm^2) 90° C wire for both the ACX500 indoor and outdoor routers (not provided)
- Corrosion-preventing compound for the ACX500 outdoor router, such as NO-OX-ID (not provided)

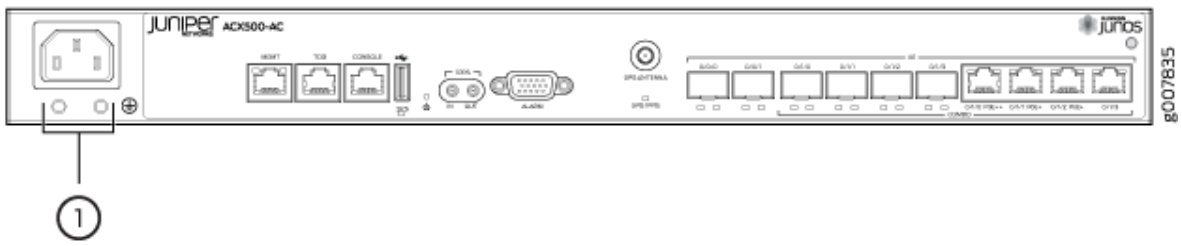
WARNING: The ACX500 outdoor router has a provision for connecting a two-hole grounding lug (Panduit LCCF6-14A-L). Ensure that the router is properly grounded with 6-AWG copper wire with this specified two-hole lug. Refer "ACX500 Router Grounding Specifications" on page 88 for more details on grounding specifications for the ACX500 router.

Warnung Warnung Der Outdoor-Router ACX500 bietet die Möglichkeit, eine Erdungsklemme mit zwei Öffnungen anzuschließen (Panduit LCCF6-14A-L). Stellen Sie sicher, dass der Router ständig über ein 6-AWG-Kabel und die entsprechende Klemme geerdet wird.

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:

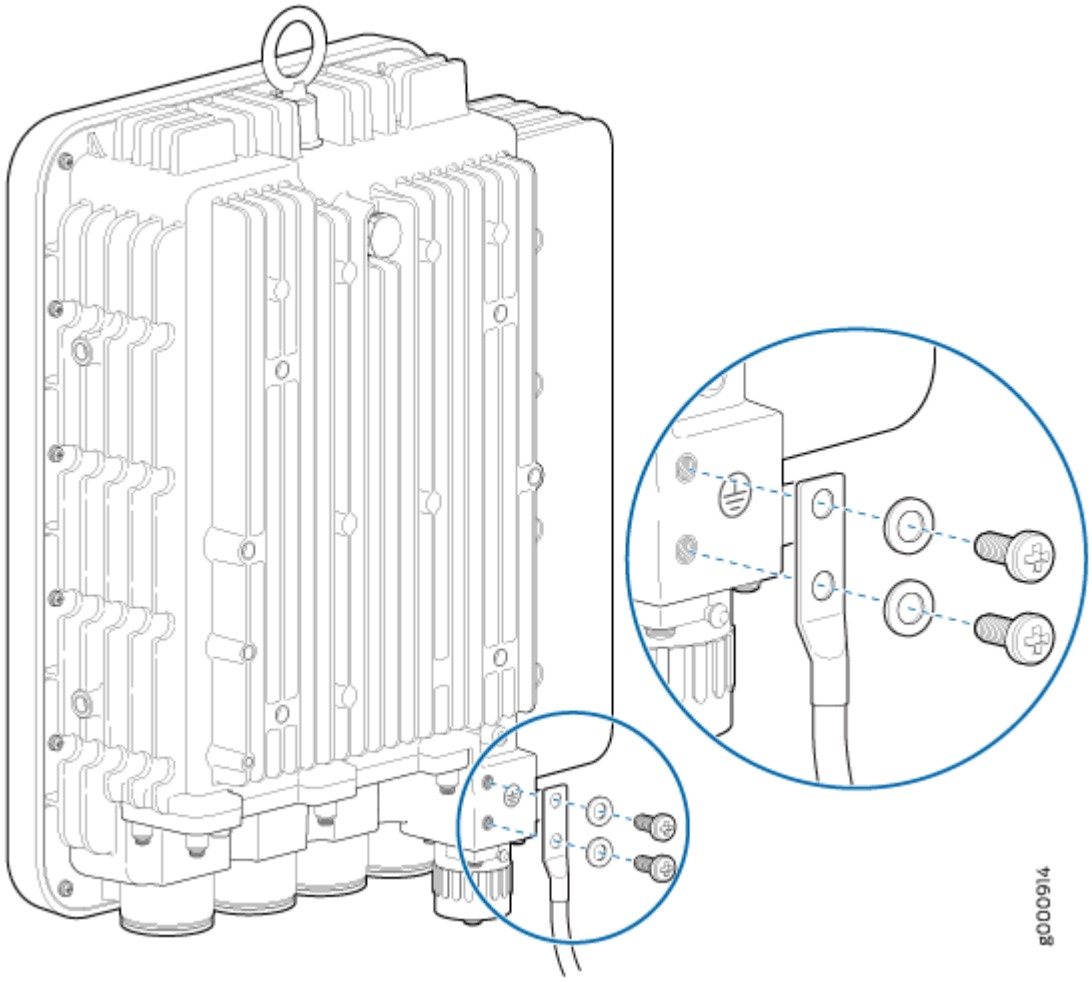
1. Verify that a licensed electrician has attached the cable lug provided with the router to the grounding cable.
2. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an approved site ESD grounding point. See the instructions for your site.
3. Ensure that all 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 54 on page 154 and Figure 55 on page 154).

Figure 54: Grounding Point Location on the ACX500 Indoor Router



1– Grounding terminals	

Figure 55: Grounding Point Location on the ACX500 Outdoor Router



NOTE:

- In the ACX500 indoor routers, the grounding points are located on the front left of the router.
- In the ACX500 outdoor routers, the grounding points are located just below the power inlet port.
- The location of the grounding points on the ACX500 routers is the same for both the AC and the DC variants.

For the ACX500 outdoor routers, perform the following additional steps as rust-preventative and corrosion-preventative measure:

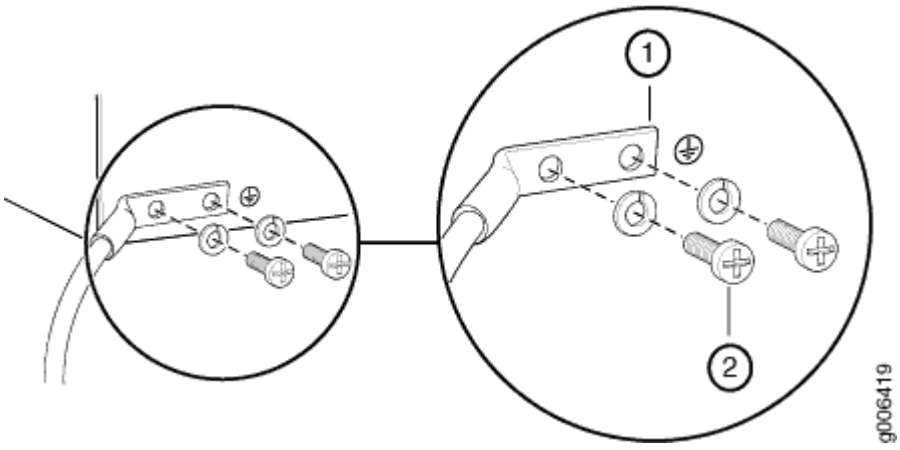
a. Clean both the mating surfaces (the grounding cable lug and the ACX500 outdoor router grounding terminals).

b. Apply a thin film (0.04 in. or 1 mm) of corrosion-preventing compound, such as NO-OX-ID, on the ACX500 outdoor router's grounding terminals.

c. Press the lug onto the conductive surface unit in order to force out the excess corrosion-preventing compound.

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). See Figure 56 on page 155 and Figure 55 on page 154.

Figure 56: Grounding Points on the ACX500 Indoor Router



1– Grounding lug	2– SAE 10-32 screws and washers

CAUTION: Ensure that each grounding lug sits 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 can damage the terminal.

CAUTION: The maximum torque rating of the grounding screws on the router is 4 lb-in. (0.49 Nm). The grounding screws can 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. (0.56 Nm) or less. Ensure that the driver is undamaged and properly calibrated and that you have been trained in its use. You might want to use a driver that is designed to prevent overtorque when the preset torque level is achieved.

9. Verify that the grounding cabling is correct, 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.

RELATED DOCUMENTATION

- Installing and Connecting an ACX500 Indoor Router Overview | 119
- Installing and Connecting an ACX500 Outdoor Router Overview | 119
- Site Preparation Checklist for ACX500 Routers | 74
- Prevention of Electrostatic Discharge Damage | 231

Connecting the ACX500 to Power

IN THIS SECTION

Connecting an AC Power Cord to the ACX500 Indoor Router

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

- Electrostatic discharge (ESD) grounding wrist strap
- AC power cord (not provided)

> **NOTE**: Power cord for the ACX500 indoor routers are not shipped with the router. You need to purchase the power cord separately.

To connect AC power to the router:

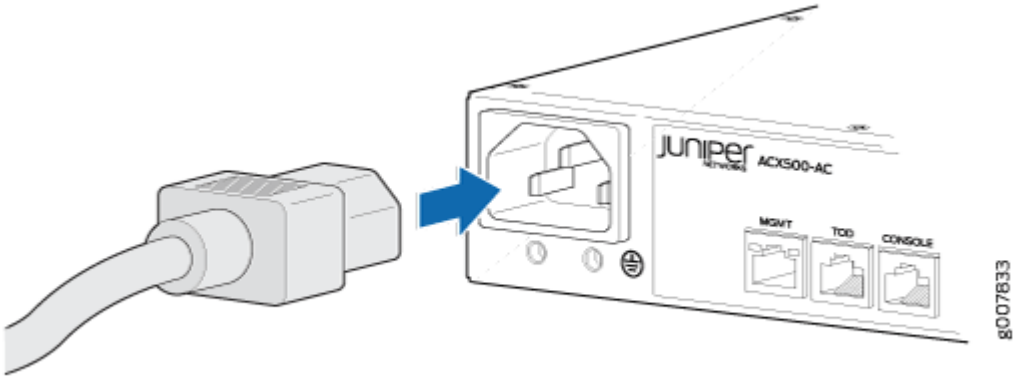
1. Locate the power cord, which should have a plug appropriate for your geographical location. See the "ACX500 Router AC Power Cord Specifications" on page 68.
2. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an ESD grounding point.
3. Insert the appliance 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**: We recommend that you use a dedicated customer-site circuit breaker rated for 20 A (100 VAC) or 16 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.

5. 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. 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 57: Connecting AC Power to the Router



SEE ALSO

ACX500 AC Power Specifications | 68

ACX500 AC Power Electrical Safety Guidelines | 232

Connecting DC Power Cables to the ACX500 Indoor Router

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

- Phillips (+) screwdriver, number 2
- Electrostatic discharge (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)

NOTE: Power cables for the ACX500 indoor routers are not shipped with the routers. You need to purchase the power cord separately.

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 DC cables to chassis ground:

   Locate the power cables, which should have a plug appropriate for your geographical location. See the "ACX500 DC Power Specifications" on page 71.

   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 return cable (**–**).

   b. The cable with very large resistance (indicating an open circuit) to chassis ground is DC input 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 58 on page 160). Apply between 8 lb-in. (0.9 Nm) and 9 lb-in. (1 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 might result in damage to the terminal.

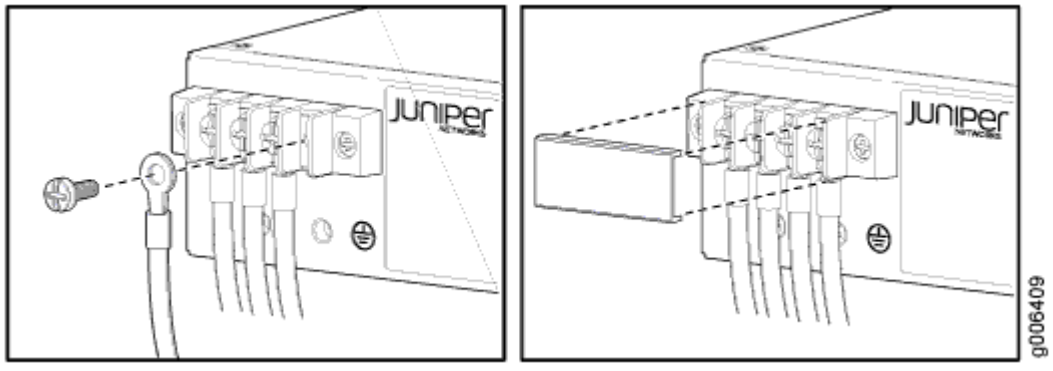
CAUTION: The maximum torque rating of the terminal screws on the DC power supply is 9 lb-in. (1 Nm). The terminal screws might be damaged if excessive torque is applied. Use only a torque-controlled driver to tighten screws on the DC power supply terminals. Use an appropriately sized driver, with a maximum torque capacity of 9 lb-in. (1 Nm) or less. Ensure that the driver is undamaged and properly calibrated and that you have been trained in its use. You might want 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 the front of the router. If the DC power cable is correctly installed and functioning normally, the system LED lights green steadily. If the status LED indicates that the power supply is not functioning normally, repeat the installation and cabling procedures.

Figure 58: Connecting DC Power to the Router



SEE ALSO

ACX500 DC Power Specifications | 71

ACX500 DC Power Electrical Safety Guidelines | 234

Connecting an AC Power Cord to the ACX500 Outdoor Router

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

- Electrostatic discharge (ESD) grounding wrist strap
- AC power cord for the ACX500 outdoor router (not provided, must be purchased separately)

NOTE: Use the power cord that is purchased from Juniper Networks, and is compatible with the ACX500 outdoor router. Using a power cord other than that is provided by Juniper Networks with the router can damage the power terminal. These power cords are specifically designed to be used only with the specified ACX500 outdoor routers.

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

NOTE: For disconnecting power to the router, first remove or switch off the power to the power cord by opening the circuit breaker or suitable service disconnect at the AC disconnect box or power distribution unit (PDU). Then rotate the power cord connector ring to disconnect the power cord from the router connector. Doing this ensures that the power cord is safe to handle.

NOTE: The information provided in this topic is applicable for both the ACX500 outdoor router variants—ACX500 outdoor router and ACX500 outdoor router with PoE.

To connect AC power to the router:

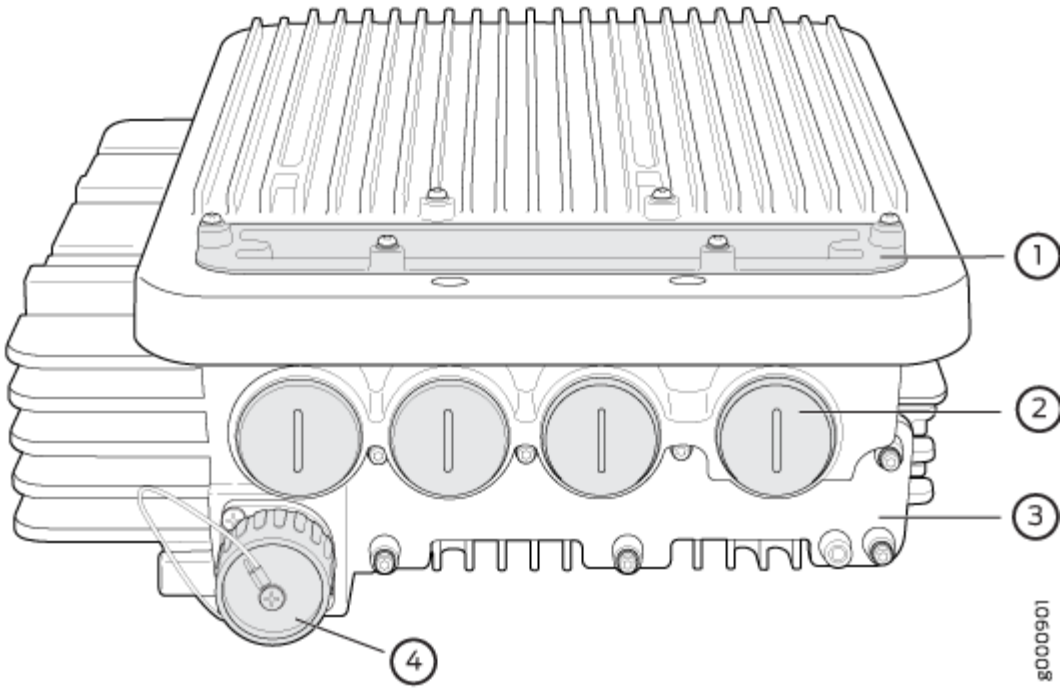
1. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an ESD grounding point.
2. Locate the power cord that is compatible with the ACX500 outdoor router.

   Power cords for the ACX500 outdoor routers are not shipped with the router. The power cords are specifically designed to be used only with the specified ACX500 outdoor routers. The unique

design of these power cords help to protect the power terminal from the external environmental factors, such as water and dust.

3. Remove the screw cover cap protecting the power terminal on the faceplate. Figure 59 on page 162 shows the location of the power terminal.

Figure 59: Power Terminal Location on the ACX500 Outdoor Router



1– Interface port chamber with weather seal cover	3– Management port chamber with weather seal cover
2– Cable connector ports with weather seal cap	4– Power port with weather seal cap

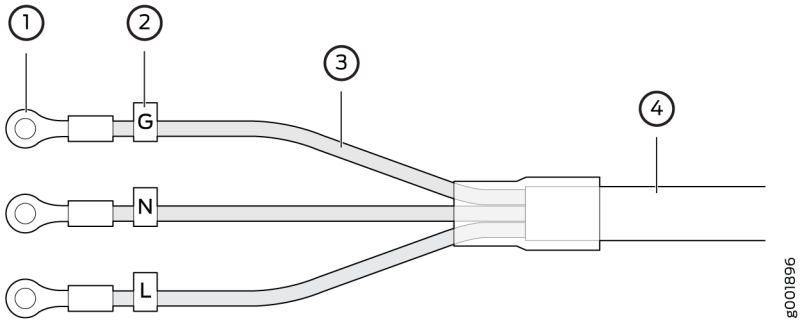
4. Power off the AC power source.

> **NOTE**: Ensure that the power source for the ACX500 outdoor router is off before connecting or disconnecting the power cord wires from the power source.

5. Insert the appliance coupler terminal end of the power cord into the appliance inlet on the power source. Ensure that the power cord terminal is connected properly.

   One end of the AC power cord for the ACX500 outdoor router has the AC power plug (see Figure 61 on page 163) that connects to the router, and the other end has three power cord wires (see Figure 60 on page 163) that are connected to the power source.

Figure 60: AC Power Cord Wires That Connect to the Power Source

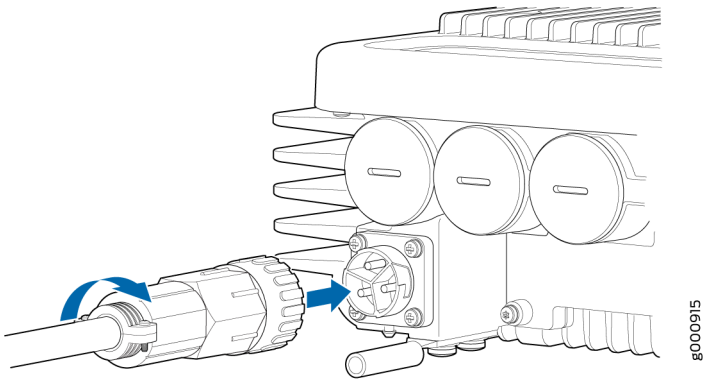


1– Power lug	3– Cord wire
2– Label (G, N and L)	4– AC power cord

WARNING: Ensure that the line (**L**), neutral (**N**), and ground (**G**) AC power cord wires are correctly connected to the respective branch circuit or power source that powers the ACX500 outdoor router. Failing to do so might result in damaging the router. The AC power cord has **L**, **N**, and **G** labels for reference and correct connection to AC mains terminals.

6. Insert the AC power cord plug to the power terminal on the router. Ensure that the power plug sits tight. See Figure 61 on page 163.

Figure 61: Connecting AC Power Plug to the Router



NOTE: An AC-powered router need to connect with the outdoor AC power cord that is supported with the router. Each power source 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 of 20 A (100 VAC) or 16 A (240 VAC), or as required by local electrical code.

7. Tighten the power cord plug screw.

   The power cord plug screw prevents water and dust from entering the terminal.

8. Verify that the power cabling is correct, that the power cables or cords do not touch or block access to router components, and that they do not drape where people could trip on them.
9. Power on the AC power source to the router.
10. Observe the system LED on the router. If an AC power source is functioning normally, the system LED lights green steadily.

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

WARNING: The AC power wiring terminals where the wires join the AC power source must be protected from water and other particles. Use a certified waterproof enclosure for the AC power wires.

Warnung Die AC-Anschlüsse, wo das Kabel mit der Wechselstromquelle verbunden ist müssen von Wasser und kleinen Partikeln geschützt werden. Verwenden Sie ein zertifiziertes wasserdichtes Gehäuse für die AC-Stromkabel.

WARNING: To meet EN/IEC60950-22 (Clause 4.2) requirements, ensure that additional protection is provided external to the router to reduce transient voltage surges (Overvoltage Category IV to Overvoltage Category II) at the AC power input of the router. The overvoltage and fault-current protection components used to achieve this protection must comply with the IEC 61643 series of standards. Use alternative components to meet CAN/CSA-C22.2 No. 60950-22-07/UL60950-22 requirements for additional protection. The components you use for additional protection may comply with ANSI/IEEE C62.11, CSA Certification Notice No. 516, CSA C22.2 No. 1, or UL 1449. Suitability of the components for the application must be determined for the intended installation. For example, some devices are suitable for installation on the load side of the service entrance only, and some are suitable for use with cord-connected equipment only.

Warnung: Zur Erfüllung der Anforderungen von EN/IEC60950-22 (Klausel 4.2) müssen Sie sicherstellen, dass zusätzlicher Schutz für den Router verwendet wird, damit

vorübergehende Spannungsstöße (Überspannung Kategorie IV bis II) am AC-Anschluss des Routers auftreten. Die zu diesem Schutz eingesetzten Überspannungs- und Fehlerstromschutzkomponenten müssen den Standards der IEC 61643-Serie entsprechen. Verwenden Sie alternative Komponenten, um zu gewährleisten, dass die Vorgaben von CAN/CSA-C22.2 Nr. 60950-22-07/UL60950-22 für zusätzlichen Schutz eingehalten werden. Die Komponenten, die Sie für zusätzlichen Schutz verwenden, müssen ANSI/IEEE C62.11, CSA-Zertifizierung Nr. 516, CSA C22.2 Nr. 1 oder UL 1449 erfüllen. Die Eignung der Komponenten für die vorgesehene Installation muss zunächst bestimmt werden. Beispielsweise ist bei einigen Geräten nur die Installation auf der Lastseite des Serviceeingangs möglich, während andere nur mit drahtgebundenen Geräten verwendet werden können.

SEE ALSO

ACX500 Power Overview | 67

ACX500 AC Power Electrical Safety Guidelines | 232

Connecting a DC Power Cord to the ACX500 Outdoor Router

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

- Electrostatic discharge (ESD) grounding wrist strap
- DC power cord for the ACX500 outdoor router (not provided, must be purchased separately)

NOTE: Use the power cord that is purchased from Juniper Networks, and which is compatible with the ACX500 outdoor router. Using a power cord other than that is provided by Juniper Networks with the router can damage the power terminal. The nominal ratings of the DC power source are +24 VDC, –48 VDC, and –60 VDC. These power cords are specifically designed to be used only with the specified ACX500 outdoor routers.

WARNING: You must ground the router before connecting the power cords.

NOTE: Ensure that the DC power source to the equipment meet requirement of SELV power source as per IEC /EN/UL 60950-1. This SELV power source must be electrically isolated from AC power source.

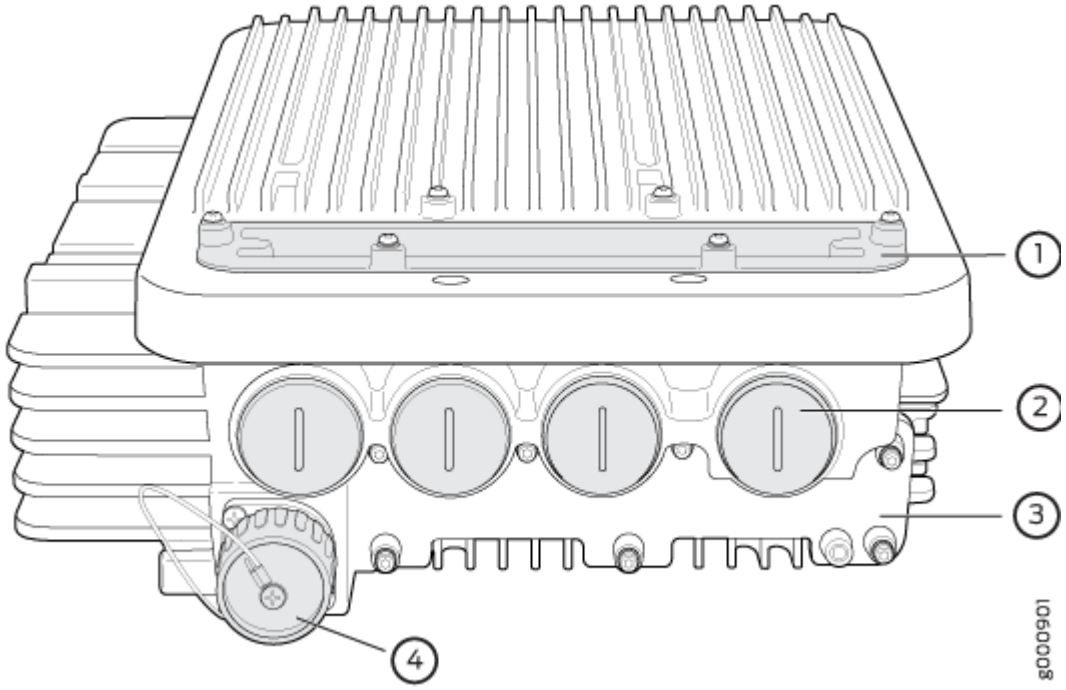
NOTE: The information provided in this topic is applicable for both the ACX500 outdoor router variants—ACX500 outdoor router and ACX500 outdoor router with PoE.

To connect DC power to the router:

1. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an ESD grounding point.
2. Locate the power cord that is compatible with the ACX500 outdoor router.

   Power cords for the ACX500 outdoor routers are not shipped with the router. The power cords are specifically designed to be used only with the specified ACX500 outdoor routers. The unique design of these power cords help to protect the power terminal from the external environmental factors, such as water and dust.
3. Remove the screw cover cap protecting the power terminal on the faceplate. Figure 62 on page 167 shows the location of the power terminal.

Figure 62: Power Terminal Location on the ACX500 Outdoor Router



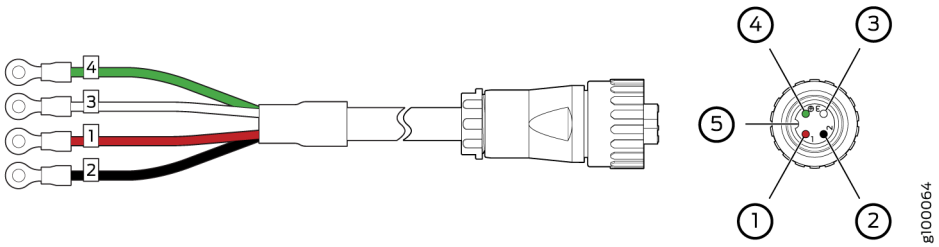
1– Interface port cover	3– Management port cover
2– Cable connector ports with dust cover	4– Power port with dust cover

4. Insert the appliance coupler terminal end of the power cord into the appliance inlet on the power supply. Ensure that the power cord terminal is connected properly.

> **CAUTION**: You must ensure that power connections maintain the proper polarity. The power source cables might be labeled (+) and (–) to indicate their polarity.

Figure 63 on page 167 shows the DC power cord.

Figure 63: ACX500 Outdoor Router DC Power Cord

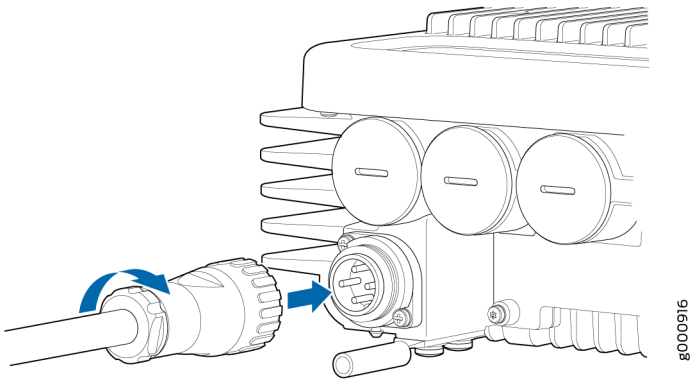


1– Positive (+) power terminal	4– Negative (–) power terminal
2– Negative (–) power terminal	5– Latch
3– Positive (+) power terminal	

The latch on the DC power cord plug allows only one way insertion of the power cord plug into the router.

5. Insert the DC power cord plug to the power terminal on the router. Ensure that the power plug sits tight. See Figure 64 on page 168.

Figure 64: Connecting DC Power to the Router



NOTE: A DC-powered router needs to be connected with the outdoor DC power cord that is purchased from Juniper Networks, and which is compatible with the ACX500 outdoor router. To supply sufficient power, the DC input wiring on the facility DC source is 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.

For other nominal input voltages such as 24 VDC, –60 VDC, we recommend that the circuit breaker rating be appropriately sized or rated, and as required by local code.

6. Tighten the power cord plug screw.

   The power cord plug screw prevents water and dust from entering the terminal.

7. Verify that the power cabling is correct, that the power cables do not touch or block access to router components, and that they do not drape where people could trip on them.

8. Observe the system LED on the router. If an DC 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.

SEE ALSO

ACX500 Power Overview | 67

ACX500 DC Power Electrical Safety Guidelines | 234

RELATED DOCUMENTATION

General Electrical Safety Guidelines and Warnings | 229

Connecting the ACX500 to External Devices

IN THIS SECTION

Connecting ACX500 Routers to Management Devices

IN THIS SECTION

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

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

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

NOTE: Ensure that you use a waterproof fiber-optic cable with an outer diameter of 10 mm for the SFP ports, and that with an outer diameter of 6.5 mm for the RJ-45 ports.

For the ACX500 outdoor router, see "Weatherproofing the ACX500 Outdoor Router" on page 138 topic to know how to access, secure, and weatherproof the router ports. See Front Panel of an ACX500 Outdoor Router to know more about the ports that are available under the management port cover on the ACX500 outdoor router.

NOTE: When accessing the management ports of the ACX500 outdoor router, ensure to weatherproof the port units by securing back the interface port cover.

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

To connect to the **MGMT** port on the ACX500 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 65: Ethernet Cable Connector

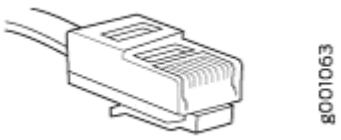
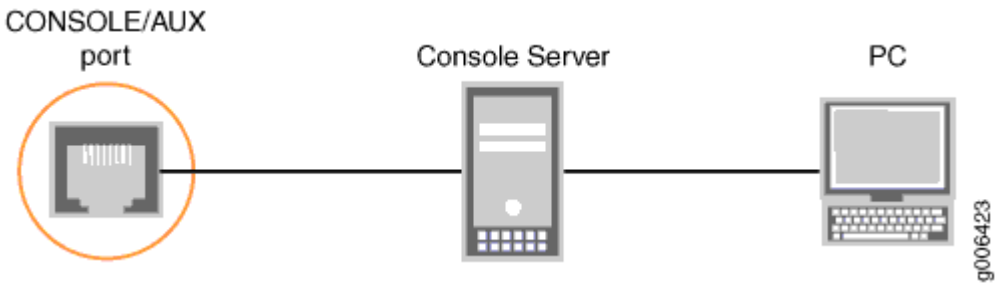


Figure 66: Ethernet Port



Connecting the Router to a Management Console

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

To connect a management console:

1. Turn off the power to the console.
2. Plug the RJ-45 end of the serial cable into the **MGMT** port on the front panel (Figure 67 on page 171 shows the connector. Figure 68 on page 172 shows the ports.)
3. Plug the DB-9 socket end into the device's serial port.

> **NOTE**: For console devices, configure the serial port to the following values:
>
> - Bits per second— 9600
> - Data bits— 8
> - Parity— None
> - Stop bits— 1
> - Flow control— None

Figure 67: Routing Engine Console Cable Connector

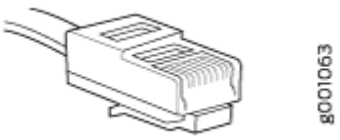
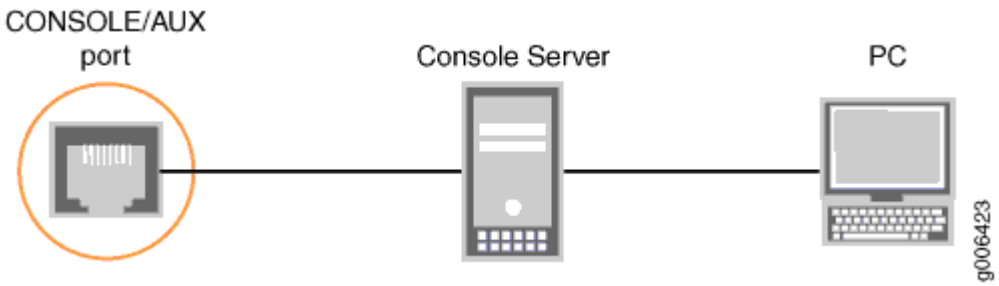


Figure 68: Console Connections



RELATED DOCUMENTATION

- Installing and Connecting an ACX500 Indoor Router Overview | 119
- General Site Guidelines | 76
- Management Port Connector Pinout Information for ACX500 Routers | 101
- Configuring Junos OS on the ACX500 Router | 174
- Front Panel of an ACX500 Outdoor Router
- Front Panel of an ACX500 Indoor Router | 52

Connecting the ACX500 Router to an External Alarm-Reporting Device

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

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

For the ACX500 outdoor router, see "Weatherproofing the ACX500 Outdoor Router" on page 138 topic to know how to access, secure, and weatherproof the router ports.

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

SEE ALSO

ACX500 Chassis | **47**

Alarm Contact Port Pinouts for ACX500 Routers | **98**

Verifying Active Alarms | **195**

Troubleshooting Resources for ACX500 Routers | **192**

Connecting the ACX500 Router to External Clocking Devices

IN THIS SECTION

The ACX500 routers support external clock synchronization for Synchronous Ethernet, and external inputs.

Connecting 1 PPS Timing Devices to the Router

The two SubMiniature B (SMB, 1 PPS input and 1 PPS output) connectors on the front panel of the router connect to external clock signal sources.

To connect the SMB coaxial cable to the external clocking input port:

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

SEE ALSO

External Clocking Ports Specifications on ACX500 Routers | 103

Troubleshooting Resources for ACX500 Routers | 192

Configuring Junos OS on the ACX500 Router

The ACX500 routers are shipped 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. One USB port on the front panel accepts a USB storage device (`usb0`) that can also function as an alternate boot device.

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** 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

ACX500 Routers Hardware and CLI Terminology Mapping | 4

Protocols and Applications Supported by ACX Series Routers | 13

4

CHAPTER

Removing, Installing, and Maintaining Components

Maintaining ACX500 Components

IN THIS SECTION

Routine Maintenance Procedures for the ACX500 Router

IN THIS SECTION

Purpose

For optimum router performance, perform preventive maintenance procedures.

Action

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

Maintaining Cables That Connect to ACX500 Network Ports

IN THIS SECTION

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.

SEE ALSO

Routine Maintenance Procedures for the ACX500 Router | 180

Maintaining Cables That Connect to ACX500 Network Ports

Replacing a Fiber-Optic Cable | 186

Maintaining the ACX500 Uplink Ports

IN THIS SECTION

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 ACX500 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.

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

SEE ALSO

ACX500 Routers Hardware and CLI Terminology Mapping | 4

Replacing ACX500 Components

IN THIS SECTION

Replacing a Console Cable

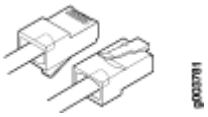
IN THIS SECTION

Removing a Console Cable

To remove a serial cable connected to a console 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** port. Figure 1 shows the connector.
3. Disconnect the cable from the console.

Figure 69: Ethernet Cable Connectors



Installing a Console Cable

The **CONSOLE** 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 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** port.
3. Plug the other end of the cable into the device's serial port.

RELATED DOCUMENTATION

Console Port Connector Pinout on ACX500 Routers | 100

Replacing a Management Ethernet Cable

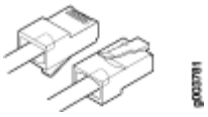
IN THIS SECTION

Removing a 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 70: Ethernet Cable Connectors



Installing a 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.

RELATED DOCUMENTATION

Management Port Connector Pinout Information for ACX500 Routers | 101

Replacing a Fiber-Optic Cable

IN THIS SECTION

To replace a fiber-optic cable:

Disconnecting a Fiber-Optic Cable

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

Before you begin disconnecting a fiber-optic cable from an optical transceiver installed in an ACX Series router, ensure that you have taken the necessary precautions for safe handling of lasers (see General Laser Safety Guidelines for Juniper Networks Devices).

Ensure that you have the following parts and tools available:

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

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

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

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

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

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

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

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

Connecting a Fiber-Optic Cable

Before you begin connecting a fiber-optic cable to an optical transceiver installed in a router, ensure that you have taken the necessary precautions for safe handling of lasers (see General Laser Safety Guidelines for Juniper Networks Devices).

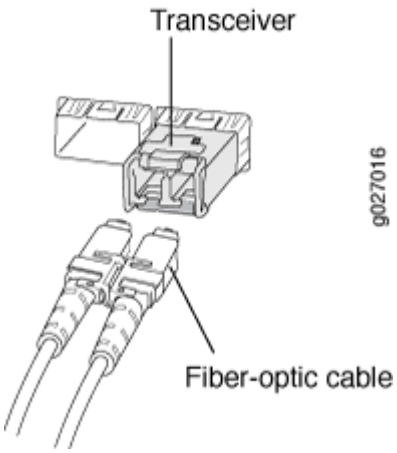
ACX Series routers have field-replaceable unit (FRU) optical transceivers to which you can connect fiber-optic cables.

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

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

1. If the fiber-optic cable connector is covered by a rubber safety cap, remove the cap. Save the cap.
2. Remove the rubber safety cap from the optical transceiver. Save the cap.
3. Insert the cable connector into the optical transceiver (see Figure 71 on page 187).

Figure 71: Connecting a Fiber-Optic Cable to an Optical Transceiver Installed in an ACX Series Router



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

> **CAUTION**: Do not bend fiber-optic cables beyond their minimum bend radius. An arc smaller than a few inches in diameter can damage the cables and cause problems that are difficult to diagnose.
>
> Do not let fiber-optic cables hang free from the connector. Do not allow fastened loops of cables to dangle, which stresses the cables at the fastening point.

SEE ALSO

- *Maintaining Cables That Connect to ACX1000 and ACX1100 Network Ports*
- *Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion*
- *Calculating Power Budget and Power Margin for Fiber-Optic Cables*

Replacing an SFP Transceiver

IN THIS SECTION

Removing an SFP Transceiver

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

To remove a transceiver (see Figure 4):

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.

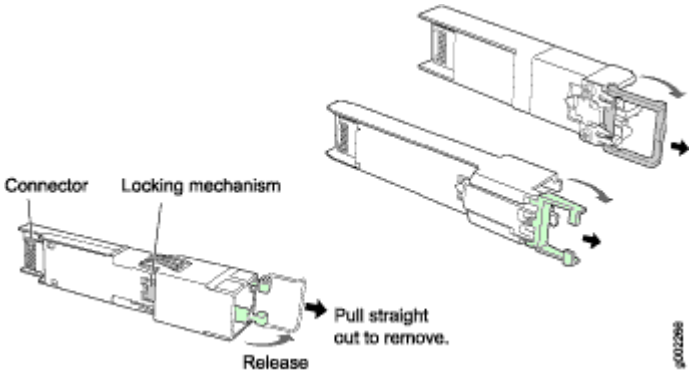
4. Remove the cable connector from the transceiver.
5. Pull the ejector handle out from the transceiver to unlock the transceiver.

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

Use needle-nose 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 72: 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.

Installing an SFP Transceiver

To install a transceiver:

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

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

8. Verify that the status LEDs on the front panel indicate that the transceiver is functioning correctly. For more information about the component LEDs, see the "LEDs on ACX500 Routers" on page 58.

RELATED DOCUMENTATION

Prevention of Electrostatic Discharge Damage | 231

5
CHAPTER

Troubleshooting Hardware

Troubleshooting ACX500 Components

IN THIS SECTION

Troubleshooting Resources for ACX500 Routers

IN THIS SECTION

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 enable you to troubleshoot the router.

LEDs on the front panel include the following:

- System LED—One LED labeled **SYS** on the front panel indicates the status of the router.
- Management port LEDs—Two pairs of LEDs on the front panel indicate the status of the ports. The port is labeled **MGMT**.
- Link LEDs—Each network port has one pair of port LEDs that indicate the status of the ports.
- PPS LED—One LED labeled **GPS 1PPS** on the front panel indicates the status of the PPS signal received from the GPS receiver.

For more information about the front panel LEDs, see "LEDs on ACX500 Routers" on page 58.

SEE ALSO

Alarm Types and Severity Classes on ACX Series Routers | **194**

Verifying Active Alarms | **195**

Monitoring System Log Messages | **193**

Monitoring System Log Messages

IN THIS SECTION

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

Before monitoring the alarms on the router, become familiar with the terms defined in Table 40 on page 194.

Table 40: Alarm Terms

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

Alarm Types

The router supports these alarms:

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

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

Alarm Severity Classes

Alarms on ACX Series routers have two severity classes:

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

  A missing rescue configuration generates a minor system alarm.

Verifying Active Alarms

IN THIS SECTION

Purpose

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 41 on page 196 lists the alarm output fields.

Table 41: Alarm Output Fields

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

6

CHAPTER

Contacting Customer Support and Returning the Chassis or Components

Contacting Customer Support and Returning the Chassis or Components

IN THIS SECTION

Contact Customer Support

You can contact Juniper Networks Technical Assistance Center (JTAC) 24 hours a day, 7 days a week in one of the following ways:

- On the Web, using the Service Request Manager link at:

  https://support.juniper.net/support/

- By telephone:
  - From the US and Canada: 1-888-314-JTAC
  - From all other locations: 1-408-745-9500

> **NOTE**: If contacting JTAC by telephone, enter your 12-digit service request number followed by the pound (#) key if this is an existing case, or press the star (*) key to be routed to the next available support engineer.

When requesting support from JTAC by telephone, be prepared to provide the following information:

- Your existing service request number, if you have one
- Details of the failure or problem

- Type of activity being performed on the device when the problem occurred
- Configuration data displayed by one or more `show` commands
- Your name, organization name, telephone number, fax number, and shipping address

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

Displaying ACX500 Components and Serial Numbers

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

```
user@host> show chassis hardware
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                VH0214340016      ACX500-DC
Midplane         REV 01   650-056163   VH0214340016      ACX500-DC
Routing Engine            BUILTIN      BUILTIN           Routing Engine
FEB 0                     BUILTIN      BUILTIN           Forwarding Engine Processor
FPC 0                     BUILTIN      BUILTIN           FPC BUILTIN
  MIC 0                   BUILTIN      BUILTIN           2x 1GE(LAN) SFP
    PIC 0                 BUILTIN      BUILTIN           2x 1GE(LAN) SFP
      Xcvr 0     REV 02   740-011613   NR224KT           SFP-SX
  MIC 1                   BUILTIN      BUILTIN           4x 1GE(LAN) RJ45, SFP
    PIC 1                 BUILTIN      BUILTIN           4x 1GE(LAN) RJ45, SFP
```

Most components also have a small rectangular serial number ID label (see Figure 73 on page 199) attached to the component body.

Figure 73: Serial Number ID Label

SEE ALSO

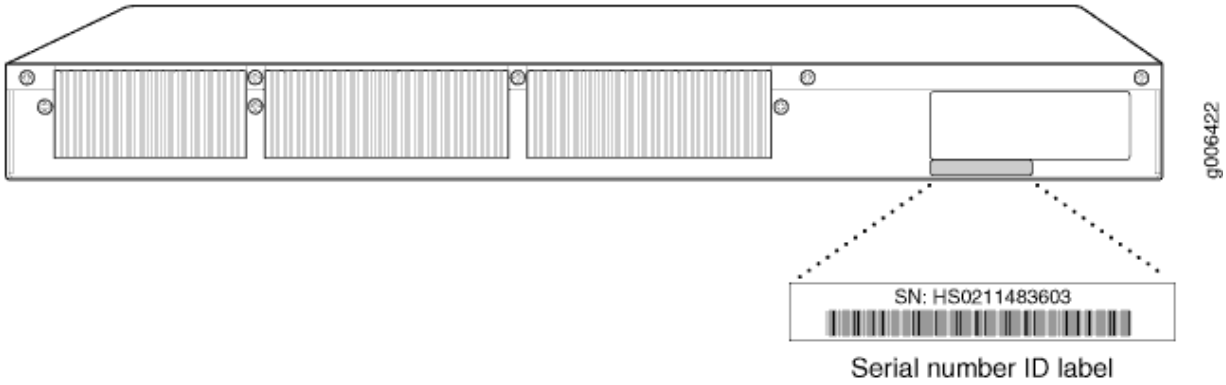
ACX500 Chassis Serial Number Label | 200

How to Return a Hardware Component to Juniper Networks, Inc. | 201

ACX500 Chassis Serial Number Label

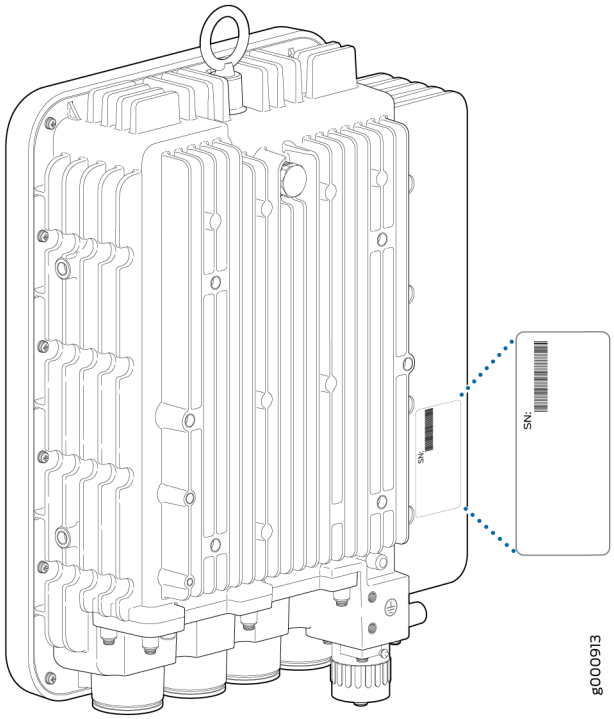
The chassis serial number is located on the rear of the ACX500 indoor chassis (see Figure 74 on page 200).

Figure 74: ACX500 Indoor Chassis Serial Number Label



The chassis serial number is located on the bottom of the ACX500 outdoor chassis (see Figure 75 on page 201).

Figure 75: ACX500 Outdoor Chassis Serial Number Label



NOTE: The location of the serial number labels for the ACX500 routers are same for both the AC and the DC variant.

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.

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.

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.

CHAPTER 7

Safety and Compliance Information

General Safety Guidelines and Warnings

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

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

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

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

Definitions of Safety Warning Levels

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Qualified Personnel Warning

WARNING: Only trained and qualified personnel should install or replace the device.
Waarschuwing Installatie en reparaties mogen uitsluitend door getraind en bevoegd personeel uitgevoerd worden.

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

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

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

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

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

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

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

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

Warning Statement for Norway and Sweden

WARNING: The equipment must be connected to an earthed mains socket-outlet.
Advarsel Apparatet skal kobles til en jordet stikkontakt.

Varning! Apparaten skall anslutas till jordat nätuttag.

Fire Safety Requirements

IN THIS SECTION

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

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

Fire Suppression

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

Fire Suppression Equipment

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

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

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

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

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

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

Installation Instructions Warning

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

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

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 your legs bear most of the weight rather than your back. Keep your knees bent and your back relatively straight. Do not twist your body as you lift. Balance the load evenly and be sure that your footing is firm.
- Use the following lifting guidelines to lift devices and components:
  - Up to 39.7 lb (18 kg): One person.
  - From 39.7 lb (18 kg) to 70.5 lb (32 kg): Two or more people.
  - From 70.5 lb (32 kg) to 121.2 lb (55 kg): Three or more people.
  - Above 121.2 lb (55 kg): Use material handling systems (such as levers, slings, lifts, and so on). When this is not practical, engage specially trained persons or systems (such as riggers or movers).

Restricted Access Warning

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

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

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

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

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

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

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

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

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

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

Ramp Warning

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

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

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

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

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

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

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

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

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

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

Rack-Mounting and Cabinet-Mounting Warnings

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

- O Juniper Networks switch deverá ser instalado numa prateleira fixa à estrutura do 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

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

Observe the following guidelines and warnings:

General Laser Safety Guidelines

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

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

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

Avertissement Les connecteurs à fibre optique sans terminaison peuvent émettre un rayonnement laser invisible. Le cristallin de l'œil humain faisant converger toute la puissance du laser sur la rétine, toute focalisation directe de l'œil sur une source laser, —même de faible puissance—, peut entraîner des lésions oculaires irréversibles.

Class 1 Laser Product Warning

LASER WARNING: Class 1 laser product.
Waarschuwing Klasse-1 laser produkt.

Varoitus Luokan 1 lasertuote.

Avertissement Produit laser de classe I.

Warnung Laserprodukt der Klasse 1.

Avvertenza Prodotto laser di Classe 1.

Advarsel Laserprodukt av klasse 1.

Aviso Produto laser de classe 1.

¡Atención! Producto láser Clase I.

Varning! Laserprodukt av klass 1.

Class 1 LED Product Warning

LASER WARNING: Class 1 LED product.
Waarschuwing Klasse 1 LED-product.

Varoitus Luokan 1 valodiodituote.

Avertissement Alarme de produit LED Class I.

Warnung Class 1 LED-Produktwarnung.

Avvertenza Avvertenza prodotto LED di Classe 1.

Advarsel LED-produkt i klasse 1.

Aviso Produto de classe 1 com LED.

¡Atención! Aviso sobre producto LED de Clase 1.

Varning! Lysdiodprodukt av klass 1.

Laser Beam Warning

LASER WARNING: Do not stare into the laser beam or view it directly with optical instruments.
Waarschuwing Niet in de straal staren of hem rechtstreeks bekijken met optische instrumenten.

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

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

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

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

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

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

¡Atención! No mirar fijamente el haz ni observarlo directamente con instrumentos ópticos.

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

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 (Network Equipment-Building System) requirements and protect against lightning surges and commercial power disturbances, the intrabuilding ports *must not* be metallically connected to interfaces that connect to the OSP or its wiring. The intrabuilding ports on the device are suitable for connection to intrabuilding or unexposed wiring or cabling only. The addition of primary protectors is not sufficient protection for connecting these interfaces metallically to OSP wiring.

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

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

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

- Install the device in compliance with the following local, national, and international electrical codes:
  - United States—National Fire Protection Association (NFPA 70), United States National Electrical Code.
  - Other countries—International Electromechanical Commission (IEC) 60364, Part 1 through Part 7.
  - Evaluated to the TN power system.

  - Canada—Canadian Electrical Code, Part 1, CSA C22.1.
  - Suitable for installation in Information Technology Rooms in accordance with Article 645 of the National Electrical Code and NFPA 75.

    Peut être installé dans des salles de matériel de traitement de l'information conformément à l'article 645 du National Electrical Code et à la NFPA 75.

- Locate the emergency power-off switch for the room in which you are working so that if an electrical accident occurs, you can quickly turn off the power.
- Make sure that you clean grounding surface and give them a bright finish before making grounding connections.
- Do not work alone if potentially hazardous conditions exist anywhere in your workspace.
- Never assume that power is disconnected from a circuit. Always check the circuit before starting to work.
- Carefully look for possible hazards in your work area, such as moist floors, ungrounded power extension cords, and missing safety grounds.
- Operate the device within marked electrical ratings and product usage instructions.
- To ensure that the device and peripheral equipment function safely and correctly, use the cables and connectors specified for the attached peripheral equipment, and make certain they are in good condition.

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

Action to Take After an Electrical Accident

If an electrical accident results in an injury, take the following actions in this order:

1. Use caution. Be aware of potentially hazardous conditions that could cause further injury.
2. Disconnect power from the device.
3. If possible, send another person to get medical aid. Otherwise, assess the condition of the victim, and then call for help.

Prevention of Electrostatic Discharge Damage

Device components that are shipped in antistatic bags are sensitive to damage from static electricity. Some components can be impaired by voltages as low as 30 V. You can easily generate potentially damaging static voltages whenever you handle plastic or foam packing material or if you move components across plastic or carpets. Observe the following guidelines to minimize the potential for electrostatic discharge (ESD) damage, which can cause intermittent or complete component failures:

- Always use an ESD wrist strap when you are handling components that are subject to ESD damage, and make sure that it is in direct contact with your skin.

  If a grounding strap is not available, hold the component in its antistatic bag (see Figure 76 on page 232) 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).

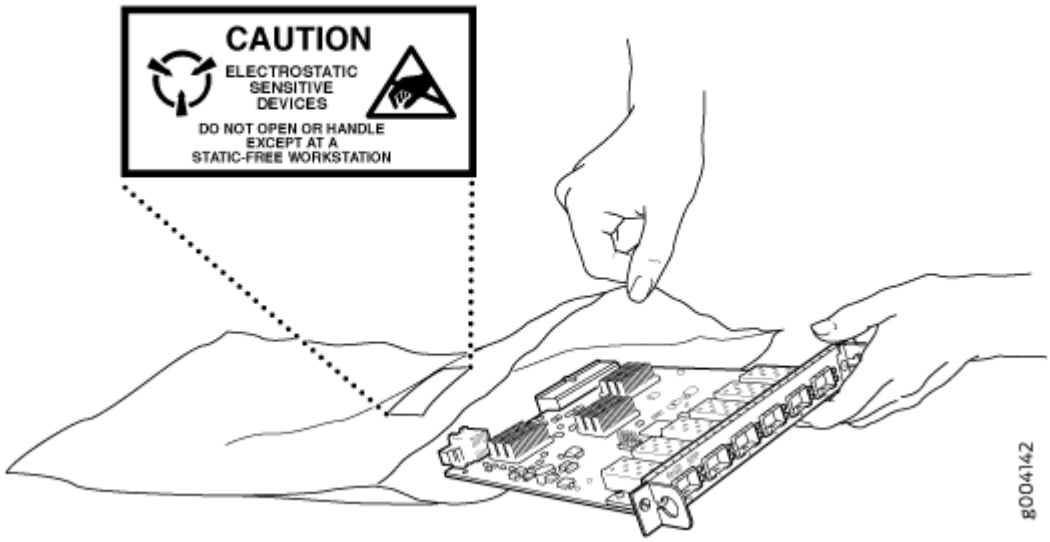
- When handling any component that is subject to ESD damage and that is removed from the device, make sure the equipment end of your ESD wrist strap is attached to the ESD point on the chassis.

  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 76 on page 232). If you are returning a component, place it in an antistatic bag before packing it.

Figure 76: 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.

ACX500 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 20 A (100 VAC) or 16 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 or yellow—Earth (label: G)
  - White or blue—Neutral (label: N)
  - Brown or black—Live (label: L)
- 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

ACX500 Power Overview | 67

ACX500 DC Power Electrical Safety Guidelines | 234

ACX500 AC Power Electrical Safety Guidelines | 232

ACX500 DC Power Specifications | 71

ACX500 AC Power Specifications | 68

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.

ACX500 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.
- 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 Electrical Safety Warnings for Juniper Networks Devices

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 and Compliance Statements

IN THIS SECTION

Agency Approvals for ACX500 Routers

IN THIS SECTION

ACX500 routers comply with the following standards:

NOTE: ACX500 indoor routers comply with Class A certification, and ACX500 outdoor routers comply with Class B certification.

- Safety

- CAN/CSA-22.2 No. 60950-1 (2007), Safety of Information Technology Equipment
- UL 60950-1 (2nd Edition), Information Technology Equipment - Safety - Part 1: General Requirements
- EN 60950-1 (2006+ A11 2010+ A2 2013) Information Technology Equipment - Safety
- IEC 60950-1 (2005+ A1 2009+ A2 2013) Information Technology Equipment - Safety (All country deviations): CB Scheme report
- CAN/CSA-C22.2 No. 60950-22 (2007) Information Technology Equipment – Safety – Part 22: Equipment to be Installed Outdoors
- UL 60950-22 (2nd Edition) Information Technology Equipment – Safety – Part 22: Equipment to be Installed Outdoors
- EN 60950-22 (2006) Information Technology Equipment – Safety - Equipment installed outdoors
- IEC 60950-22 (2005) Information Technology Equipment - Safety (All country deviations): CB Scheme report.
- EN 60825-1 (2007) Safety of Laser Products - Part 1: Equipment Classification, Requirements and User's Guide

- EMC
  - EN 300 386 V1.6.1 Telecom Network Equipment - EMC requirements
  - EN 55024:1998/A1:2001/A2:2003 Information Technology Equipment Immunity Characteristics
  - CISPR 24:1997/A1:2001/A2:2002 IT Equipment Immunity Characteristics Note: “Other than telecom centers (OTC)” limits to be complied with for CPE routers and low-end products
  - CISPR 32:2012/EN55032:2012 Electromagnetic compatibility of multimedia equipment - Emission requirements
  - FCC 47CFR, Part 15 Class A (2009) USA Radiated Emissions
  - ICES-003 Issue 4, Feb 2004 Canada Radiated Emissions
  - EN 55022 2006+A1:2007 European Radiated Emissions
  - EN 55032:2012 European Radiated Emissions
  - VCCI-V-3/2013.04 and V-4/2012.04 Japanese Radiated Emissions
  - BSMI CNS 13438 and NCC C6357 Taiwan Radiated Emissions
  - AS/NZS CISPR22: 2009

  - IEC 61000-3-3
  - IEC 61000-4-14
  - IEEE 1613
  - IEC 61850-3: Communication networks and systems for power utility automation
  - EN 50121-4: Railway applications
- EMI
  - FCC 47 CFR15, Class A, Class B
  - EN55022, Class A, Class B
  - CISPR 22, Class A, Class B
  - AS/NZS CISPR 22, Class A, Class B
  - ICES 003, Class A, Class B
  - VCCI, Class A, Class B
  - KN 22, Class A, Class B
  - IEEE 1613
  - IEC 61850-3
  - EN50121-4

> **NOTE**: Class B requirement is only for the ACX500 Outdoor routers.

- Immunity
  - EN 55024 +A1+A2 (1998) Information Technology Equipment Immunity Characteristics
  - EN-61000-3-2 (2006) Power Line Harmonics
  - EN-61000-3-3 +A1+A2+A3 (1995) Power Line Voltage Fluctuations
  - EN-61000-4-2 +A1+A2 (1995) Electrostatic Discharge
  - EN-61000-4-3 +A1+A2 (2002) Radiated Immunity
  - EN-61000-4-4 (2004) Electrical Fast Transients
  - EN-61000-4-5 (2006) Surge

  - EN-61000-4-6 (2007) Immunity to Conducted Disturbances
  - EN-61000-4-11 (2004) Voltage Dips and Sags
- ETSI
  - ETSI EN 300 386 latest version is V1.6.1 (2010)
  - ETSI EN 300 019-2-1 v2.1.2 (Class 1.2)
  - ETSI EN 300 019-2-2 v2.1.2 (Class 2.3)
  - ETSI EN 300 019-2-3 v2.2.2 (Class 3.2)
  - ETSI 300 132-2 v2.2.1
  - ETSI 300 753 (Class 3.2)
  - ETSI EN 300 440-2
  - ETSI EN 300 489-1
  - ETSI EN 300-489-3
  - ETSI EN 300 019: Environmental Conditions & Environmental Tests for Telecommunications Equipment
  - ETSI EN 300 019-2-1 (2000) – Storage, Class T1.2
  - ETSI EN 300 019-2-2 (1999) – Transportation, Class T2.3
  - ETSI EN 300 019-2-3 (2003), T 3.2 – Stationary Use at Weather-protected Locations (ACX Indoor Routers),
  - ETSI EN 300 019-2-4, T 4.1 – Stationary Use at Non-weather Protected Locations (ACX Outdoor Routers).
  - ETSI EN 300 440-1/-2 GPS spurious emission
  - ETS 300 019-1
  - ETS 300753 (1997) – Acoustic noise emitted by telecommunications equipment

The router is designed to comply with the following standards:

- GR-63-Core Issue 4 (2012) Network Equipment, Building Systems (NEBS) Physical Protection
- GR-1089-Core Issue 6 (May, 2011) EMC and Electrical Safety for Network Telecommunications Equipment
- SR-3580 (2007) NEBS Criteria Levels (Level 3)

- IEEE 1613 Environmental and Testing Requirements for Communications Networking Devices in Electric Power Substations
- GR-3108 Generic Requirements for Network Equipment in the Outside Plant (OSP)
- GR-487 General Requirements for Electronic Equipment Cabinet
- GR-3171 Class 3
- Generic Requirements for Electronic Equipment Cabinets
- AT&T TP-76200 Issue 16 (2011) Network Equipment Power, Grounding, Environmental, and Physical Design Requirements
- Verizon TPR.9305 Issue 4 (2011) Verizon NEBS Compliance: NEBS Compliance Clarification Document
- Deutsche Telekom 1TR9 (2008) EMC Specification
- British Telecom EMC Immunity Requirements (2007)
- IBM C-S 2-0001-005 ESD
- IBM C-S 2-0001-012 Radio Frequency Electromagnetic Susceptibility
- ITU-T K.21 (2011) Resistibility of telecommunication equipment installed in customer premises to over voltages and over currents
- ITU-T K.20 (2011) Resistibility of telecommunication equipment installed in telecom centers to over voltages and over currents
- Juniper Inductive GND (JIG)
- ITU-T G.813: Timing characteristics of SDH equipment client clocks (SEC)
- ITU-T G.703 clause 5: Physical/electrical characteristics of hierarchical digital interfaces
- ITU-T G.703 clause 9: Physical/electrical characteristics of hierarchical digital interfaces
- ITU-T G.781: Synchronization layer functions
- ITU-T G.8261/Y.1361: Timing and synchronization aspects in packet networks
- ITU-T G.8262: Timing characteristics of Synchronous Ethernet equipment client clock
- ITU-T G.8263: Timing characteristics of packet-based equipment clocks
- ITU-T G.8264: Distribution of timing information through packet networks
- ITU-T G.8265.1/8265.2: Architecture and requirements for packet-based frequency delivery

- ITU-T G.8271: Time and phase synchronization aspects of packet networks
- IEEE 1588-2008: Precision Clock Synchronization Protocol for Networked Measurement and Control Systems

Compliance Statement for Argentina

EQUIPO DE USO IDÓNEO.

Compliance Statements for NEBS for ACX500 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.

Compliance Statements for EMC Requirements for ACX500 Routers

IN THIS SECTION

ACX500 Indoor Routers

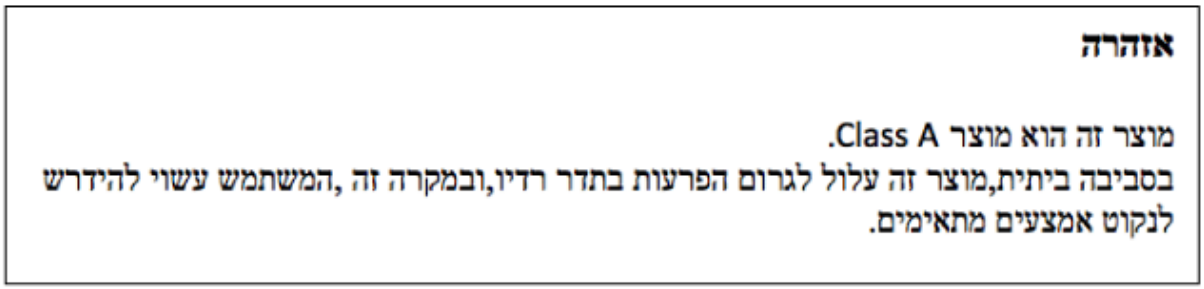
Canada

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

European Community

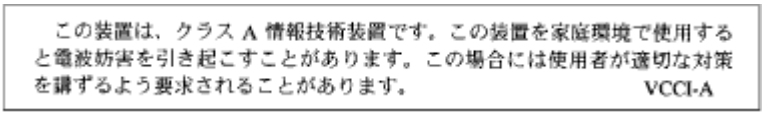
This is a Class A product. In a domestic environment, this product might cause radio interference in which case the user might be required to take adequate measures.

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.

ACX500 Outdoor Routers

Canada

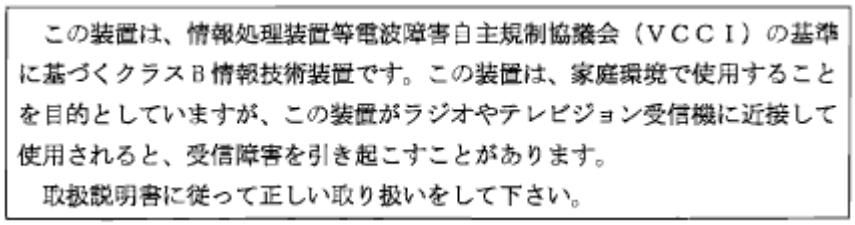
This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

European Community

This is a Class B product.

Japan


この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＢ情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。
取扱説明書に従って正しい取り扱いをして下さい。

The preceding statement translates as follows:

This is a Class B 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-B.

United States

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, might cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio or TV technician for help.

Compliance Statements for 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 ACX500 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