

# ACX6160 Universal Metro Router Hardware Guide

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# About This Guide

Use this guide to plan, install, perform initial software configuration, perform routine maintenance, and to troubleshoot ACX6160 Universal Metro Routers.

After completing the installation and basic configuration procedures covered in this guide.

## RELATED DOCUMENTATION

| [ACX6160 Quick Start Guide](#)

# 1

CHAPTER

## Overview

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# ACX6160 System Overview

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## ACX6160 Description

### IN THIS SECTION

- [Benefits of the ACX6160 | 3](#)
- [Front Panel | 4](#)
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The Juniper Networks ACX6160 Universal Metro Router is a standalone optical transponder that has 12 network ports, of which 8 are client ports, and 4 are line ports. It has removable DC power supplies and cooling fans. It supports the Open ROADM Multi-Source Agreements (MSA) (Version 2.2.1).

The ACX6160 is a transparent transponder that supports:

- Eight 100-Gigabit Ethernet/OTU4 client interfaces that support QSFP28 LR4 optics.

**NOTE:** Only four client interfaces are currently supported.

- Four 100-Gbps coherent dense wavelength division multiplexing (DWDM) line interfaces that support CFP2-DCO optics. These interfaces utilize quadrature phase shift keying (QPSK) modulation

with Open ROADM (reconfigurable optical add/drop multiplexer)-compliant high-gain forward error correction(HG-FEC).

[Table 1 on page 3](#) describes the model.

**Table 1: ACX6160 Hardware Model**

| Model Number | Description                                                                   |
|--------------|-------------------------------------------------------------------------------|
| ACX6160-T-DC | This model includes the chassis, five fan modules, and two DC power supplies. |

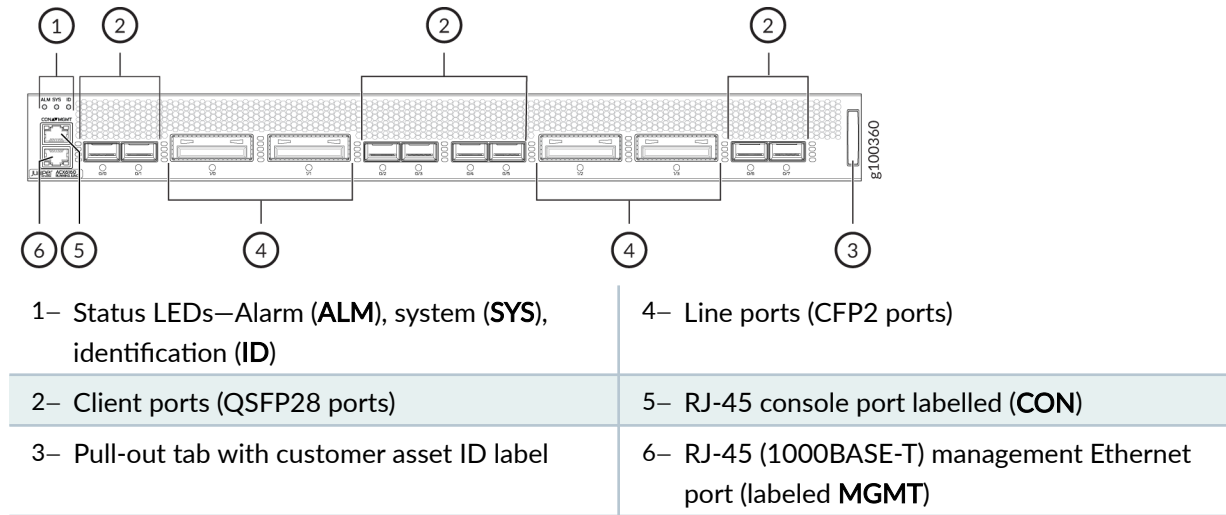
## Benefits of the ACX6160

- The ACX6160 provides full Open ROADM compatible transponder support for metro packet optical transport applications in a 1 U platform. Open ROADM-compatible APIs provide fully compliant third-party controller support along with HG-FEC-compliant interfaces, enabling true interoperable transponder functionality.
- The ACX6160 supports a zero touch deployment (ZTD) feature that significantly reduces the time required to install and provision new equipment, resulting in lower OpEx, lower TCO, and greater operational efficiency. ZTD also reduces the complexity of deploying MPLS in the access layer.
- Disaggregated and open-line system—The ACX6160 optimizes open-line system performance when combined with disaggregated control design. This enables flexible updates with service continuity and the freedom to deploy best transponder solutions.

## Front Panel

The front panel of the ACX6160 contains 12 network ports, comprising eight client ports and four line ports, LEDs, console and management ports, and system status LEDs. [Figure 1 on page 4](#) shows the ACX6160 front panel.

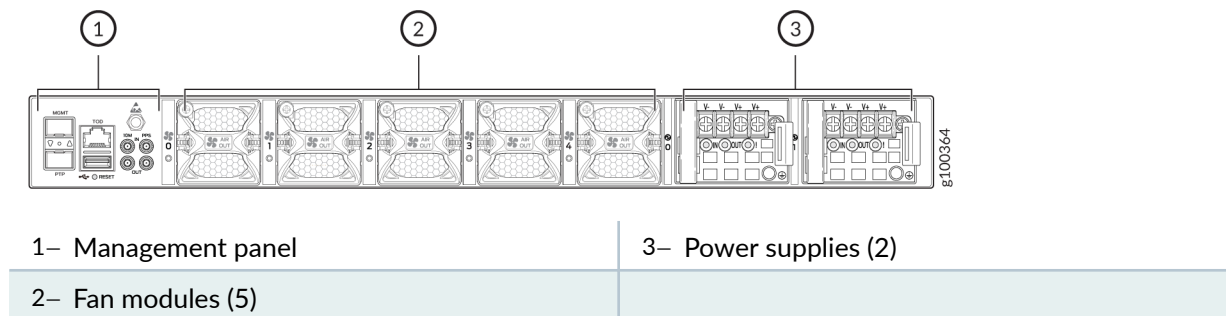
**Figure 1: ACX6160 Front Panel**



## Rear Panel

The rear panel contains the management panel, the fan modules, and power supplies for the ACX6160. [Figure 2 on page 4](#) shows the ACX6160 rear panel with the management panel and the FRUs. The management panel has external clock synchronization ports, and a USB port to support software installation and recovery.

**Figure 2: ACX6160 Management and FRU Panel**



## ACX6160 Hardware Components

The ACX6160 supports the components in [Table 2 on page 5](#) listed in alphabetic order.

**Table 2: ACX6160 Hardware Components**

| Component    | Spare Juniper Model Number |
|--------------|----------------------------|
| Chassis      | ACX6160-T-CHAS             |
| Fan module   | ACX6160-FAN-FRU            |
| Power supply | JPSU-650W-DC-AFO           |

## ACX6160 Component Redundancy

The following hardware components provide redundancy on an ACX6160:

- **Power supplies**—The ACX6160 has two power supplies. Each power supply provides power to all components in the device. The two power supplies provide full power redundancy to the device. If one power supply fails or is removed, the second power supply balances the electrical load without interruption. To provide power redundancy to the system, you must install both power supplies. Connect power source feed A to one power supply and power source feed B to the second power supply.



**CAUTION:** Do not connect feed A and feed B to the same power supply input terminal.

- **Cooling system**—The ACX6160 has five fan modules. If a fan module fails and the remaining fan modules are unable to keep the ACX6160 within the acceptable temperature thresholds, chassis alarms occur and the ACX6160 can shut down.



**CAUTION:** Replace a failed fan module with a new fan module within 4 minutes of removal to prevent chassis overheating.

## ACX6160 Field-Replaceable Units

Field-replaceable units (FRUs) are components that you can replace at your site. The ACX6160 FRUs are hot-removable and hot-insertable. You can remove and replace them without powering off the ACX6160 or disrupting the routing function.

The ACX6160 allows for two 50 GB serial advanced technology attachment (SATA) solid state drives (SSD) as a secondary boot drive or for log storage. The SATA SSD is a hot-insertable and hot-removable field-replaceable unit (FRU). The SSD cover plate is located on the top of the chassis.

Table 3 on page 6 lists the FRUs for the ACX6160 and actions to take before removing them.

**Table 3: Required Actions Before Removing a FRU from the ACX6160**

| FRU            | Required Actions Before Removal             |
|----------------|---------------------------------------------|
| Power supplies | Remove the cable for the power supply unit. |
| Fan modules    | None.                                       |
| SATA SSD       | None.                                       |

**NOTE:** If you have a Juniper Care service contract, register any addition, change, or upgrade of hardware components at <https://www.juniper.net/customers/support/tools/updateinstallbase/>. Failure to do so can result in significant delays if you need replacement parts. This note does not apply if you replace existing components with the same type of component.

## ACX6160 Front Panel

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- [ACX6160 Chassis Status LEDs | 8](#)

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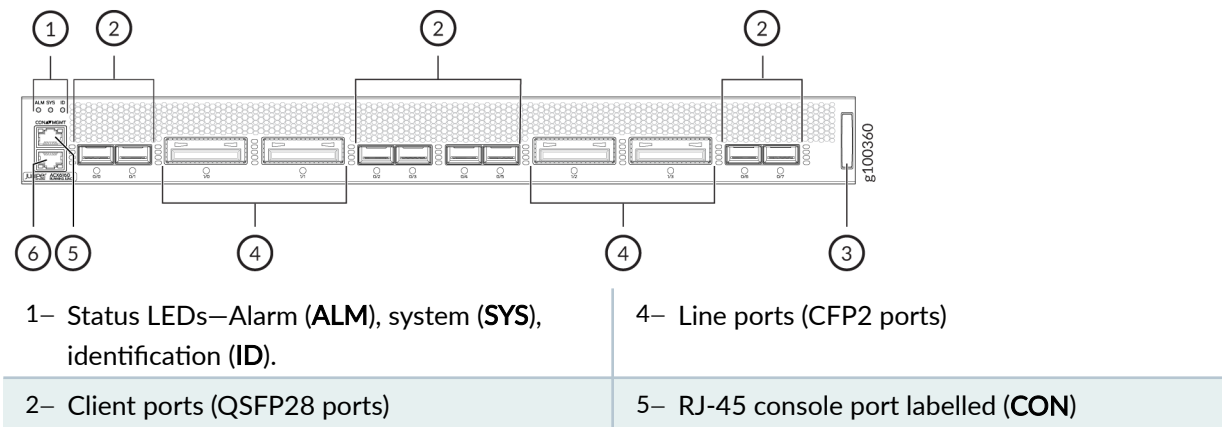
## ACX6160 Front Panel

IN THIS SECTION

- QSFP28 Network Ports | 8
- CFP2-DCO Network Ports | 8

The front panel of the ACX6160 contains network ports, port LEDs, console and management ports, and system status LEDs. You can manage the ACX6160 by using an open ROADM controller. [Figure 3 on page 7](#) shows the ACX6160 port panel. There are eight QSFP28 network ports and four line CFP2 ports on the front panel. Only four of the eight QSFP28 ports are currently supported (only the even ports of QSFP28, ports **0/0**, **0/2**, **0/4**, **0/6** are supported). The system status LEDs that alert you to minor or major alarms or other issues with the transponder.

Figure 3: ACX6160 Front Panel



|                                              |                                                                        |
|----------------------------------------------|------------------------------------------------------------------------|
| 3– Pull-out tab with customer asset ID label | 6– RJ-45 (1000BASE-T) management Ethernet port (labeled <b>MGMT</b> ). |
|----------------------------------------------|------------------------------------------------------------------------|

QSFP28 Network Ports

The ACX6160 has eight (client) network ports (**0/0** through **0/7**) that support QSFP28 transceivers. Currently (only the even ports of QSFP28, ports **0/0**, **0/2**, **0/4**, **0/6** are supported). These transceivers provide a speed of 100 Gbps, through four 25-Gbps channels. The ports are configured as 100-Gigabit Ethernet ports by default.

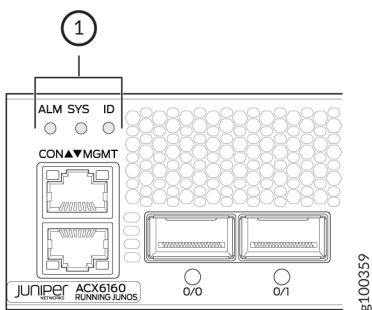
CFP2-DCO Network Ports

The ACX6160 has four line CFP2 network ports (**1/0** through **1/3**) that support C form-factor pluggable type 2 transceivers.

ACX6160 Chassis Status LEDs

The ACX6160 has three status LEDs located on the left of the port panel, adjacent to the client port **0/0** (see [Figure 4 on page 8](#)). The system status LEDs that alert you to minor or major alarms or other issues with the router, external clock synchronization ports.

Figure 4: ACX6160 Chassis Status LEDs



|                                                                                           |  |
|-------------------------------------------------------------------------------------------|--|
| 1– Status LEDs—Alarm ( <b>ALM</b> ), system ( <b>SYS</b> ), identification ( <b>ID</b> ). |  |
|-------------------------------------------------------------------------------------------|--|

[Table 4 on page 9](#) describes the chassis status LEDs (located on the left side of the front panel) on an ACX6160, their colors and states, and the status they indicate.

Table 4: Chassis Status LEDs

| Name                        | Color | State       | Description                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------|-------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ALM</b> —Alarm or beacon | Unlit | Off         | The device is halted or there is no alarm.                                                                                                                                                                                                                                                                                                                                                                                 |
|                             | Red   | On steadily | A major hardware fault has occurred, such as a temperature alarm or power failure, and the device has halted. When such a fault occurs, power off the device. See <a href="#">"Powering Off the ACX6160" on page 66</a> . Correct any voltage or site temperature issues, and allow the device to cool down. Power on the device and monitor the power supply and fan LEDs to help determine where the error is occurring. |
|                             | Amber | On steadily | A minor alarm has occurred, such as a software error. When you see the <b>ALM</b> LED lit amber, power off the device. <a href="#">"Powering Off the ACX6160" on page 66</a> . Power on the device and monitor the <b>SYS</b> status LEDs to ensure that Junos OS boots properly.                                                                                                                                          |

Table 4: Chassis Status LEDs (*Continued*)

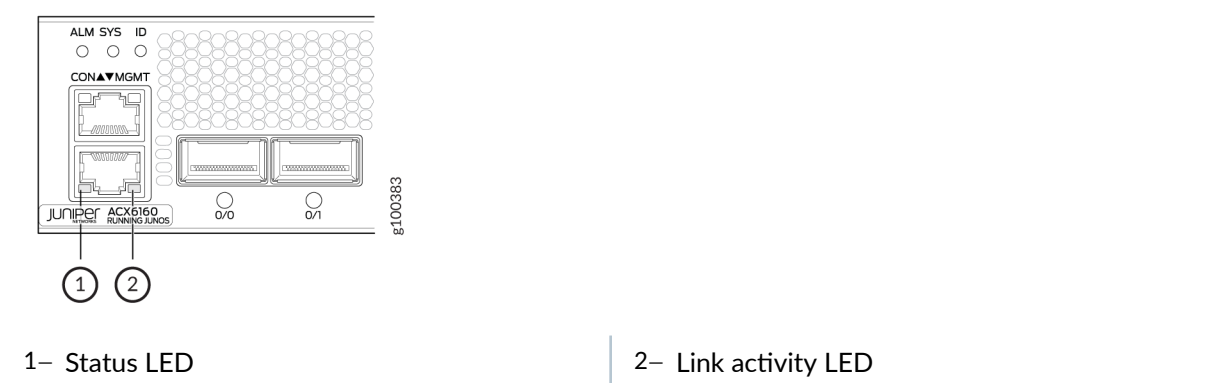
| Name                      | Color | State              | Description                                                                                                                                              |
|---------------------------|-------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SYS</b> –System        | Unlit | Off                | The device is powered off or halted.                                                                                                                     |
|                           | Green | On steadily<br>Off | The device is powered on and Junos OS is loaded on the device.                                                                                           |
| <b>ID</b> –Identification | Unlit |                    | The beacon feature is not enabled on the device.                                                                                                         |
|                           | Blue  | Blinking           | The beacon feature is enabled on the device. The beacon feature helps the administrator identify the device. This feature is not supported at this time. |

## ACX6160 Management and Console Port LEDs on the Front Panel

There are two management ports on the ACX6160, both ports are labeled **MGMT**. The RJ-45 management port is for 10/100/1000BASE-T connections and is located on the front panel. The other management port is located on the rear panel.

The RJ-45 port has separate LEDs for status and activity. [Figure 5 on page 11](#) shows the location of the LEDs.

**Figure 5: Management Port LEDs on an ACX6160**



[Table 5 on page 11](#) describes the RJ-45 management port LEDs.

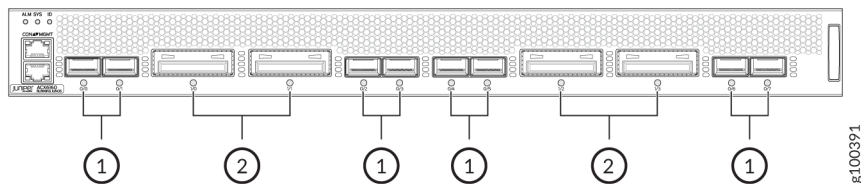
**Table 5: ACX6160 RJ-45 Management Port LEDs**

| LED           | Color | State                  | Description                                                    |
|---------------|-------|------------------------|----------------------------------------------------------------|
| Link activity | Unlit | Off                    | No link is established, there is a fault, or the link is down. |
|               | Amber | Blinking or flickering | A link is established, and there is link activity.             |
| Status        | Unlit | Off                    | Either the port speed is 10 Mbps or the link is down.          |
|               | Green | On steadily            | The port speed is 1000 Mbps.                                   |

## ACX6160 Network Port LEDs

Each ACX6160 network port uses a single bicolored LED to indicate link status and activity. The circular LEDs are located underneath the QSFP28 and CFP2 ports. [Figure 6 on page 12](#) shows the location of the LEDs.

**Figure 6: Network Port LEDs on an ACX6160**



1– Network port LEDs (for the QSFP28 ports)

2– Network port LEDs (for the CFP2 ports)

The number underneath the LED indicates the port number that the LED belongs to.

[Table 6 on page 12](#) describes the QSFP28 and CFP2 network port LEDs.

**Table 6: ACX6160 Network Port LEDs**

| Color | State       | Description                                                                                                  |
|-------|-------------|--------------------------------------------------------------------------------------------------------------|
| Unlit | Off         | The port is administratively disabled, there is no power, the link is down, or a transceiver is not present. |
| Red   | On steadily | Transceiver is present and provisioned but has failed.                                                       |
| Amber | On steadily | There are one or more errors on the traffic.                                                                 |
| Green | On steadily | There is traffic.                                                                                            |

### RELATED DOCUMENTATION

[ACX6160 System Overview | 2](#)

[ACX6160 Management Panel | 13](#)

# ACX6160 Management Panel

IN THIS SECTION

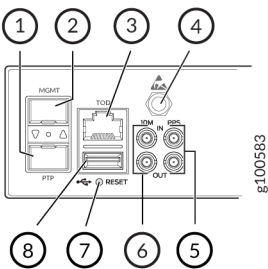
- ACX6160 Management Panel | 13

## ACX6160 Management Panel

The ACX6160 management panel is found on the rear panel of the device.

There are MGMT and PTP ports that support SFP optics on the management panel on the FRU side. The small form-factor pluggable (SFP) management port is for 10/100/1000BASE-T and 1000BASE-X connections and is located on the rear panel of the device. The USB port is also located on the rear panel and supports software installation and recovery. See [Figure 7 on page 13](#) for management panel details.

Figure 7: ACX6160 Management Panel



|                                                                                                                               |                                                                                                                                                   |
|-------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 1– SFP PTP Ethernet (100BASE-T) port(labeled <b>PTP</b> ). The PTP is not currently supported. It is reserved for future use. | 5– Pulses-per-second SMBconnector (labeled <b>PPS</b> ) input and output. The PPS port is not currently supported. It is reserved for future use. |
| 2– SFP management Ethernet port (labeled <b>MGMT</b> ). In the Junos OS CLI, this port is identified as <code>em2</code> .    | 6– 10 MHz SubMiniature B (SMB) connector (labeled 10M) input and output. The 10M                                                                  |

|                                                                                                                           |                                                                  |
|---------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
|                                                                                                                           | port is not currently supported. It is reserved for future use.  |
| 3– RS-232 Time-of-day port (labeled <b>TOD</b> ). The TOD port is not currently supported. It is reserved for future use. | 7– Reset button. Press and hold 5 seconds to reset the hardware. |
| 4– Electrostatic discharge (ESD) terminal                                                                                 | 8– USB port.                                                     |

The SFP port has a LED to indicate both link and activity. [Table 7 on page 14](#) describes the SFP management port LEDs.

**Table 7: ACX6160 SFP Management Port LED**

| LED           | Color | State                  | Description                                                    |
|---------------|-------|------------------------|----------------------------------------------------------------|
| Link activity | Unlit | Off                    | No link is established, there is a fault, or the link is down. |
|               | Green | On steadily            | A link is established, but there is no link activity.          |
|               |       | Blinking or flickering | A link is established, and there is link activity.             |

RELATED DOCUMENTATION

|                                             |
|---------------------------------------------|
| <a href="#">ACX6160 System Overview   2</a> |
| <a href="#">ACX6160 Front Panel   6</a>     |

# ACX6160 Cooling System

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# ACX6160 Cooling System Description

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- Fan Modules | 15
- Airflow Through the Chassis | 16

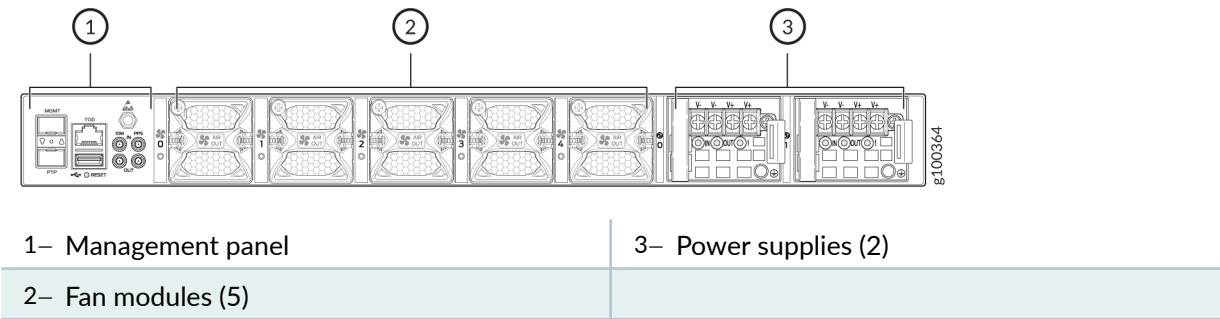
## Fan Modules

The cooling system in an ACX6160 consists of fan modules and a single fan in each power supply. There are five fan modules in the ACX6160, each fan module has two fans.

The fan modules in the ACX6160 are hot-insertable and hot-removable field-replaceable units (FRUs). These fan modules are designed to work with the airflow out direction. The fan modules are installed in the fan module slots on the rear panel of the device next to the power supplies. The ACX6160 has five fan modules numbered 0 through 4 from left to right. Each fan module slot has a fan icon next to it.

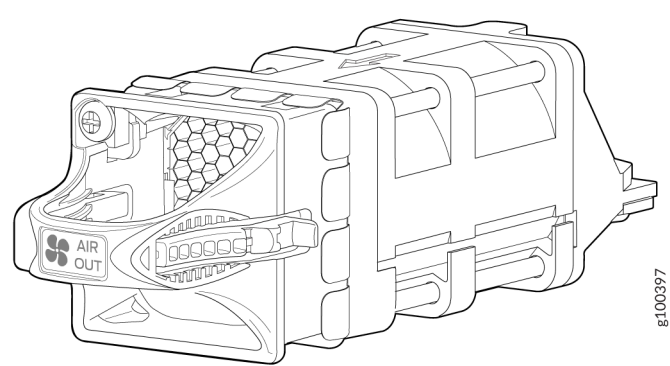
Figure 8 on page 15 shows the location of the fan modules on the device. Figure 9 on page 16 shows an example of a fan module.

Figure 8: ACX6160 Rear Panel



You remove and replace a fan module from the rear panel of the chassis. The device continues to operate for a limited period of time (4 minutes) during the replacement of the fan module without thermal shutdown. [Figure 9 on page 16](#) shows the fan module for the ACX6160.

Figure 9: ACX6160 Fan Module



**NOTE:** All fan modules must be installed for optimal operation of the device.

[Table 8 on page 16](#) lists the fan information.

Table 8: ACX6160 Fan Module

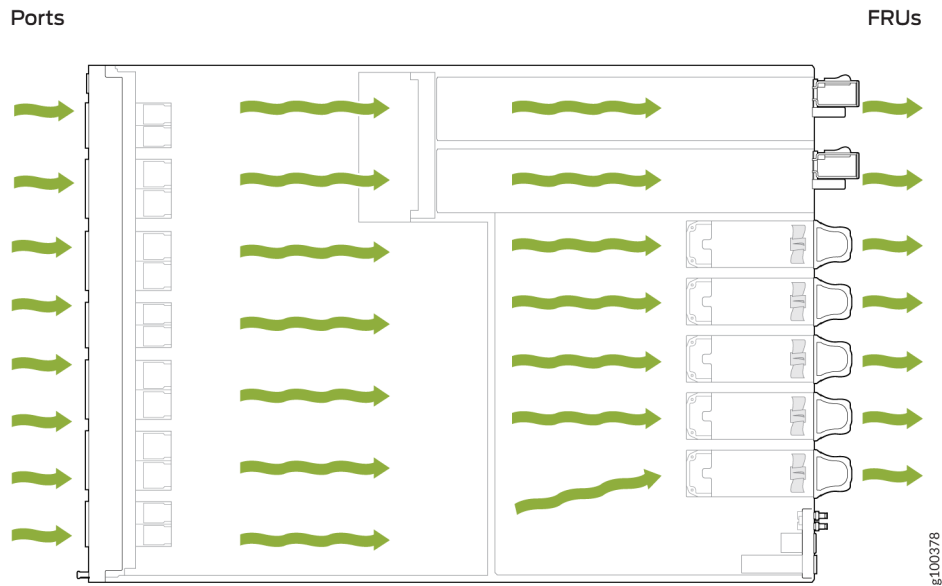
| Fan Module      | Label on the Fan Module | Direction of Airflow in the Fan Module                                                                                                                | Power Supply to be Installed                                                                                                         |
|-----------------|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| ACX6160-FAN-FRU | <b>AIR OUT</b>          | Port-to-FRU, that is, air comes in through vents on the end with ports; air exhausts out the end with the fans (also known as front-to-back airflow). | You must install only power supplies that have <b>AIR OUT</b> labels in devices in which the fan modules have <b>AIR OUT</b> labels. |

Airflow Through the Chassis

In the ACX6160 cooling system, cool air enters through the vents in the front panel and hot air exhausts through the rear (FRU) panel. This type of airflow is known as *airflow out* or *port-to-FRU* airflow. The airflow direction on the ACX6160 is airflow out, air comes into the device through the vents in the front

panel. When the chassis is installed, it must be positioned so that the FRUs are next to the *hot aisle*. [Figure 10 on page 17](#) shows the airflow through the chassis.

**Figure 10: Airflow Through the ACX6160 Chassis (Port-to-FRU)**



**NOTE:** Under normal operating conditions, the fan modules operate at a moderate speed. Temperature sensors in the chassis monitor the temperature within the chassis. The system raises an alarm if a fan module fails or if the ambient temperature inside the chassis rises above the acceptable range. If the temperature inside the chassis rises above the threshold temperature, the system shuts down automatically.



# ACX6160 Power System

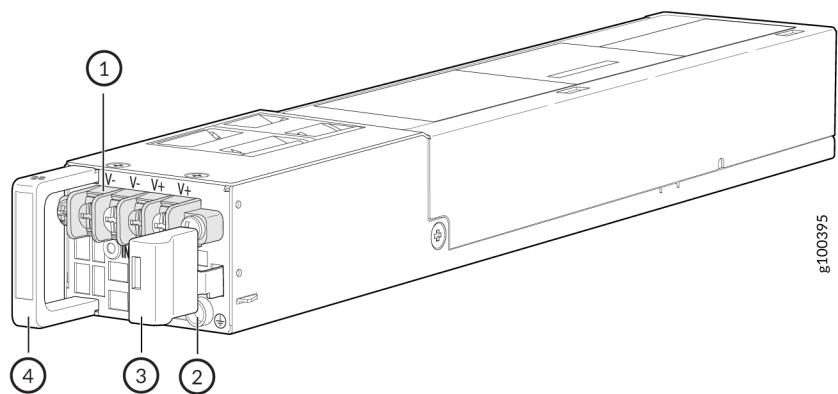
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- ACX6160 DC Power Cable Specifications | 22

## ACX6160 DC Power Supply Description

The power supplies in an ACX6160 devices (see [Figure 12 on page 19](#)) are hot-removable and hot-insertable FRUs that you can install in the ACX6160 device without powering it off or disrupting the routing functions. Each 650-W DC input has dual feeds for power resiliency and provides 12-VDC output with a standby voltage of 5-VDC.

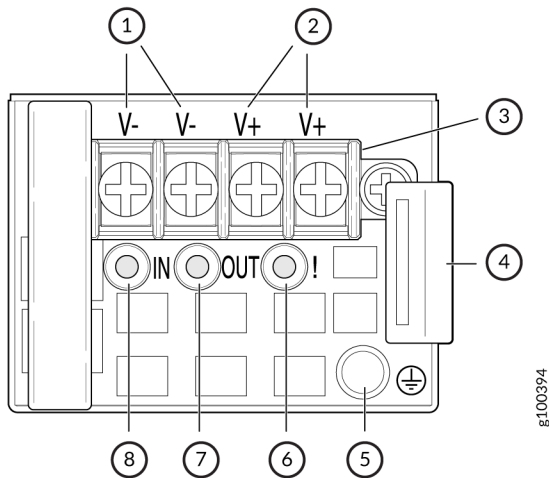
Figure 12: ACX6160 DC Power Supply



|                        |                |
|------------------------|----------------|
| 1– Terminal block      | 3– Latch lever |
| 2– ESD grounding point | 4– Handle      |

**NOTE:** The DC power supply has four terminals labeled V-, V-, V+, and V+ (see [Figure 13 on page 20](#)) for connecting DC power source cables labeled positive (+) and negative (-).

Figure 13: ACX6160 DC Power Supply Faceplate



|                                          |                        |
|------------------------------------------|------------------------|
| 1– Shunt negative input terminals (-48V) | 5– ESD grounding point |
| 2– Shunt positive input terminals (+RTN) | 6– Fault LED (!)       |
| 3– Terminal block                        | 7– Output LED (OUT)    |
| 4– Latch lever                           | 8– Input LED (IN)      |

 **CAUTION:** To avoid electrical injury, carefully follow instructions in ["Connecting the ACX6160 to Power"](#) on page 54, ["Maintaining the ACX6160 Power Supplies"](#) on page 71.

## ACX6160 DC Power Supply LEDs

[Figure 13 on page 20](#) shows the location of the LEDs on the DC power supply.



**CAUTION:** The V+ terminals are shunted internally together, as are the V- terminals. Do not connect the terminals to different sources.

Table 10 on page 21 describes the LEDs on the DC power supplies.

Table 10: ACX6160 DC Power Supply LEDs

| Name      | Color | State       | Description                                                                                                                                                                                                                |
|-----------|-------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IN        | Unlit | Off         | The power supply is disconnected from power, or the power supply is not receiving power.                                                                                                                                   |
|           | Green | On steadily | The power supply is receiving power.                                                                                                                                                                                       |
| OUT       | Unlit | Off         | The power supply is disconnected from power, or the power supply is not sending out power.                                                                                                                                 |
|           | Green | On steadily | Power is sending out power.                                                                                                                                                                                                |
| ! (Fault) | Amber | On steadily | An error is detected in the power supply. Replace the power supply as soon as possible. To maintain proper airflow through the chassis, leave the power supply installed in the chassis until you are ready to replace it. |

## ACX6160 DC Power Specifications

Table 11 on page 21 describes the DC power specifications for ACX6160 DC power supplies.

Table 11: DC Power Specifications for an ACX6160

| Item             | Specifications                                                                                                                                       |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| DC input voltage | <ul style="list-style-type: none"><li>Rated operating voltage: -48 VDC to -60 VDC</li><li>Operating voltage range: -40 VDC through -72 VDC</li></ul> |

**Table 11: DC Power Specifications for an ACX6160 (Continued)**

| Item                      | Specifications |
|---------------------------|----------------|
| DC input current rating   | 20 A maximum   |
| Typical power consumption | 300 W          |
| Maximum power consumption | 500 W          |

## ACX6160 DC Power Cable Specifications

ACX6160 DC power supplies require a D-Sub 3W3- type connector. The three pins on the connector provide -48 VDC input (-), return (+), and ground connections to the power supply.

**NOTE:** The optional right-angle DC power cables, CBL-JNP-PWR-DSUB2 and CBL-JNP-PWR-DSUB3, do not include a ground connection wire.

Regardless which DC power cable you use, you must connect the ACX6160 to earth ground before you connect it to power, using the procedure described in ["Connecting the ACX6160 Grounding Cable" on page 55](#).

DC power cables, each approximately 4 m long, are supplied with the ACX6160. The provided cables include the three-pin connector on one end and insulated wires at the opposite end, for connection to the site's DC power distribution system.

[Table 12 on page 22](#) lists the specifications for the ACX6160 DC power cables.

**Table 12: ACX6160 DC Power Cable Specifications**

| Juniper Model Number              | Wire Function     | Insulation Color | Wire Size                           |
|-----------------------------------|-------------------|------------------|-------------------------------------|
| CBL-JNP-PWR-DSUB (straight cable) | -48 VDC input (-) | Blue             | 8 AWG (8.4 mm <sup>2</sup> ), 90° C |
|                                   | Return (+)        | Black            | 8 AWG (8.4 mm <sup>2</sup> ), 90° C |

Table 12: ACX6160 DC Power Cable Specifications *(Continued)*

| Juniper Model Number                                               | Wire Function     | Insulation Color | Wire Size                           |
|--------------------------------------------------------------------|-------------------|------------------|-------------------------------------|
|                                                                    | Ground            | Green and yellow | 8 AWG (8.4 mm <sup>2</sup> ), 90° C |
| CBL-JNP-PWR-DSUB2 (right-angle cable)                              | -48 VDC input (-) | Blue             | 8 AWG (8.4 mm <sup>2</sup> ), 90° C |
|                                                                    | Return (+)        | Black            | 8 AWG (8.4 mm <sup>2</sup> ), 90° C |
| CBL-JNP-PWR-DSUB3<br>(FT4 vertical-flame rated, right-angle cable) | -48 VDC input (-) | Gray             | 8 AWG (8.4 mm <sup>2</sup> ), 90° C |
|                                                                    | Return (+)        | Gray             | 8 AWG (8.4 mm <sup>2</sup> ), 90° C |



**WARNING:** For field-wiring connections, use copper conductors only.



**WARNING:** Power cables must not block access to ACX6160 components or drape where people could trip over them.



**CAUTION:** You must ensure that power connections maintain the proper polarity. The power source cables might be labeled (+) and (-) to indicate their polarity. There is no standard color coding for DC power cables. The color coding used by the external DC power source at your site might be different from the color coding for the leads on the DC power cable provided with the chassis.

## RELATED DOCUMENTATION

[ACX6160 Installation Overview | 47](#)

[Maintaining the ACX6160 Power Supplies | 71](#)

# 2

CHAPTER

## Site Planning, Preparation, and Specifications

---

[ACX6160 Site Preparation Checklist | 25](#)

[ACX6160 Site Guidelines and Requirements | 27](#)

[ACX6160 Network Cable and Transceiver Planning | 36](#)

[ACX6160 Management Cable Specifications and Pinouts | 42](#)

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# ACX6160 Site Preparation Checklist

The checklist in [Table 13 on page 25](#) summarizes the tasks you need to perform when preparing a site for an ACX6160 installation.

**Table 13: Site Preparation Checklist**

| Item or Task                                                                                        | For More Information                                                                                                                                                                           | Performed by | Date |
|-----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------|
| <b>Environment</b>                                                                                  |                                                                                                                                                                                                |              |      |
| Verify that environmental factors such as temperature and humidity do not exceed router tolerances. | <a href="#">"ACX6160 Environmental Requirements and Specifications" on page 27</a>                                                                                                             |              |      |
| <b>Power</b>                                                                                        |                                                                                                                                                                                                |              |      |
| Measure the distance between external power sources and the router installation site.               |                                                                                                                                                                                                |              |      |
| Calculate the power consumption and requirements.                                                   | <ul style="list-style-type: none"> <li>• <a href="#">"ACX6160 DC Power Specifications" on page 21</a></li> <li>• <a href="#">"ACX6160 DC Power Cable Specifications" on page 22</a></li> </ul> |              |      |
| <b>Rack or Cabinet</b>                                                                              |                                                                                                                                                                                                |              |      |
| Verify that your rack or cabinet meets the minimum requirements for the installation of the router. | <ul style="list-style-type: none"> <li>• <a href="#">"ACX6160 Rack Requirements" on page 32</a></li> <li>• <a href="#">Table 18 on page 34</a></li> </ul>                                      |              |      |

**Table 13: Site Preparation Checklist (Continued)**

| Item or Task                                                        | For More Information                                                                             | Performed by | Date |
|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|--------------|------|
| Plan rack or cabinet location, including required space clearances. | <a href="#">"ACX6160 Clearance Requirements for Airflow and Hardware Maintenance" on page 30</a> |              |      |
| Secure the rack or cabinet to the floor and building structure.     |                                                                                                  |              |      |

**Cables**

|                                                                                                                                                                                                                                                                                                                                   |                                                                                                                               |  |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|--|--|
| <p>Acquire cables and connectors:</p> <ul style="list-style-type: none"> <li>Determine the number of cables needed based on your planned configuration.</li> <li>Review the maximum distance allowed for each cable. Choose the length of cable based on the distance between the hardware components being connected.</li> </ul> | <ul style="list-style-type: none"> <li><a href="#">"ACX6160 Network Cable and Transceiver Planning" on page 36</a></li> </ul> |  |  |
| Plan the cable routing and management.                                                                                                                                                                                                                                                                                            |                                                                                                                               |  |  |

**RELATED DOCUMENTATION**


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[ACX6160 Installation Overview | 47](#)


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[Installation Instructions Warning | 108](#)


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[Chassis and Component Lifting Guidelines | 109](#)


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[Restricted Access Warning | 109](#)

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[Ramp Warning | 111](#)

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[Rack-Mounting and Cabinet-Mounting Warnings | 111](#)

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[Grounded Equipment Warning | 115](#)

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## ACX6160 Site Guidelines and Requirements

### IN THIS SECTION

- [ACX6160 Environmental Requirements and Specifications | 27](#)
- [General Site Guidelines | 28](#)
- [ACX6160 Chassis Grounding Cable and Lug Specifications | 29](#)
- [ACX6160 Clearance Requirements for Airflow and Hardware Maintenance | 30](#)
- [ACX6160 Physical Specifications | 30](#)
- [Site Electrical Wiring Guidelines | 31](#)
- [ACX6160 Rack Requirements | 32](#)
- [ACX6160 Cabinet Requirements | 34](#)

### ACX6160 Environmental Requirements and Specifications

The ACX6160 must be installed in a rack or cabinet. It must be housed in a dry, clean, well-ventilated, and temperature-controlled environment.

Follow these environmental guidelines:

- Keep the site as dust-free as possible, because dust can clog air intake vents and filters, reducing the efficiency of the ACX6160 cooling system.
- Maintain ambient airflow for normal ACX6160 operation. If the airflow is blocked or restricted, or if the intake air is too warm, the chassis might overheat, leading to the ACX6160 temperature monitor shutting down the router to protect the hardware components.

Table 14 on page 28 provides the required environmental conditions for normal ACX6160 operation.

**Table 14: ACX6160 Environmental Tolerances**

| Description       | Tolerance                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Altitude          | No performance degradation up to 6,562 feet (2000 meters).                                                                                                                                                                                                                                                                                                                                         |
| Relative humidity | <ul style="list-style-type: none"> <li>• Normal operation ensured in relative humidity range of 5% through 90%, noncondensing.</li> <li>• Short-term operation ensured in relative humidity range of 5% through 93%, noncondensing.</li> </ul> <p><b>NOTE:</b> As defined in NEBS GR-63-CORE, Issue 3, short-term events can be up to 96 hours in duration but not more than 15 days per year.</p> |
| Temperature       | <ul style="list-style-type: none"> <li>• Normal operation ensured in temperature range of 23° F (–5° C) through 131° F (55° C).</li> <li>• Nonoperating storage temperature in shipping container: –40° F (–40° C) through 158° F (70° C).</li> </ul>                                                                                                                                              |
| Seismic           | Designed to comply with Zone 4 earthquake requirements per NEBS GR-63-CORE, Issue 3.                                                                                                                                                                                                                                                                                                               |

**NOTE:** Install the ACX6160 only in restricted access areas, such as dedicated equipment rooms and equipment closets, in accordance with Articles 110-16, 110-17, and 110-18 of the National Electrical Code, ANSI/NFPA 70.

## 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.

## ACX6160 Chassis Grounding Cable and Lug Specifications

For installations that require a separate grounding conductor to the chassis, the ACX6160 must be adequately grounded before power is connected to ensure proper operation and to meet safety and electromagnetic interference (EMI) requirements. To ground an ACX6160, connect a grounding cable to earth ground and then attach it to the chassis grounding points.



**WARNING:** The device is a pluggable type A equipment installed in a restricted-access location. It has a separate protective earthing terminal provided on the chassis in addition to the grounding pin of the power supply cord. This separate protective earthing terminal must be permanently connected to earth ground for installations that require a separate grounding conductor to the chassis.



**WARNING:** To comply with GR-1089 requirements, all intrabuilding copper cabling used for SFP+, QSFP+, and QSFP28 ports must be shielded and grounded at both ends.



**CAUTION:** Before device installation begins, a licensed electrician must attach a cable lug to the grounding cables that you supply. See ["Connecting the ACX6160 Grounding Cable" on page 55](#). A cable with an incorrectly attached lug can damage the ACX6160.

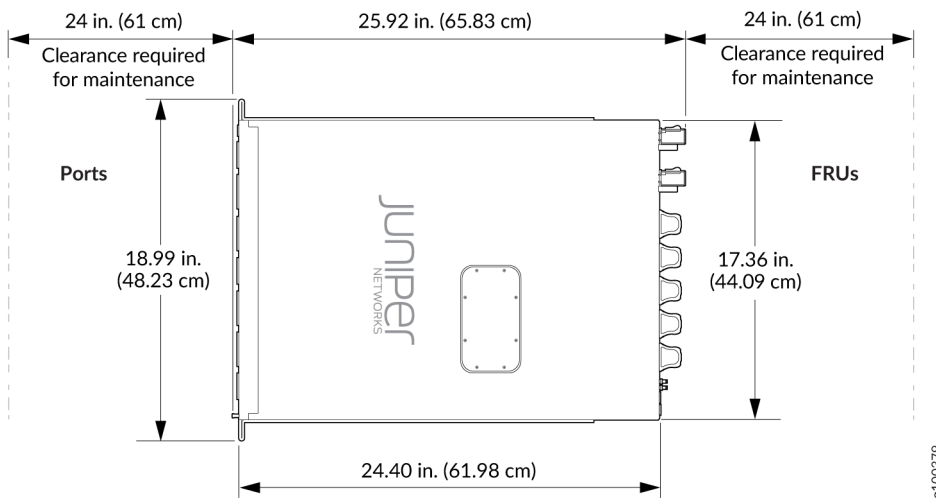
Before connecting the ACX6160 to earth ground, review the following information:

- The grounding lug required is a Panduit LCD10-10A-L or equivalent (not provided). The grounding lug accommodates 14–10 AWG (2–5.3 mm<sup>2</sup>) stranded wire.
- The grounding points require two #10-32 UNF x .31L screws and washers. The grounding points are spaced at 0.63 in. (16 mm).
- The grounding cable that you provide for an ACX6160 must be the same size or heavier than the input wire of each power supply. Minimum recommendations are 14 AWG (2 mm<sup>2</sup>) stranded wire, 60° C wire, or as permitted by local code.

## ACX6160 Clearance Requirements for Airflow and Hardware Maintenance

When planning the site for an ACX6160 installation, you must allow sufficient clearance around the installed chassis (see [Figure 14 on page 30](#)).

**Figure 14: Clearance Requirements for Airflow and Hardware Maintenance for an ACX6160**



Follow these guidelines:

- For the cooling system to function properly, the airflow around the chassis must be unrestricted. See ["ACX6160 Cooling System" on page 14](#) for more information about the airflow through the chassis.
- If you are mounting an ACX6160 in a rack with other equipment, ensure that the exhaust from other equipment does not blow into the intake vents of the chassis.
- You must leave at least 24 in. (61 cm) both in front of and behind the ACX6160 for service personnel to remove and install hardware components. NEBS GR-63 recommends that you allow at least 30 in. (76.2 cm) in front of the rack or cabinet and 24 in. (61 cm) behind the rack.

## ACX6160 Physical Specifications

[Table 15 on page 31](#) lists the physical specifications for the ACX6160 chassis.

Table 15: Physical Specifications for the ACX6160

| Product SKU | Weight                                                        | Height            | Width                | Depth                |
|-------------|---------------------------------------------------------------|-------------------|----------------------|----------------------|
| ACX6160-T   | With all power supplies and fans installed: 24 lbs (10.89 kg) | 1.72 in. (4.3 cm) | 17.36 in. (44.09 cm) | 25.92 in. (65.83 cm) |

## Site Electrical Wiring Guidelines

Table 16 on page 31 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 16: Site Electrical Wiring Guidelines

| Site Wiring Factor    | Guidelines                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Signaling limitations | <p>If your site experiences any of the following problems, consult experts in electrical surge suppression and shielding:</p> <ul style="list-style-type: none"><li>• Improperly installed wires cause radio frequency interference (RFI).</li><li>• Damage from lightning strikes occurs when wires exceed recommended distances or pass between buildings.</li><li>• Electromagnetic pulses (EMPs) caused by lightning damage unshielded conductors and electronic devices.</li></ul> |

**Table 16: Site Electrical Wiring Guidelines (Continued)**

| Site Wiring Factor            | Guidelines                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Radio frequency interference  | <p>To reduce or eliminate RFI from your site wiring, do the following:</p> <ul style="list-style-type: none"> <li>• Use a twisted-pair cable with a good distribution of grounding conductors.</li> <li>• If you must exceed the recommended distances, use a high-quality twisted-pair cable with one ground conductor for each data signal, when applicable.</li> </ul>                                                                                        |
| Electromagnetic compatibility | <p>If your site is susceptible to problems with electromagnetic compatibility (EMC), particularly from lightning or radio transmitters, seek expert advice.</p> <p>Strong sources of electromagnetic interference (EMI) can cause:</p> <ul style="list-style-type: none"> <li>• Destruction of the signal drivers and receivers in the device,</li> <li>• Electrical hazards as a result of power surges conducted over the lines into the equipment.</li> </ul> |

## ACX6160 Rack Requirements

The ACX6160 chassis is designed to be installed in four-post racks.

Rack requirements consist of:

- Rack type
- Mounting bracket hole spacing
- Rack size and strength

[Table 17 on page 33](#) provides the rack requirements and specifications for the ACX6160.

**Table 17: Rack Requirements for the ACX6160**

| Rack Requirement              | Guidelines                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rack type: four-post          | <p>Use a four-post rack that provides bracket holes or hole patterns spaced at 1-U (1.75 in. or 4.45 cm) increments and that meets the size and strength requirements to support the weight.</p> <p>A U is the standard rack unit defined in <i>Cabinets, Racks, Panels, and Associated Equipment</i> (document number EIA-310-D) published by the Electronics Components Industry Association (<a href="http://www.ecianow.org/">http://www.ecianow.org/</a>).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Mounting bracket hole spacing | <p>The holes in the mounting brackets are spaced at 1 U (1.75 in. or 4.45 cm), so that the ACX6160 can be mounted in any rack that provides holes spaced at that distance.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Rack size and strength        | <ul style="list-style-type: none"> <li>• Ensure that the rack complies with the standards for a 19-in. rack as defined in <i>Cabinets, Racks, Panels, and Associated Equipment</i> (document number EIA-310-D) published by the Electronics Components Industry Association (<a href="http://www.ecianow.org/">http://www.ecianow.org/</a>).</li> <li>• Use a 600-mm rack as defined in the four-part <i>Equipment Engineering (EE); European telecommunications standard for equipment practice</i> (document numbers ETS 300 119-1 through 119-4) published by the European Telecommunications Standards Institute (<a href="http://www.etsi.org">http://www.etsi.org</a>).</li> </ul> <p>The horizontal spacing between the rails in a rack that complies with this standard is usually wider than the router's mounting brackets, which measure 19 in. (48.26 cm) from outer edge to outer edge. Use approved wing devices to narrow the opening between the rails as required.</p> <ul style="list-style-type: none"> <li>• Ensure that the rack rails are spaced widely enough to accommodate the external dimensions of the ACX6160 chassis. The outer edges of the front-mounting rails extend the width to 19 in. (48.26 cm).</li> <li>• Space the front and rear racks between 24.25 in. (61.6 cm) to 31 in. (78.7 cm) front-to-back.</li> <li>• Ensure that the rack is strong enough to support the weight of the device.</li> <li>• Ensure that the spacing of rails and adjacent racks allows for proper clearance around the ACX6160 and rack.</li> </ul> |

**Table 17: Rack Requirements for the ACX6160 (Continued)**

| Rack Requirement                      | Guidelines                                                                                                                                                                                                                                                                                                |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rack connection to building structure | <ul style="list-style-type: none"> <li>Secure the rack to the building structure.</li> <li>If earthquakes are a possibility in your geographical area, secure the rack to the floor.</li> <li>Secure the rack to the ceiling brackets as well as wall or floor brackets for maximum stability.</li> </ul> |

## ACX6160 Cabinet Requirements

You can mount the ACX6160 in an enclosure or cabinet that contains a four-post 19-in. open rack as defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310-D) published by the Electronics Industry Association.

Cabinet requirements consist of:

- Cabinet size and clearance
- Cabinet airflow requirements

[Table 18 on page 34](#) provides the cabinet requirements and specifications for the ACX6160.

**Table 18: Cabinet Requirements for the ACX6160**

| Cabinet Requirement        | Guidelines                                                                                                                                                  |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cabinet size and clearance | The minimum cabinet size for accommodating an ACX6160 device is 36 in. (91.4 cm) deep. Large cabinets improve airflow and reduce the chance of overheating. |

**Table 18: Cabinet Requirements for the ACX6160 (Continued)**

| Cabinet Requirement          | Guidelines                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cabinet airflow requirements | <p>When you mount the device in a cabinet, ensure that ventilation through the cabinet is sufficient to prevent overheating.</p> <ul style="list-style-type: none"> <li>• Ensure that the cool air supply you provide through the cabinet adequately dissipates the thermal output of the device.</li> <li>• Ensure that the cabinet allows the chassis hot exhaust air to exit the cabinet without recirculating into the device. An open cabinet (without a top or doors) that employs hot air exhaust extraction from the top allows the best airflow through the chassis. If the cabinet contains a top or doors, perforations in these elements assist with removing the hot air exhaust.</li> <li>• The ACX6160 fans exhaust hot air through the vents on the fan modules and power supplies. Install the device in the cabinet in a way that maximizes the open space on the FRU side of the chassis. This maximizes the clearance for critical airflow.</li> <li>• Route and dress all cables to minimize the blockage of airflow to and from the chassis.</li> <li>• Ensure that the spacing of rails and adjacent cabinets allows for the proper clearance around the device and cabinet.</li> </ul> |

**RELATED DOCUMENTATION**
[General Safety Guidelines and Warnings | 103](#)
[General Electrical Safety Guidelines and Warnings | 126](#)
[Prevention of Electrostatic Discharge Damage | 128](#)

# ACX6160 Network Cable and Transceiver Planning

## IN THIS SECTION

- Determining Transceiver Support for the ACX6160 | 36
- Cable and Connector Specifications for the ACX6160 | 37
- Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion | 38
- Calculating Power Budget and Power Margin for Fiber-Optic Cables | 40

## Determining Transceiver Support for the ACX6160

The ACX6160 has 12 network ports. The eight QSFP28 network ports on the port panel support QSFP28 transceivers.

The four CFP2 network ports on the port panel support CFP2 transceivers. You can configure each of the four CFP2 ports as 100-Gigabit Ethernet ports.

See "[ACX6160 Front Panel](#)" on [page 6](#) for more information about the network ports.

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 enables you to search by product, displaying all the transceivers supported on that device, or category, by interface speed or type. The list of supported transceivers for the ACX6160 is located at <https://pathfinder.juniper.net/hct/product/#prd=ACX6160>.



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

third-party optical module or cable and, if required, replace it with an equivalent Juniper-qualified component.

Use of third-party optical modules with high-power consumption (for example, coherent ZR or ZR+) can potentially cause thermal damage to or reduce the lifespan of the host equipment. Any damage to the host equipment due to the use of third-party optical modules or cables is the users' responsibility. Juniper Networks will accept no liability for any damage caused due to such use.

## Cable and Connector Specifications for the ACX6160

### IN THIS SECTION

- [LC Duplex Connectors](#) | 37

The transceivers that are supported on ACX Series, MX Series, and PTX Series devices use fiber-optic cables and connectors. The type of connector and the type of fiber depends on the transceiver type.

You can determine the type of cable and connector required for your specific transceiver by using the [Hardware Compatibility Tool](#).



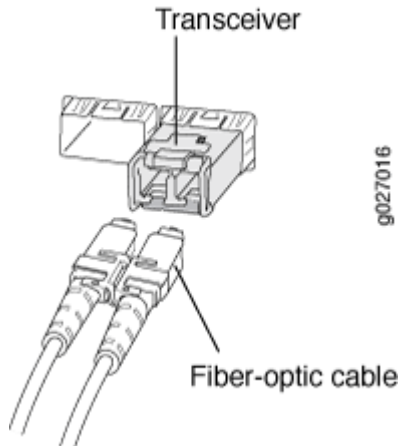
**CAUTION:** To maintain agency approvals, use only a properly constructed, shielded cable.

### LC Duplex Connectors

You can use patch cables with LC duplex connectors to connect two supported transceivers of the same type—for example, 100GBASE-LR4-to-100GBASE-LR4. The patch cable is one fiber pair with two LC duplex connectors at opposite ends.

Figure 15 on page 38 shows an LC duplex connector being installed in a transceiver.

**Figure 15: LC Duplex Connector**



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

### IN THIS SECTION

- [Signal Loss in Multimode and Single-Mode Fiber-Optic Cable | 38](#)
- [Attenuation and Dispersion in Fiber-Optic Cable | 39](#)

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

Multimode fiber is large enough in diameter to allow rays of light to reflect internally (bounce off the walls of the fiber). Interfaces with multimode optics typically use LEDs as light sources. However, LEDs are not coherent sources. They spray varying wavelengths of light into the multimode fiber, which reflects the light at different angles. Light rays travel in jagged lines through a multimode fiber, causing signal dispersion. When light traveling in the fiber core radiates into the fiber cladding, higher-order mode loss results. Together these factors limit the transmission distance of multimode fiber compared with single-mode fiber.

Single-mode fiber is so small in diameter that rays of light can reflect internally through one layer only. Interfaces with single-mode optics use lasers as light sources. Lasers generate a single wavelength of

light, which travels in a straight line through the single-mode fiber. Compared with multimode fiber, single-mode fiber has higher bandwidth and can carry signals for longer distances.

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

## Attenuation and Dispersion in Fiber-Optic Cable

Correct functioning of an optical data link depends on modulated light reaching the receiver with enough power to be demodulated correctly. *Attenuation* is the reduction in power of the light signal as it is transmitted. Attenuation is caused by passive media components such as cables, cable splices, and connectors. Although attenuation is significantly lower for optical fiber than for other media, it still occurs in both multimode and single-mode transmission. An efficient optical data link must have enough light available to overcome attenuation.

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

- Chromatic dispersion—Spreading of the signal over time, resulting from the different speeds of light rays.
- Modal dispersion—Spreading of the signal over time, resulting from the different propagation modes in the fiber.

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

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

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

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

### IN THIS SECTION

- [How to Calculate Power Budget for Fiber-Optic Cables | 40](#)
- [How to Calculate Power Margin for Fiber-Optic Cables | 40](#)

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

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

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

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

To ensure that fiber-optic connections have sufficient power for correct operation, you need to calculate the link's power budget, which is the maximum amount of power it can transmit. When you calculate the power budget, you use a worst-case analysis to provide a margin of error, even though all the parts of an actual system do not operate at the worst-case levels. To calculate the worst-case estimate of power budget ( $P_B$ ), you assume minimum transmitter power ( $P_T$ ) and minimum receiver sensitivity ( $P_R$ ):

$$P_B = P_T - P_R$$

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

$$P_B = P_T - P_R$$

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

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

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

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

$$P_M = P_B - LL$$

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

Factors that can cause link loss include higher-order mode losses, modal and chromatic dispersion, connectors, splices, and fiber attenuation. [Table 19 on page 41](#) lists an estimated amount of loss for the factors used in the following sample calculations. For information about the actual amount of signal loss caused by equipment and other factors, refer to vendor documentation.

**Table 19: Estimated Values for Factors Causing Link Loss**

| Link-Loss Factor               | Estimated Link-Loss Value                                                                        |
|--------------------------------|--------------------------------------------------------------------------------------------------|
| Higher-order mode losses       | Single mode—None<br>Multimode—0.5 dB                                                             |
| Modal and chromatic dispersion | Single mode—None<br>Multimode—None, if product of bandwidth and distance is less than 500 MHz-km |
| Faulty connector               | 0.5 dB                                                                                           |
| Splice                         | 0.5 dB                                                                                           |
| Fiber attenuation              | Single mode—0.5 dB/km<br>Multimode—1 dB/km                                                       |

The following sample calculation for a 2-km-long multimode link with a power budget ( $P_B$ ) of 13 dB uses the estimated values from [Table 19 on page 41](#). This example calculates link loss (LL) as the sum of fiber attenuation (2 km @ 1 dB/km, or 2 dB) and loss for five connectors (0.5 dB per connector, or 2.5 dB) and two splices (0.5 dB per splice, or 1 dB) as well as higher-order mode losses (0.5 dB). The power margin ( $P_M$ ) is calculated as follows:

$$P_M = P_B - LL$$

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

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

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

The following sample calculation for an 8-km-long single-mode link with a power budget ( $P_B$ ) of 13 dB uses the estimated values from [Table 19 on page 41](#). This example calculates link loss (LL) as the sum of fiber attenuation (8 km @ 0.5 dB/km, or 4 dB) and loss for seven connectors (0.5 dB per connector, or 3.5 dB). The power margin ( $P_M$ ) is calculated as follows:

$$P_M = P_B - LL$$

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

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

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

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

## RELATED DOCUMENTATION

*Determining Transceiver Support and Specifications*

[ACX6160 Front Panel | 6](#)

[ACX6160 System Overview | 2](#)

# ACX6160 Management Cable Specifications and Pinouts

## IN THIS SECTION

- [Cable Specifications for Console and Management Connections for the ACX6160 | 43](#)
- [Management Port Connector Pinouts for the ACX6160 | 43](#)
- [Console Port Connector Pinouts for the ACX6160 | 44](#)
- [USB Port Specifications for the ACX6160 | 45](#)

## Cable Specifications for Console and Management Connections for the ACX6160

Table 20 on page 43 lists the specifications for the cables that connect the ACX6160 to a management device.

**NOTE:** All RJ-45 connectors must conform to the rules and regulations as described in the FCC specification 47 CFR Part 68.

**Table 20: Cable Specifications for Console and Management Connections for the ACX6160**

| Port on ACX6160                 | Cable Specification                                              | Cable Supplied                                              | Maximum Length       | Device Receptacle |
|---------------------------------|------------------------------------------------------------------|-------------------------------------------------------------|----------------------|-------------------|
| Console ( <b>CON</b> ) port     | RS-232 (EIA-232) serial cable                                    | 2.13-meter-long RJ-45 patch cable and RJ-45 to DB-9 adapter | 2.13&#38;#160;meters | RJ-45             |
| Management ( <b>MGMT</b> ) port | Category 5 cable or equivalent suitable for 1000BASE-T operation | 2.13-meter-long RJ-45 patch cable                           | 100&#38;#160;meters  | RJ-45             |

## Management Port Connector Pinouts for the ACX6160

The 10/100/1000BASE-T RJ-45 management port (labeled **MGMT**) uses an RJ-45 connector to connect to a management device for out-of-band management.

Table 21 on page 44 provides the pinout information of the RJ-45 management port connector. An RJ-45 cable is supplied with the ACX6160.

**Table 21: RJ-45 Management Port Connector Pinouts for the ACX6160**

| Pin | Signal | Description                  |
|-----|--------|------------------------------|
| 1   | TRP1+  | Transmit/receive data pair 1 |
| 2   | TRP1-  | Transmit/receive data pair 1 |
| 3   | TRP2+  | Transmit/receive data pair 2 |
| 4   | TRP3+  | Transmit/receive data pair 3 |
| 5   | TRP3-  | Transmit/receive data pair 3 |
| 6   | TRP2-  | Transmit/receive data pair 2 |
| 7   | TRP4+  | Transmit/receive data pair 4 |
| 8   | TRP4-  | Transmit/receive data pair 4 |

## Console Port Connector Pinouts for the ACX6160

The console port (labeled **CON**) is an RS-232 serial interface that uses an RJ-45 connector to connect to a console management device. The default baud rate for the console port is 9600&#38;#160;baud.

[Table 22 on page 45](#) provides the pinout information for the RJ-45 console connector. An RJ-45 cable and an RJ-45 to DB-9 adapter are supplied with the ACX6160.

**NOTE:** If your laptop or PC does not have a DB-9 plug connector pin and you want to connect your laptop or PC directly to an ACX6160, use a combination of the RJ-45 cable and RJ-45 to DB-9 adapter supplied with the router and a USB-to-DB-9 plug adapter. You must provide the USB-to-DB-9 plug adapter.

Table 22: Console Port Connector Pinouts for the ACX6160

| Pin | Signal        | Description         |
|-----|---------------|---------------------|
| 1   | RTS Output    | Request to send     |
| 2   | DTR Output    | Data terminal ready |
| 3   | TxD Output    | Transmit data       |
| 4   | Signal Ground | Signal ground       |
| 5   | Signal Ground | Signal ground       |
| 6   | RxD Input     | Receive data        |
| 7   | DCD Input     | Data carrier detect |
| 8   | CTS Input     | Clear to send       |

## USB Port Specifications for the ACX6160

USB flash drives used with the ACX6160 must support USB 2.0 or later.



**CAUTION:** Remove the USB flash drive before upgrading Junos OS or rebooting an ACX6160. Failure to do so could expose your router to unpredictable behavior.

### RELATED DOCUMENTATION

[ACX6160 Front Panel | 6](#)

[ACX6160 Management Panel | 13](#)

# 3

CHAPTER

## Initial Installation and Configuration

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ACX6160 Installation Overview | 47

Mounting the ACX6160 | 49

Connecting the ACX6160 to Power | 54

Connecting the ACX6160 to External Devices | 62

Performing Software Configurations on the ACX6160 | 64

Powering Off the ACX6160 | 66

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# ACX6160 Installation Overview

## IN THIS SECTION

- Overview of Installing the ACX6160 | 47
- ACX6160 Installation Safety Guidelines | 48

## Overview of Installing the ACX6160

Before you begin to install and connect an ACX6160, ensure that you have reviewed the information in ["ACX6160 Installation Safety Guidelines" on page 48](#).

You can mount an ACX6160 flush with the front of a 19-in. four-post rack. Use the standard mounting brackets provided with the ACX6160 for this configuration.

To install and connect an ACX6160:

1. Unpack the ACX6160 and verify the components received. See ["Unpacking the ACX6160" on page 49](#).
2. Determine how the device is to be mounted.  
Mount the ACX6160 in a rack or cabinet. See ["Mounting the ACX6160 in a Rack or Cabinet" on page 51](#).
3. For installations that require a separate grounding conductor to the chassis, follow the instructions in ["Connecting the ACX6160 Grounding Cable" on page 55](#).
4. Connect the ACX6160 to a management console for initial configuration. See [Figure 25 on page 64](#).
5. Connect the ACX6160 to power. Follow the instructions in ["Connecting DC Power to the ACX6160" on page 56](#).
6. Perform initial configuration on the ACX6160 following the instructions in the ["Performing Software Configurations on the ACX6160" on page 64](#).

## ACX6160 Installation Safety Guidelines

### IN THIS SECTION

- [General Installation Safety Guidelines | 48](#)
- [ACX6160 Chassis Lifting Guidelines | 48](#)

Observe the following guidelines before and during ACX6160 installation:

### General Installation Safety Guidelines

Before installing or moving the ACX6160, verify that the intended site meets the specified power, environmental, and clearance requirements. See the following documentation:

- ["ACX6160 Site Preparation Checklist" on page 25](#)
- ["ACX6160 Clearance Requirements for Airflow and Hardware Maintenance" on page 30](#)
- ["ACX6160 Rack Requirements" on page 32](#)
- ["ACX6160 Cabinet Requirements" on page 34](#)
- ["ACX6160 Environmental Requirements and Specifications" on page 27](#)
- ["ACX6160 DC Power Specifications" on page 21](#)

### ACX6160 Chassis Lifting Guidelines

The weight of a fully-loaded ACX6160 is approximately 24 lb (10.89 kg). Observe the following guidelines for lifting and moving an ACX6160:



**CAUTION:** If you are installing the ACX6160 above 60 in. (152.4 cm) from the floor, remove the power supplies, fan modules, and any expansion modules before attempting to install the device, or ask someone to assist you during the installation.

- Before installing the ACX6160, read the guidelines in ["ACX6160 Site Preparation Checklist" on page 25](#) to verify that the intended site meets the specified power, environmental, and clearance requirements.
- Before lifting or moving the ACX6160, disconnect all external cables.

- As when lifting any heavy object, lift most of the weight with your legs rather than your back. Keep your knees bent and your back relatively straight and avoid twisting your body as you lift. Balance the load evenly and be sure that your footing is solid.

## RELATED DOCUMENTATION

| [Mounting the ACX6160](#) | 49

# Mounting the ACX6160

## IN THIS SECTION

- [Unpacking the ACX6160](#) | 49
- [Mounting the ACX6160 in a Rack or Cabinet](#) | 51

## Unpacking the ACX6160

The ACX6160 chassis is a rigid sheet-metal structure that houses the hardware components. The ACX6160 is shipped in a cardboard carton, secured with foam packing material. The carton also contains an accessory kit and a pointer card with links to the quick start instructions.



**CAUTION:** ACX6160 routers are maximally protected inside the shipping carton. Do not unpack the ACX6160 until you are ready to begin installation.

To unpack an ACX6160:

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 point up.
3. Open the top flaps on the shipping carton.

4. Remove the accessory kit and verify the contents against the inventory of components listed in [Table 23 on page 50](#).
5. Pull out the packing material holding the device in place.
6. Verify the chassis components received:
  - Two power supplies
  - Five fan modules
7. Save the shipping carton and packing materials in case you need to move or ship the chassis later.

**Table 23: Inventory of Components Supplied with an ACX6160**

| Component                                                                                                                                                                                                                                                                                                                                                                                   | Quantity |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Chassis with five fan modules and two power supplies                                                                                                                                                                                                                                                                                                                                        | 1        |
| Rack mount kit for ACX6160 <ul style="list-style-type: none"> <li>• Mounting rail assembly, each comprised of:               <ul style="list-style-type: none"> <li>• Mounting rail (2)</li> <li>• Front flange (2)</li> <li>• 12 Flat-head screws for mounting brackets (Phillips, M4 x 6 mn)</li> <li>• Rear-mounting blades (2)</li> </ul> </li> <li>• Extension brackets (2)</li> </ul> | 1        |
| RJ-45 cable and RJ-45 to DB-9 adapter                                                                                                                                                                                                                                                                                                                                                       | 1        |
| Documentation Roadmap card                                                                                                                                                                                                                                                                                                                                                                  | 1        |

## Mounting the ACX6160 in a Rack or Cabinet

### IN THIS SECTION

- [Before You Begin Rack Installation | 51](#)
- [Mounting the ACX6160 | 52](#)

You can mount an ACX6160 in a four post 19-in. rack or cabinet by using the included mounting brackets. (The remainder of this topic uses *rack* to mean *rack or cabinet*.)

For four-post rack installation, the shipping carton contains two front-mounting rails with two matching rear-mounting blades. This configuration allows either end of the device to be mounted flush with the rack and still be adjustable for racks with different depths. Space the front and rear racks between 24.25 in. (61.6 cm) to 31 in. (78.7 cm) front-to-back.

### Before You Begin Rack Installation

Before you begin mounting an ACX6160 in the rack:

1. Ensure that you understand how to prevent electrostatic discharge (ESD) damage. See ["Prevention of Electrostatic Discharge Damage" on page 128](#).
2. Verify that the site meets the requirements described in the ["ACX6160 Site Preparation Checklist" on page 25](#).
3. Place the rack in its permanent location, allowing adequate clearance for airflow and maintenance, and secure it to the building structure.
4. Read ["General Safety Guidelines and Warnings" on page 103](#).
5. Remove the ACX6160 from the shipping carton (see ["Mounting the ACX6160" on page 49](#)).
6. Ensure that you have the following parts and tools available to mount the ACX6160 in a rack:
  - ESD grounding strap (not provided).
  - A pair of front-mounting rails (provided).
  - A pair of rear-mounting blades (provided). These mounting blades support the rear of the chassis and must be installed.
  - Screws to secure the mounting rails to the chassis (12 screws are provided).
  - Eight screws to secure the chassis and mounting blades to the rack (not provided).
  - Screwdriver appropriate for the rack-mounting screws (not provided).

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

Optional equipment: Grounding cable kit with bracket, lug, and three nuts with integrated washers.



**WARNING:** ACX6160 devices must be supported at all four corners. Mounting the chassis by using only the front brackets will damage the chassis and can result in serious bodily injury.



**CAUTION:** ACX6160 routers require two people for installation, one person to lift the device into place and another person to attach the device to the rack. If you are installing the ACX6160 above 60 in. (152.4 cm) from the floor, you can remove the power supplies and fan modules to minimize the weight before attempting to install the ACX6160.



**CAUTION:** If you are mounting multiple devices in a rack, mount the device in the lowest position of the rack first. Proceed to mount the rest of the devices from the bottom to the top of the rack to minimize the risk of the rack toppling.

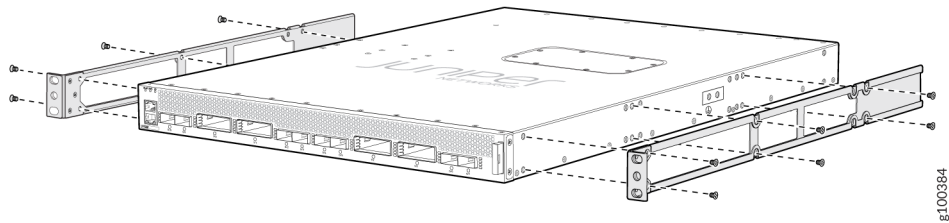
## Mounting the ACX6160

To mount the ACX6160 on a four-post rack by using the provided mounting kit:

1. Wrap and fasten one end of the ESD grounding around your bare wrist and connect the other end of the strap to the ESD point on the chassis.
2. Decide whether the field-replaceable unit (FRU) end or the port end of the ACX6160 must be placed at the front of the rack. Position the ACX6160 in such a manner that the **AIR OUT** labels on components are next to the hot aisle.

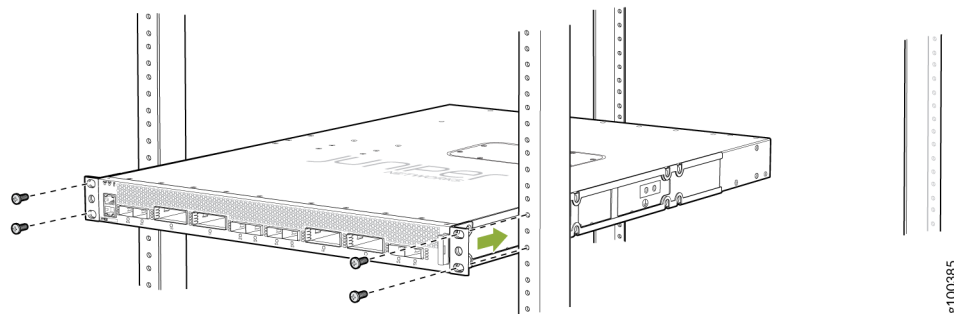
3. Align the holes in the mounting rail with the screw holes on the side of the chassis. The front bracket is preinstalled in the rail. See [Figure 16 on page 53](#) to see the proper alignment for the ACX6160.

**Figure 16: Attaching Front-Mounting Rails to the ACX6160**



4. Attach the mounting rail to the device by using the mounting screws. Tighten the screws.
5. Repeat Step 3 and Step 4 on the opposite side of the device.
6. Have one person grasp both sides of the device, lift it, and position it in the rack so that the front bracket is aligned with the rack holes. See [Figure 17 on page 53](#).
7. Have a second person secure the front of the device to the rack by using four mounting screws (and cage nuts and washers if your rack requires them). Tighten the screws.

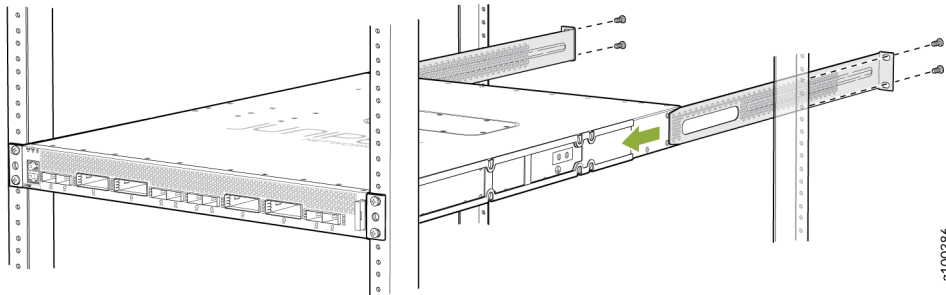
**Figure 17: Attaching the ACX6160 (with Mounting Rails to the Rack)**



8. Continue to support the ACX6160 while sliding the rear-mounting blades into the channel of the mounting-rails on the sides of the chassis and securing the blades to the rack. Use four mounting

screws (and cage nuts and washers if your rack requires them) to attach the blade to the rack. Tighten the screws. See [Figure 18 on page 54](#).

**Figure 18: Sliding Mounting Blades into the Mounting Rail**



9. Ensure that the ACX6160 chassis is level by verifying that all the screws on the front of the rack are aligned with the screws at the back of the rack.

#### RELATED DOCUMENTATION

[ACX6160 Installation Overview | 47](#)

[Connecting the ACX6160 Grounding Cable | 55](#)

## Connecting the ACX6160 to Power

#### IN THIS SECTION

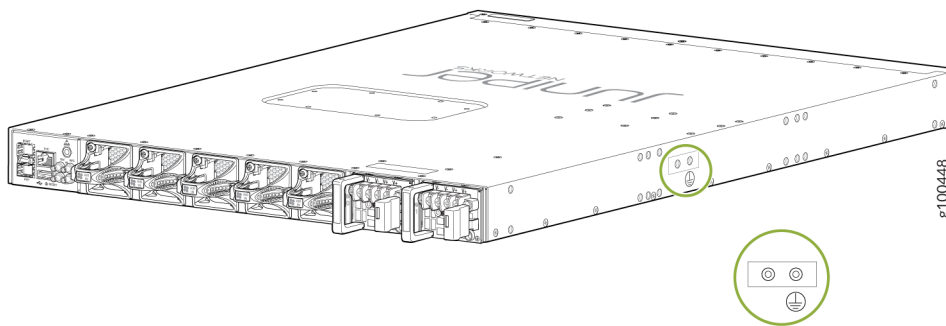
- [Connecting the ACX6160 Grounding Cable | 55](#)
- [Connecting DC Power to the ACX6160 | 56](#)

## Connecting the ACX6160 Grounding Cable

To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the ACX6160 device to earth ground before you connect it to power.

You must install the ACX6160 in a restricted-access location and ensure that the chassis is always properly grounded. The ACX6160 has a two-hole protective grounding terminal provided on the chassis. See [Figure 19 on page 55](#). Under all circumstances, use this grounding connection to ground the chassis. For AC-powered systems, you must also use the grounding wire in the AC power cord along with the two-hole grounding lug connection. This tested system meets or exceeds all applicable EMC regulatory requirements with the two-hole protective grounding terminal.

**Figure 19: ACX6160 Grounding Points**



Before you connect earth ground to the protective earthing terminal of an ACX6160 device, ensure that a licensed electrician has attached an appropriate grounding lug to the grounding cable.



**CAUTION:** Using a grounding cable with an incorrectly attached lug can damage the device.

**NOTE:** Mount your device in the rack before attaching the grounding lug to the device. See ["Mounting the ACX6160" on page 49](#).

Ensure that you have the following parts and tools available:

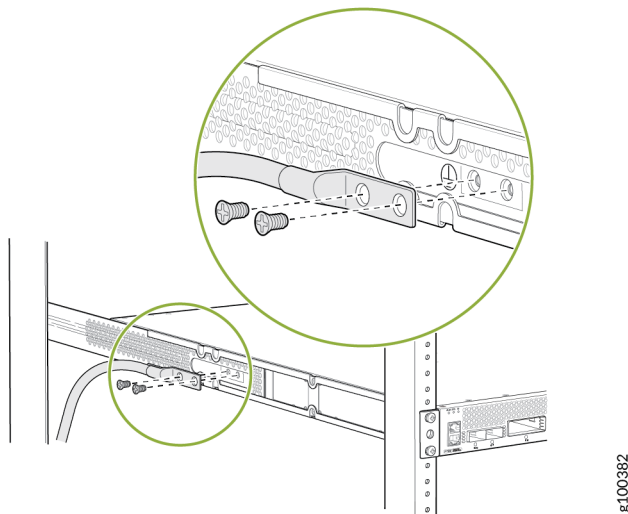
- Grounding cable for your ACX6160 device—The grounding cable must be 14 AWG (2 mm<sup>2</sup>), minimum 90° C wire, or as permitted by the local code.
- Grounding lug for your grounding cable—The grounding lug required is a Panduit LCD10-10A-L or equivalent.

- Two SAE #10-32 UNF x .31L in. washers and screws—To attach the grounding lug to the protective earthing terminal.
- Screwdriver to attach the screws.

To connect earth ground to an ACX6160 device:

1. Attach one end of the grounding cable to an appropriate earth ground site, such as the mounting rack.
2. Position the grounding lug over the protective earthing terminal on the side of the chassis, which is visible through the mounting bracket.
3. Secure the grounding lug to the protective earthing terminal with the washers and screws. See [Figure 20 on page 56](#).

**Figure 20: Connecting a Grounding Cable to an ACX6160 Device**



4. Dress the grounding cable and ensure that it does not touch or block access to other device components and that it does not drape where people could trip over it.

## Connecting DC Power to the ACX6160

Before you begin connecting DC power to the ACX6160:

- Read ["General Electrical Safety Guidelines and Warnings" on page 126](#), ["DC Power Electrical Safety Guidelines" on page 129](#), and the following warnings:
  - ["DC Power Copper Conductors Warning" on page 130](#)

- ["DC Power Disconnection Warning" on page 131](#)
- ["DC Power Grounding Requirements and Warning" on page 132](#)
- ["DC Power Wiring Sequence Warning" on page 133](#)
- ["DC Power Wiring Terminations Warning" on page 135](#)
- Ensure that you have taken the necessary precautions to prevent ESD damage (see ["Prevention of Electrostatic Discharge Damage" on page 128](#)).
- Ensure that you have connected the ACX6160 chassis to earth ground.



**CAUTION:** Before you connect power to the device, a licensed electrician must attach a cable lug to the grounding and power cables that you supply. A cable with an incorrectly attached lug can damage the device (for example, by causing a short circuit). To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the chassis to earth ground before you connect it to power. Under all circumstances, use the protective earthing terminal on the device chassis to connect to the earth ground. For instructions on connecting earth ground, see ["Connecting the ACX6160 Grounding Cable" on page 55](#).

- Install the power supply in the chassis following the instructions in ["Installing a Power Supply in an ACX6160" on page 72](#) see the *ACX6160 Universal Metro Router Hardware Guide*.

The ACX6160 is shipped from the factory with two power supplies. Each power supply is a hot-removable and hot-insertable field-replaceable unit (FRU) when the second power supply is installed and running. You can install replacement power supplies in the two slots next to the fan modules without powering off the device or disrupting the routing functions.



**WARNING:** DC-powered ACX6160 models are intended for installation only in a restricted-access location.

**NOTE:** The battery returns of the DC power supply must be connected as an isolated DC return (DC-I).

Ensure that you have the following parts and tools available:

- ESD grounding strap
- DC power source cables (14–16 AWG) with ring lug (Molex 190700069 or equivalent) (not provided)

- Phillips (+) screwdriver, number 2 (not provided)
- Multimeter (not provided)

**NOTE:** Each power supply must be connected to a dedicated power source outlet.

To connect DC power to an ACX6160:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist, and connect the other end of the strap to an approved site ESD point on the chassis.
2. Verify that the DC power cables are correctly labeled before making connections to the power supply. In a typical power distribution scheme where the return is connected to chassis ground at the battery plant, you can use a multimeter to verify the resistance of the -48V and RTN DC cables to chassis ground:
  - The cable with very low resistance (indicating a closed circuit) to chassis ground is positive (+) and is installed on the V+ (return) DC power input terminal.
  - The cable with very high resistance (indicating an open circuit) to chassis ground is negative (-) and is installed on the V- (input) DC power input terminal.



**CAUTION:** You must ensure that power connections maintain the proper polarity. The power source cables might be labeled (+) and (-) to indicate their polarity. There is no standard color coding for DC power cables. The color coding used by the external DC power source at your site determines the color coding for the leads on the power cables that attach to the DC power input terminals on each power supply.

3. Install heat-shrink tubing insulation around the power cables.

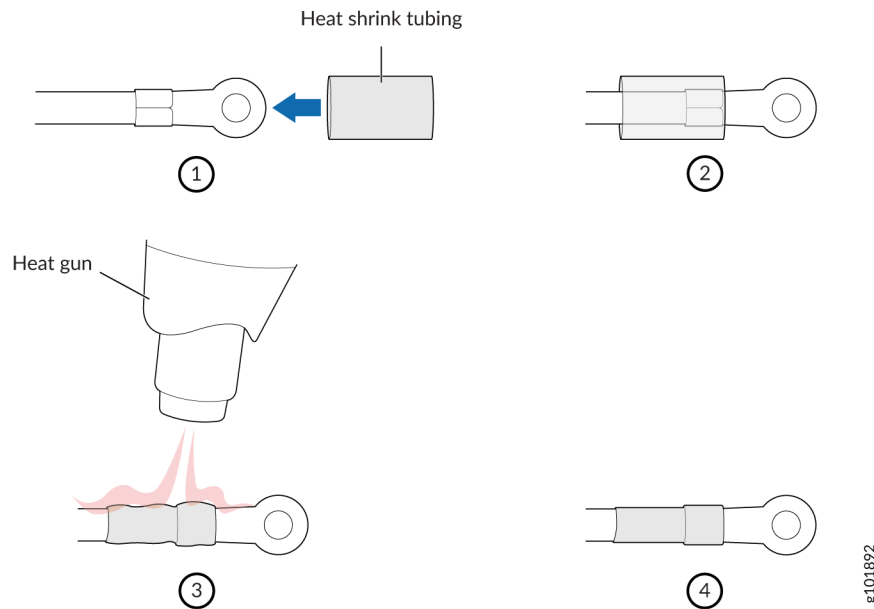
To install heat-shrink tubing:

  - a. Slide the tubing over the portion of the cable where it is attached to the lug barrel. Ensure that tubing covers the end of the wire and the barrel of the lug attached to it.
  - b. Shrink the tubing with a heat gun. Ensure that you heat all sides of the tubing evenly so that it shrinks around the cable tightly.

Figure 21 on page 59 shows the steps to install heat-shrink tubing.

**NOTE:** Do not overheat the tubing.

**Figure 21: How to Install Heat-Shrink Tubing**



4. Ensure that the input circuit breaker is open so that the voltage across the DC power source cable leads is 0 V and that the cable leads do not become active while you are connecting DC power.

**NOTE:** The V+ terminals are referred to as +RTN, and V- terminals are referred to as -48 V in "DC Power Wiring Sequence Warning" on page 133 and "DC Power Electrical Safety Guidelines" on page 129.

5. Ensure that the power supplies are fully inserted in the chassis.
6. Remove the terminal block cover. The terminal block cover is a piece of clear plastic that snaps into place over the terminal block (see [Figure 22 on page 61](#)).
7. Remove the screws on the terminals using the screwdriver. Save the screws.



**WARNING:** Ensure that the power cables do not block access to device components or drape where people can trip on them.

8. Connect each power supply to the power sources. Secure power source cables to the power supplies by screwing the ring lugs attached to the cables to the appropriate terminals by using the screw from the terminals (see [Figure 22 on page 61](#) and [Figure 23 on page 61](#)). The ACX6160 is designed to operate with a DC power supply that has a single, nonredundant, feed input. For source redundancy, two DC power supplies must be installed; connect source (A) to one power supply and connect source (B) to the second power supply. This configuration provides the commonly deployed A/B feed redundancy for the system.

The terminal block of the power supply has four terminals labeled V+, V+, V-, and V- for connecting DC power source cables labeled positive (+) and negative (-). The V+ terminals are shunted internally together, as are the V- terminals.



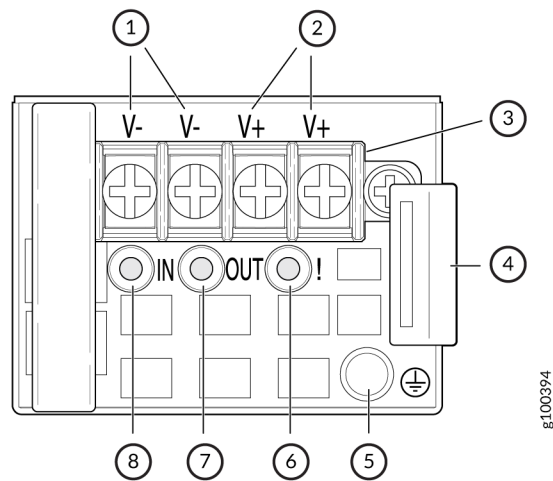
**CAUTION:** The connection between each power source and power supply must include a circuit breaker.

Do not connect two sources to a single power supply because doing so can potentially cause circulating current in feed wires whenever there is any difference in the voltage of the two sources.

- a. Secure the ring lug of the positive (+) DC power source cable to the V+ terminal on the DC power supply.
- b. Secure the ring lug of the negative (-) DC power source cable to the V- terminal on the DC power supply.

- c. Use the screwdriver to tighten the screws on the power supply terminals until they are snug. Do not overtighten—apply between 5 lb-in. (0.56 Nm) and 6 lb-in. (0.68 Nm) of torque to the screws.

Figure 22: DC Power Supply Faceplate for an ACX6160

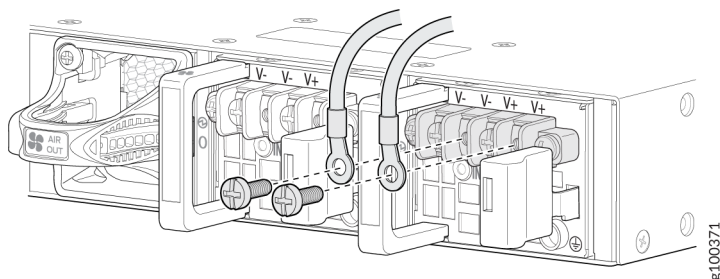


|                                          |                        |
|------------------------------------------|------------------------|
| 1– Shunt negative input terminals (+RTN) | 5– ESD grounding point |
| 2– Shunt positive input terminals (-48V) | 6– Fault(!) LED        |
| 3– Terminal block                        | 7– Output (OUT) LED    |
| 4– Latch lever                           | 8– Input (IN) LED      |



**CAUTION:** The V+ terminals are shunted internally together, as are the V- terminals. Do not connect the terminals to different sources.

Figure 23: Securing Ring Lugs to the Terminals on the ACX6160 DC Power Supply



9. Replace the terminal block cover.
10. Close the input circuit breaker.

**NOTE:** The device powers on as soon as power is provided to the power supply. There is no power device on the device.

11. Verify that the **IN** and **OUT** LEDs on the power supply are lit green and are on steadily.

## RELATED DOCUMENTATION

| [ACX6160 Power System](#) | 19

# Connecting the ACX6160 to External Devices

## IN THIS SECTION

- [Connecting the ACX6160 to a Management Ethernet Device](#) | 62
- [Connecting the ACX6160 to a Management Console](#) | 63

## Connecting the ACX6160 to a Management Ethernet Device

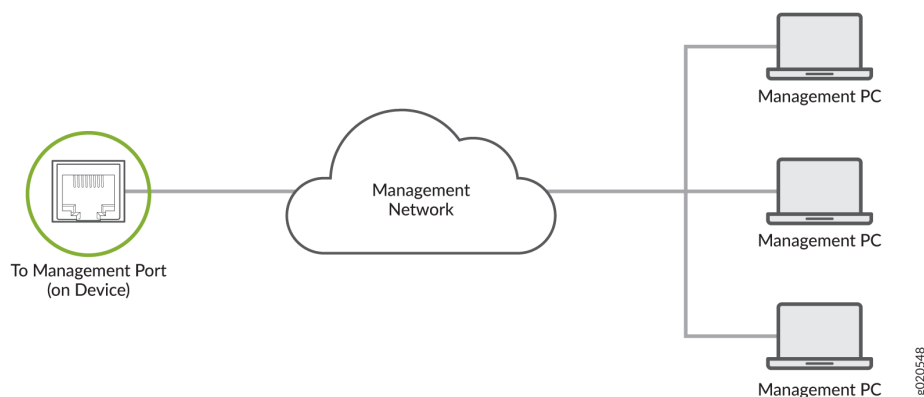
Ensure that you have an appropriate cable available. See "[ACX6160 Management Cable Specifications and Pinouts](#)" on page 42.

You can monitor and manage the ACX6160 by using a dedicated management channel. The device has two management ports—a 10/100/1000BASE-T RJ-45 port for copper connections and a Gigabit Ethernet SFP port for fiber-optic connections. Use the management ports to connect the device to a network for out-of-band management.

To connect an ACX6160 to a network for out-of-band management (see [Figure 24 on page 63](#)):

1. Connect one end of the cable to one of the two management ports—labeled **MGMT**—on the ACX6160.
2. Connect the other end of the cable to the management network device.

**Figure 24: Connecting an ACX6160 to a Network for Out-of-Band Management**



## Connecting the ACX6160 to a Management Console

Ensure that you have an RJ-45 to DB-9 rollover cable available. An RJ-45 cable with an RJ-45 to DB-9 adapter is provided with the ACX6160.

**NOTE:** If your laptop or PC does not have a DB-9 plug connector pin and you want to connect your laptop or PC directly to the ACX6160, use a combination of the RJ-45 cable and RJ-45 to DB-9 adapter supplied with the router and a USB to DB-9 plug adapter. You must provide the USB to DB-9 plug adapter.

The ACX6160 has a console port with an RJ-45 connector. Use the console port to connect the router directly to a management console, such as a laptop, or to a console server.

To connect the ACX6160 to a management console (see [Figure 25 on page 64](#) or [Figure 26 on page 64](#)):

1. Connect one end of the Ethernet cable to the console port (labeled **CON**).

2. Connect the other end of the Ethernet cable directly to a management console or console server.

Figure 25: Connecting the ACX6160 Directly to a Management Console



Figure 26: Connecting the ACX6160 to a Management Console Through a Console Server



## Performing Software Configurations on the ACX6160

### IN THIS SECTION

- [Performing the Initial Software Configuration for the ACX6160](#) | 64

## Performing the Initial Software Configuration for the ACX6160

Use these steps to perform the initial configuration:

1. Connect the ACX6160 to power. See "[Connecting the ACX6160 to Power](#)" on page 54.
2. Connect the Ethernet RJ-45 **MGMT** port on the ACX6160 to your management network where your Open ROADM controller resides. See "[Connecting the ACX6160 to a Management Ethernet Device](#)" on page 62.

By default, the ACX6160 is set up for dynamic IP address assignment. The following process takes place:

- When the ACX6160 powers on, it requests an IP address from the DHCP server in your management network. This assigned IPv4 or IPv6 address is temporary and allows the Open ROADM controller to establish initial contact for commissioning the ACX6160.
  - After the DHCP server assigns the temporary IP address to the device, the device waits for the Open ROADM controller to connect to it using NETCONF over SSH on port 830 with the default username **openroadm** and password **openroadm**.
  - If the login is successful, the Open ROADM controller configures the info container after it connects to the ACX6160 by using the DHCP temporary IP address. The info container contains the node-id, IP address, gateway address, and other details specific to the node.
3. The Open ROADM controller reboots the ACX6160 by using the Open ROADM restart RPC command. The reboot is necessary for the new IP address to take effect.
  4. Use the Open ROADM controller to set up the permanent IP address, change the default username and password, and complete the initial configuration.
  5. You can now manage the ACX6160 by using the Open ROADM controller.

**NOTE:** If at any point in time, the Open ROADM controller deletes the info container on a node after the initial commissioning is done, the device goes into a factory default state and the commission process is re-initiated.

**NOTE:** See the ACX6160 Universal Metro Router User Guide at <https://www.juniper.net/documentation/> for information about the ACX6160 features.

## RELATED DOCUMENTATION

| [ACX6160 Management Cable Specifications and Pinouts](#) | 42

# Powering Off the ACX6160

## IN THIS SECTION

- [Powering Off the ACX6160 | 66](#)

## Powering Off the ACX6160

Before you power off an ACX6160:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See ["Prevention of Electrostatic Discharge Damage" on page 128](#).
- Ensure that you do not need to route traffic through the ACX6160.
- Ensure that you have the following parts and tools available to power off the ACX6160:
  - An ESD grounding strap
  - An external management device such as a PC
  - An RJ-45 to DB-9 rollover cable to connect the external management device to the console port

To power off an ACX6160:

1. Remove the power source cable from the power supply faceplate. Remove the screws securing the ring lugs attached to the power source cables to the power supply using the screwdriver and remove the power source cables from the power supply. Replace the screws on the terminals and tighten them.
2. Remove all the cables from the device before removing it from the rack or cabinet.

## RELATED DOCUMENTATION

[Connecting the ACX6160 to External Devices | 62](#)

[Connecting the ACX6160 to Power | 54](#)

# 4

CHAPTER

## Maintaining Components

---

Maintaining the ACX6160 Fan Modules | 68

Maintaining the ACX6160 Power Supplies | 71

Maintaining ACX6160 Transceivers and Fiber-Optic Cables | 74

Maintaining SATA Solid State Drive in an ACX6160 | 84

Uninstalling the ACX6160 | 87

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# Maintaining the ACX6160 Fan Modules

## IN THIS SECTION

- [Removing a Fan Module from the ACX6160 | 68](#)
- [Installing a Fan Module in the ACX6160 | 69](#)

## Removing a Fan Module from the ACX6160

Before you remove a fan module from an ACX6160, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see ["Prevention of Electrostatic Discharge Damage" on page 128](#)).

Ensure that you have the following parts and tools available:

- ESD grounding strap
- Antistatic bag or an antistatic mat
- Phillips (+) screwdriver, number 1

The fan modules in an ACX6160 are hot-removable and hot-insertable field-replaceable units (FRUs)—you can remove and replace them without powering off the ACX6160 or disrupting routing functions.



**CAUTION:** Replace the fan module within 4 minutes of removal to prevent chassis overheating. Before removing the fan module, ensure you have a replacement fan module available.

To remove a fan module from an ACX6160 (see [Figure 27 on page 69](#)):

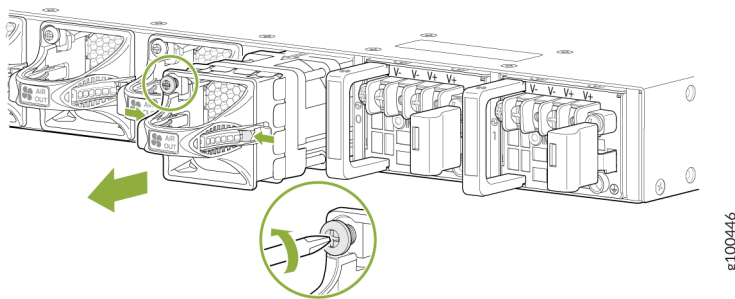
1. Place the antistatic bag or the antistatic mat on a flat, stable surface.
2. Wrap and fasten one end of the ESD grounding strap around your bare wrist, and connect the other end of the strap to the ESD point on the chassis.
3. Using the Phillips screwdriver, loosen the locking screw (three or four turns).
4. Grasp the handle on the fan module and squeeze the outside of the handle to release the module.



**WARNING:** To avoid injury, do not touch the fan with your hands or any tools as you slide the fan module out of the chassis—the fan might still be running.

5. Pull firmly to slide the fan module halfway out of the chassis.
6. When the fan stops spinning, slide the fan module completely out of the chassis.
7. Place the fan module in the antistatic bag or on the antistatic mat placed on a flat, stable surface.

**Figure 27: Removing a Fan Module from an ACX6160**



**NOTE:** When a fan module is removed, the CLI message `Fan/Blower is Absent` is logged in the system log, and the system raises a minor alarm.

## Installing a Fan Module in the ACX6160

Before you install a fan module in an ACX6160, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see ["Prevention of Electrostatic Discharge Damage" on page 128](#)).

Ensure that you have the following parts and tools available:

- ESD grounding strap
- Phillips (+) screwdriver, number 1

The fan modules in an ACX6160 are hot-removable and hot-insertable FRUs—you can remove and replace them without powering off the ACX6160 or disrupting routing functions.



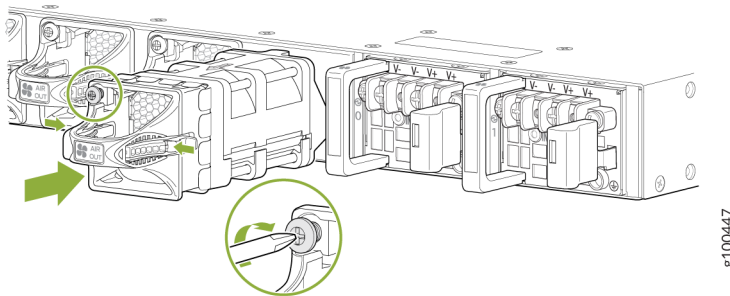
**CAUTION:** Replace the fan module within 4 minutes of removal to prevent chassis overheating. Before removing the fan module, ensure you have a replacement fan module available.

**NOTE:** The fan module provides airflow out, which is also known as *port-to-FRU* airflow.

To install a fan module in an ACX6160 (see [Figure 28 on page 70](#)):

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist, and connect the other end of the strap to the ESD point on the chassis.
2. Taking care not to touch the connectors, remove the fan module from its bag.
3. Align the module with the open fan-module slot on the FRU end of the ACX6160 and slide it in until it is fully seated.
4. Using the Phillips screwdriver, tighten the locking screw (three or four turns).

**Figure 28: Installing a Fan Module in an ACX6160**



## RELATED DOCUMENTATION

[Maintaining the ACX6160 Power Supplies | 71](#)

[Maintaining ACX6160 Transceivers and Fiber-Optic Cables | 74](#)

# Maintaining the ACX6160 Power Supplies

## IN THIS SECTION

- [Removing a Power Supply from the ACX6160 | 71](#)
- [Installing a Power Supply in an ACX6160 | 72](#)

## Removing a Power Supply from the ACX6160

Before you remove a power supply from an ACX6160, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see ["Prevention of Electrostatic Discharge Damage" on page 128](#)).

Ensure that you have the following parts and tools available:

- ESD grounding strap
- Antistatic bag or an antistatic mat
- Phillips (+) screwdriver, number 2 (for a DC power supply)

The power supplies in an ACX6160 are hot-removable and hot-insertable field-replaceable units (FRUs) when the second power supply is installed and running. You can install replacement power supplies in the two slots next to the fan modules without powering off the device or disrupting the routing functions.



**CAUTION:** Replace the power supply with a new power supply within 1 minute of removal to prevent chassis overheating.

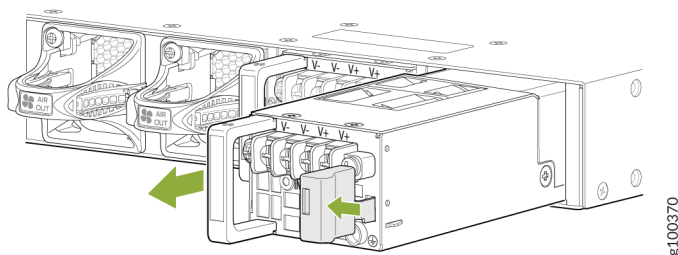
To remove a power supply from an ACX6160 (see [Figure 29 on page 72](#)):

1. Place the antistatic bag or the antistatic mat on a flat, stable surface.
2. Wrap and fasten one end of the ESD grounding strap around your bare wrist, and connect the other end of the strap to the ESD point on the chassis.

**NOTE:** If you need to remove all the power supplies installed in your ACX6160, you must power off the ACX6160 before removing the power supplies. See ["Powering Off the ACX6160" on page 66](#).

3. Disconnect the power supplied to the ACX6160. Switch the circuit breaker on the panel board that services the DC circuit to the off position.
4. Remove the power source cable from the power supply faceplate:
  - Using the screwdriver, remove the screws securing the ring lugs attached to the power source cables to the power supply. Then remove the power source cables from the power supply. Replace the screws on the terminals and tighten them.
5. Slide the locking lever toward the handle until it stops.
6. Grasp the power supply handle and pull firmly to slide the power supply halfway out of the chassis.
7. Place one hand under the power supply to support it and slide it completely out of the chassis. Take care not to touch power supply components, pins, leads, or solder connections.

**Figure 29: Removing a Power Supply in an ACX6160**



8. Place the power supply in the antistatic bag or on the antistatic mat placed on a flat, stable surface.

## Installing a Power Supply in an ACX6160

Before you install a power supply in an ACX6160, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see ["Prevention of Electrostatic Discharge Damage" on page 128](#)).

Ensure that you have the following parts and tools available:

- ESD grounding strap
- Antistatic bag or an antistatic mat

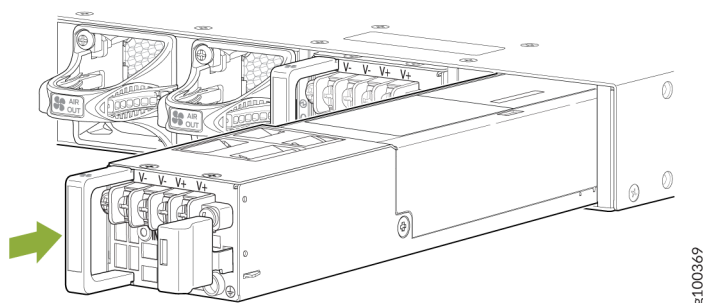
- Phillips (+) screwdriver, number 2 (To attach the power cable to the DC power supply, we need the screwdriver).

The power supplies in an ACX6160 are hot-removable and hot-insertable FRUs when the second power supply is installed and running. You can install replacement power supplies in the two power-supply slots next to the fan modules without powering off the device or disrupting the routing functions.

To install a power supply in an ACX6160 (see [Figure 30 on page 73](#)):

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist, and connect the other end of the strap to the ESD point on the chassis.
2. Taking care not to touch power supply components, pins, leads, or solder connections, remove the power supply from its bag.
3. Using both hands, place the power-supply in the power supply slot on the FRU panel of the ACX6160 and slide it in until it is fully seated and the locking lever slides into place.

**Figure 30: Installing a Power Supply in an ACX6160**



**NOTE:** Each power supply must be connected to a dedicated power source outlet.

**NOTE:** If you have a Juniper Care service contract, register any addition, change, or upgrade of hardware components at <https://www.juniper.net/customers/support/tools/updateinstallbase/>. Failure to do so can result in significant delays if you need replacement parts. This note does not apply if you replace existing components with the same type of component.

## RELATED DOCUMENTATION

Connecting the ACX6160 to Power | 54

# Maintaining ACX6160 Transceivers and Fiber-Optic Cables

## IN THIS SECTION

- Removing a QSFP28 Transceiver | 74
- Removing a CFP2 Transceiver | 76
- Installing a QSFP28 Transceiver | 77
- Installing a CFP2 Transceiver | 79
- Disconnecting a Fiber-Optic Cable from the ACX6160 | 81
- Connecting a Fiber-Optic Cable to the ACX6160 | 82
- Maintaining Fiber-Optic Cables in an ACX6160 | 83

## Removing a QSFP28 Transceiver

Before you begin removing a transceiver from a device, ensure that you have taken the necessary precautions for the safe handling of lasers (see "[Laser and LED Safety Guidelines and Warnings](#)" on page 116).

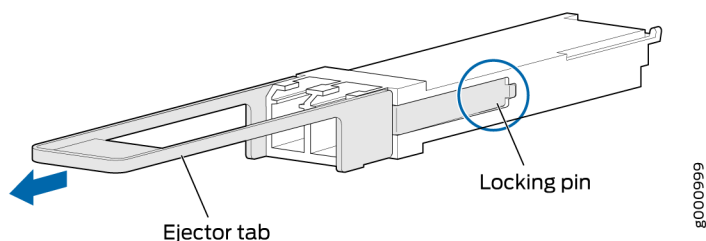
Ensure that you have the following parts and tools available:

- An antistatic bag or an antistatic mat
- Rubber safety caps to cover the transceiver and fiber-optic cable connector
- A dust cover to cover the port or a replacement transceiver

See [Figure 31 on page 75](#) to remove a QSFP28 transceiver.

The 28-Gbps quad small form-factor pluggable (QSFP28) transceivers for Juniper Network devices are hot-insertable and hot-removable components. Removing a QSFP28 transceiver does not interrupt the device functioning, but the removed QSFP28 transceiver no longer receives or transmits data.

**Figure 31: 28-Gbps Quad Small Form-Factor Pluggable (QSFP28) Transceiver**



To remove a QSFP28 transceiver (see [Figure 31 on page 75](#)):

1. Place an electrostatic bag or antistatic mat on a flat, stable surface to receive the transceiver. Have ready a rubber safety cap for the QSFP28 transceiver and the cable.
2. Wrap and fasten one end of the ESD grounding strap around your bare wrist, and connect the other end of the strap to the ESD point on the chassis.
3. Label the cable connected to the QSFP28 transceiver so that you can later reconnect the cable to the correct transceiver.
4. Disconnect the cable from the transceiver. Immediately cover the transceiver and the end of the cable connector with a rubber safety cap.



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



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

5. Arrange the cable in the cable management system to prevent it from dislodging or developing stress points. Secure the cable so that it does not support its own weight as it hangs to the floor. Place excess cable out of the way in a neatly coiled loop in the cable management system. Placing fasteners on the loop helps to maintain its shape.



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

6. Pull the transceiver's rubber handle straight back. The locking pins on the transceiver are automatically released. Place the transceiver on the antistatic mat or in the electrostatic bag.

## Removing a CFP2 Transceiver

The C form-factor pluggable (CFP) transceivers for Juniper Networks devices are hot-removable and hot-insertable FRUs. You can remove and replace them without powering off the device or disrupting device functions.

**NOTE:** After you remove a transceiver or when you change the media-type configuration, wait for 6 seconds for the interface to display the operational commands.

To remove a CFP2 transceiver from the ACX6160:

1. Place the antistatic bag or antistatic mat on a flat, stable surface.
2. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to the ESD point on the device.
3. Label the cable connected to the transceiver so that you can reconnect it correctly.



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



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



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

4. Remove the cable connected to the transceiver. Cover the transceiver and the end of each fiber-optic cable connector with a rubber safety cap immediately after disconnecting the fiber-optic cables.
5. To remove the transceiver:
  - a. Loosen the screws on the transceiver by using your fingers.
  - b. Grasp the screws on the transceiver and gently slide the transceiver approximately 0.5 in. (1.3 cm) straight out of the port.



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

6. By using your fingers, grasp the body of the transceiver and pull it straight out of the port.
7. Place the transceiver in the antistatic bag or on the antistatic mat placed on a flat, stable surface.
8. Place the dust cover over the empty port or install the replacement transceiver.

## Installing a QSFP28 Transceiver

The transceivers for Juniper Networks devices are hot-removable and hot-insertable field-replaceable units (FRUs). You can remove and replace them without powering off the device or disrupting the device functions.

**NOTE:** After you insert a transceiver or after you change the media-type configuration, wait for 6 seconds for the interface to display operational commands.

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



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

Use of third-party optical modules with high-power consumption (for example, coherent ZR or ZR+) can potentially cause thermal damage to or reduce the lifespan of the host equipment. Any damage to the host equipment due to the use of third-party optical modules or cables is the users' responsibility. Juniper Networks will accept no liability for any damage caused due to such use.

Before you begin to install a transceiver in a device, ensure that you have taken the necessary precautions for safe handling of lasers (see "[Laser and LED Safety Guidelines and Warnings](#)" on page 116).

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

To install a replacement QSFP28 transceiver:

1. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to the ESD point on the device.
2. Verify that a rubber safety cap covers the QSFP28 transceiver, installing one if necessary.
3. Orient the transceiver over the port so that the transceiver connector faces the appropriate direction.
4. Slide the QSFP28 transceiver into the port until the locking pins lock in place. If there is resistance, remove the transceiver and flip it so that the connector faces the other direction and slide it into the slot. Ensure that the transceiver is seated snugly in the port.
5. Remove the rubber safety cap from the transceiver and the end of the cable connector, and insert the cable into the transceiver.



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



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

6. Arrange the cable in the cable management system to prevent the cable from dislodging or developing stress points. Secure the cable so that it does not support its own weight as it hangs to the floor. Place excess cable out of the way in a neatly coiled loop in the cable management system. Placing fasteners on the loop helps to maintain its shape.



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



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

7. Verify that the port status LEDs on the front panel indicate that the QSFP28 transceiver is functioning correctly.

## Installing a CFP2 Transceiver

Before you begin to install a transceiver in a device, ensure that you have taken the necessary precautions for safe handling of lasers (see "[Laser and LED Safety Guidelines and Warnings](#)" on page 116).

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

The transceivers for Juniper Networks devices are hot-removable and hot-insertable field-replaceable units (FRUs). You can remove and replace them without powering off the device or disrupting the device functions.

**NOTE:** After you insert a transceiver or after you change the media-type configuration, wait for 6 seconds for the interface to display operational commands.

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



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

Use of third-party optical modules with high-power consumption (for example, coherent ZR or ZR+) can potentially cause thermal damage to or reduce the lifespan of the host equipment. Any damage to the host equipment due to the use of third-party optical modules or cables is the users' responsibility. Juniper Networks will accept no liability for any damage caused due to such use.

To install a CFP2 transceiver:



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

1. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to the ESD point on the chassis.
2. Remove the transceiver from its bag.
3. Check to see whether the transceiver is covered with a rubber safety cap. If it is not, cover the transceiver with a rubber safety cap.



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

4. If the port in which you want to install the transceiver is covered with a dust cover, remove the dust cover and save it in case you need to cover the port later. If you are hot-swapping a transceiver, wait for at least 10 seconds after removing the transceiver from the port before installing a new transceiver.

- Using both hands, carefully align the transceiver in front of the empty port. The connectors must face the chassis.



**CAUTION:** Before you slide the transceiver into the port, ensure that the transceiver is aligned correctly. Misalignment might cause the pins to bend, making the transceiver unusable.

- Slide the transceiver in gently until it is fully seated. Tighten the captive screws on the transceiver by using your fingers.
- Remove the rubber safety cap when you are ready to connect the cable to the transceiver.



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

## Disconnecting a Fiber-Optic Cable from the ACX6160

Before you disconnect a fiber-optic cable from an ACX6160, ensure that you have taken the necessary precautions for safe handling of lasers (see ["Radiation from Open Port Apertures Warning" on page 119](#) and ["Laser and LED Safety Guidelines and Warnings" on page 116](#)).

Ensure that you have the following parts and tools available:

- Rubber safety cap to cover the transceiver
- Rubber safety cap to cover the fiber-optic cable connector

The ACX6160 has optical transceivers to which you can connect fiber-optic cables.

To disconnect a fiber-optic cable from an optical transceiver installed in the ACX6160:

- (Recommended) Disable the port in which the transceiver is installed by including the disable statement at the `[edit interfaces]` hierarchy level for the specific interface:

```
[edit interfaces]
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.



**LASER WARNING:** Do not stare into the laser beam or view it directly with optical instruments even if the interface has been disabled.

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



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

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

## Connecting a Fiber-Optic Cable to the ACX6160

Before you connect a fiber-optic cable to an ACX6160, ensure that you have taken the necessary precautions for safe handling of lasers (see "[Radiation from Open Port Apertures Warning](#)" on page 119 and "[Laser and LED Safety Guidelines and Warnings](#)" on page 116).

The ACX6160 has optical transceivers to which you can connect fiber-optic cables.

To connect a fiber-optic cable to an optical transceiver installed in the ACX6160:



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



**LASER WARNING:** Do not stare into the laser beam or view it directly with optical instruments even if the interface has been disabled.

1. If the fiber-optic cable connector is covered by a rubber safety cap, remove the cap. Save the cap.
2. If the optical transceiver is covered by a rubber safety cap, remove the cap. Save the cap.

3. Insert the cable connector into the optical transceiver.
4. Secure the cable so that it does not support its own weight. Place excess cable out of the way in a neatly coiled loop. Placing fasteners on a loop helps cables maintain their shape.



**CAUTION:** Do not bend fiber-optic cables beyond their minimum bend radius. Bending the cables beyond their minimum bend radius can damage the cables and cause problems that are difficult to diagnose.



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

## Maintaining Fiber-Optic Cables in an ACX6160

To maintain fiber-optic cables in an ACX6160:

- When you unplug fiber-optic cables from transceivers, place rubber safety caps over the transceivers and on the end of the cables.
- Anchor fiber-optic cables to avoid stress on the connectors. When attaching a fiber-optic cable to a transceiver, be sure to secure the fiber-optic cable so that it does not support its own weight as it hangs to the floor. Never let a fiber-optic cable hang free from the connector.
- Do not bend fiber-optic cables beyond their minimum bend radius. Bending the cables beyond their minimum bend radius can damage the cables and cause problems that are difficult to diagnose.
- Frequent plugging and unplugging of fiber-optic cables in and out of optical instruments can damage the instruments, which are expensive to repair. Attach a short fiber extension to the optical equipment. Any wear and tear due to frequent plugging and unplugging is then absorbed by the short fiber extension, which is easier and less expensive to replace than the instruments.
- Keep fiber-optic cable connections clean. Microdeposits of oil and dust in the canal of the transceiver or cable connector can cause loss of light, reduction in signal power, and possibly intermittent problems with the optical connection.

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

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

#### SEE ALSO

| [Maintaining ACX6160 Transceivers and Fiber-Optic Cables](#) | 74

## Maintaining SATA Solid State Drive in an ACX6160

#### IN THIS SECTION

- [Removing a SATA Solid State Drive from an ACX6160](#) | 84
- [Installing a SATA Solid State Drive in an ACX6160](#) | 85

### Removing a SATA Solid State Drive from an ACX6160

The ACX6160 supports two 50 -GB Serial Advanced Technology Attachment (SATA) solid state drives (SSD) as secondary boot drives or for log storage. The SATA SSD is a hot-insertable and hot-removable field-replaceable unit (FRU). The SSDs are preinstalled in the ACX6160.

Before you remove an SATA SSD from the device, ensure that you understand how to prevent electrostatic discharge (ESD) damage. See "[Prevention of Electrostatic Discharge Damage](#)" on page 128.

Ensure that you have the following parts and tools available to remove a SATA SSD from an ACX6160:

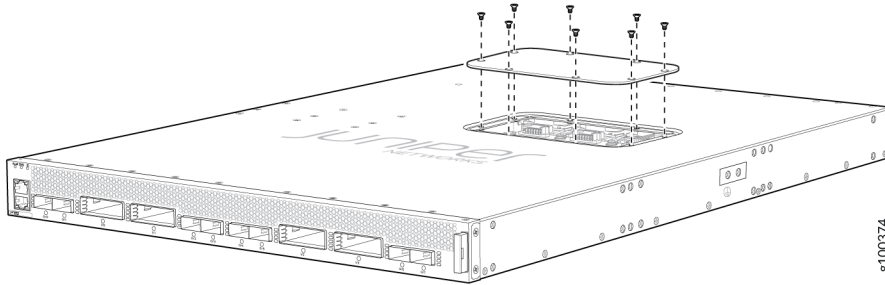
- ESD grounding strap
- Phillips (+) screwdriver, number 1
- An electrostatic bag or antistatic mat

To remove a SATA SSD in an ACX6160:

1. Place an electrostatic bag or antistatic mat on a flat, stable surface to receive the SATA SSD.

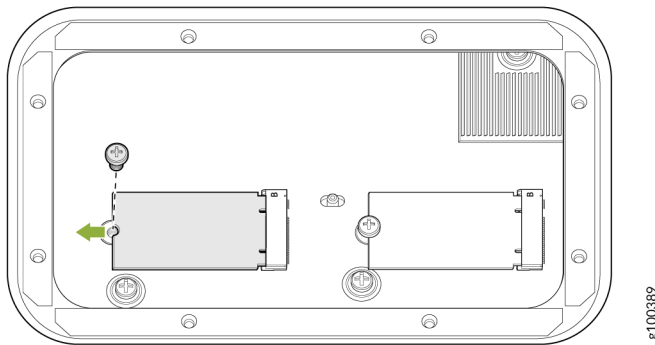
2. Wrap and fasten one end of the ESD grounding around your bare wrist and connect the other end of the strap to the ESD point on the chassis.
3. Remove the eight captive screws securing the SSD cover plate by using the Phillips (+) screwdriver, number 1. The SSD cover plate is located on the top of the chassis (see [Figure 32 on page 85](#)).

**Figure 32: Removing the SATA SSD Cover Plate**



4. Remove the single screw holding the SATA SSD in place and slide the drive out of the plug (see [Figure 33 on page 85](#)).

**Figure 33: Removing the SATA SSD**



5. Place the SATA SSD in an electrostatic bag or on an antistatic mat.
6. Place the SSD cover plate back on the chassis and tighten the eight captive screws securing the SSD cover plate.

## Installing a SATA Solid State Drive in an ACX6160

Before you install a SATA SSD in the device, ensure that you understand how to prevent ESD damage. See ["Prevention of Electrostatic Discharge Damage" on page 128](#).

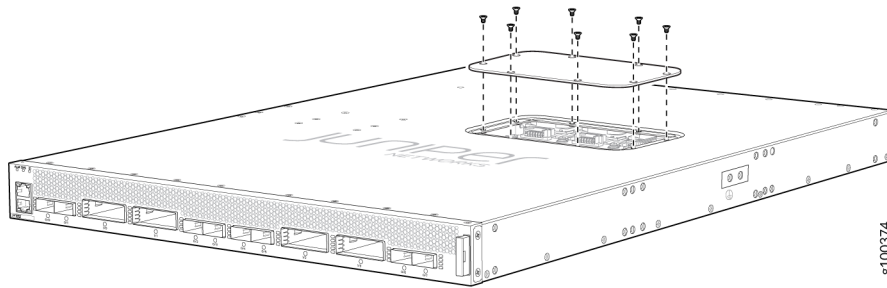
Ensure that you have the following parts and tools available to install an SATA SSD in the ACX6160:

- ESD grounding strap
- Phillips (+) screwdriver, number 1
- An electrostatic bag or antistatic mat

To install a SATA SSD in an ACX6160:

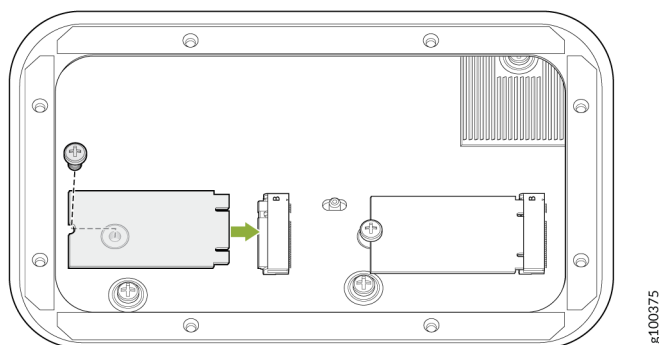
1. Wrap and fasten one end of the ESD grounding around your bare wrist and connect the other end of the strap to the ESD point on the chassis.
2. If not already removed, remove the eight captive screws securing the SSD cover plate by using the Phillips (+) screwdriver, number 1. The SSD cover plate is located on the top of the chassis (see [Figure 34 on page 86](#)).

**Figure 34: Removing the SATA SSD Cover Plate**



3. Slide the drive into the SSD plug and tighten the single screw holding the SATA SSD. (see [Figure 35 on page 86](#)).

**Figure 35: Installing the SATA SSD**



4. Place the SSD cover plate back on the chassis and tighten the eight captive screws securing the SSD cover plate.

## Uninstalling the ACX6160

### IN THIS SECTION

- [Removing an ACX6160 from a Rack or Cabinet | 87](#)

### Removing an ACX6160 from a Rack or Cabinet

Before removing an ACX6160 from a rack:

Ensure that you have the following parts and tools available:

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

If you need to relocate an installed ACX6160, use the procedure described in this topic. (The remainder of this topic uses “rack” to mean “rack or cabinet.” )

**NOTE:** When you remove multiple devices from a rack, remove the device at the top of the rack first and proceed to remove the rest of the devices from top to bottom.

- Ensure that the rack is stable and secured to the building.
- Ensure that there is enough space to place the removed ACX6160 in its new location and along the path to the new location.
- Read ["General Safety Guidelines and Warnings" on page 103](#) and ["ACX6160 Installation Safety Guidelines" on page 48](#).
- Safely power off the device.

- Disconnect the power cords.
- Ensure that you have disconnected any cables or wires attached to the ACX6160 (see ["Maintaining ACX6160 Transceivers and Fiber-Optic Cables" on page 74](#)).

To remove an ACX6160 from a rack:

1. Have one person support the weight of the ACX6160 while another person uses the screwdriver to remove the front-mounting screws that attach the mounting rails to the rack.
2. Use the screwdriver to remove the mounting screws that attach the mounting blades attached to the rear of the rack. Slide out the mounting rail.
3. Remove the ACX6160 from the rack.
4. Place the removed screws and rear-mounting blades in a labeled bag. You will need them when you reinstall the chassis.
5. Transport the ACX6160 to your desired new location.

## RELATED DOCUMENTATION

| [Mounting the ACX6160](#) | 49

# 5

CHAPTER

## Troubleshooting Hardware

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Troubleshooting the ACX6160 | 90

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# Troubleshooting the ACX6160

## IN THIS SECTION

- ACX6160 Troubleshooting Resources Overview | 90

## ACX6160 Troubleshooting Resources Overview

To troubleshoot an ACX6160, you use alarms, performance monitors, and LEDs on the network ports, management panel, and components.

- LEDs—When the device detects an alarm condition, it lights the red or yellow alarm LED on the management panel as appropriate. In addition, you can also use component LEDs and network port LEDs to troubleshoot the ACX6160. For more information, see the following topics:
  - "ACX6160 Chassis Status LEDs" on page 8
  - "ACX6160 Management and Console Port LEDs on the Front Panel" on page 10
  - "ACX6160 Network Port LEDs" on page 12
  - "ACX6160 Fan Module LEDs" on page 18
  - "ACX6160 DC Power Supply LEDs" on page 20

**NOTE:** See the *ACX6160 Universal Metro Router User Guide* at <https://www.juniper.net/documentation/> for details on the ACX6160 alarms and performance monitors.

- JTAC—If you need assistance during troubleshooting, you can contact the Juniper Networks Technical Assistance Center (JTAC) by using our Web or by telephone. If you encounter software problems, or problems with hardware components not discussed here, contact JTAC.

## RELATED DOCUMENTATION

[ACX6160 Management Panel | 13](#)

[Definitions of Safety Warning Levels | 104](#)

[Contact Customer Support | 93](#)

# 6

CHAPTER

## Contacting Customer Support and Returning the Chassis or Components

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[Returning the ACX6160 Chassis or Components](#) | 93

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# Returning the ACX6160 Chassis or Components

## IN THIS SECTION

- [Contact Customer Support | 93](#)
- [Locating the Serial Number on an ACX6160 Chassis or Component | 94](#)
- [How to Return a Hardware Component to Juniper Networks, Inc. | 97](#)
- [Guidelines for Packing Hardware Components for Shipment | 98](#)
- [Packing an ACX6160 Chassis or Component for Shipping | 98](#)

## 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.

## Locating the Serial Number on an ACX6160 Chassis or Component

### IN THIS SECTION

- [Locating the Chassis Serial Number ID Label on an ACX6160 | 95](#)
- [Locating the Serial Number ID Labels on FRU Components | 96](#)

If you are returning an ACX6160 or an ACX6160 field-replaceable unit (FRU) to Juniper Networks for repair or replacement, you must locate the serial number of the router or FRU. You must provide the serial number to the Juniper Networks Technical Assistance Center (JTAC) when you contact them to obtain a Return Material Authorization (RMA).

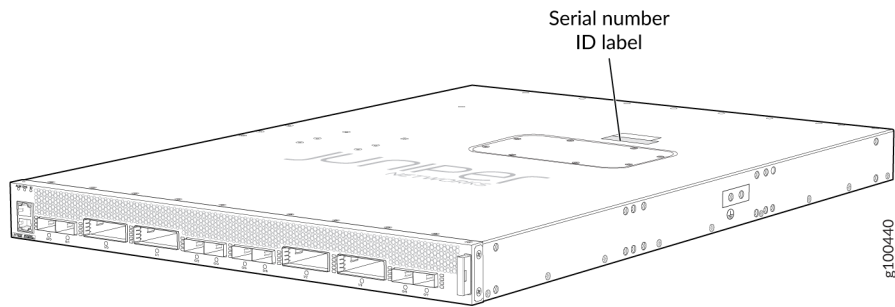
**NOTE:** If you want to find the serial number ID label on a component, you need to remove the component from the chassis, for which you must have the required parts and tools available.

**NOTE:** You must remove the fan module to read the serial number from the serial number ID label. The fan module serial number cannot be viewed through the CLI.

## Locating the Chassis Serial Number ID Label on an ACX6160

The serial number ID label is located on a label on the top cover.

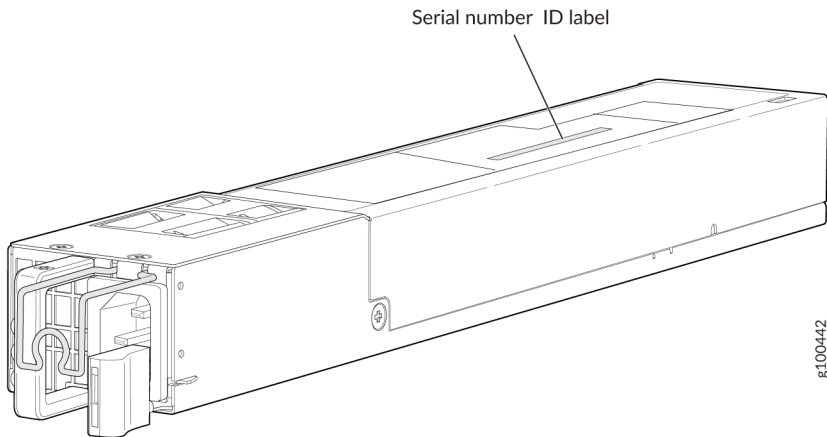
**Figure 36: Locating the Serial Number ID Labels on Chassis**



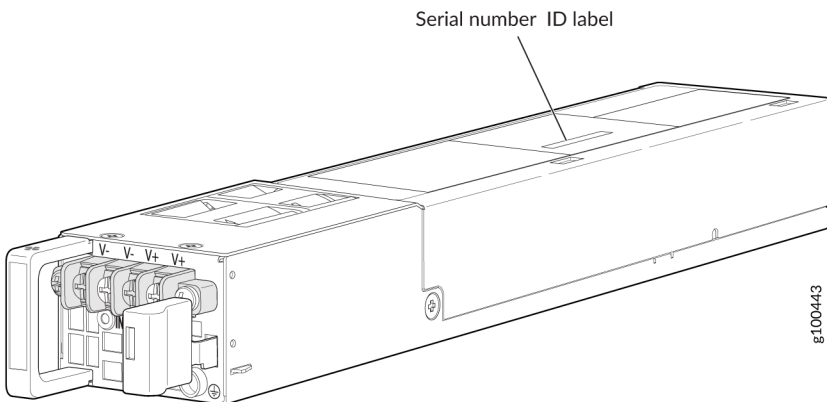
## Locating the Serial Number ID Labels on FRU Components

For each FRU, you must remove the FRU from the chassis to see the FRU's serial number ID label. The serial number ID label is located on the top of the FRU. See [Figure 37 on page 96](#), [Figure 38 on page 96](#), and [Figure 39 on page 97](#).

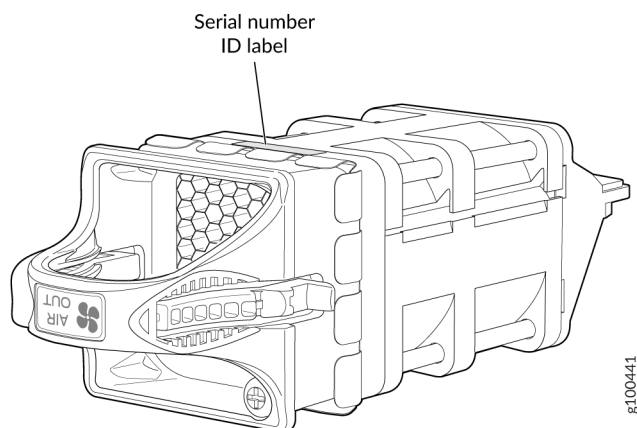
**Figure 37: AC Power Supply Serial Number Location**



**Figure 38: DC Power Supply Serial Number Location**



**Figure 39: Fan Module Serial Number Location**



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

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

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

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

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

To return a defective hardware component:

1. Determine the part number and serial number of the defective component.
2. Obtain an RMA number from the Juniper Networks Technical Assistance Center (JTAC). You can send e-mail or telephone as described above.

3. Provide the following information in your e-mail message or during the telephone call:
  - Part number and serial number of component
  - Your name, organization name, telephone number, and fax number
  - Description of the failure
4. The support representative validates your request and issues an RMA number for return of the component.
5. Pack the component for shipment.

## Guidelines for Packing Hardware Components for Shipment

To pack and ship individual components:

- When you return components, make sure that they are adequately protected with packing materials and packed so that the pieces are prevented from moving around inside the carton.
- Use the original shipping materials if they are available.
- Place individual components in antistatic bags.
- Write the RMA number on the exterior of the box to ensure proper tracking.



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

## Packing an ACX6160 Chassis or Component for Shipping

### IN THIS SECTION

- [Packing an ACX6160 for Shipping | 99](#)
- [Packing ACX6160 Components for Shipping | 100](#)

If you are returning an ACX6160 or component to Juniper Networks for repair or replacement, pack the item as described in this topic.

Before you pack an ACX6160 or component:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See ["Prevention of Electrostatic Discharge Damage" on page 128](#).
- Retrieve the original shipping carton and packing materials. Contact your JTAC representative, if you do not have these materials, to learn about approved packing materials.

Ensure that you have the following parts and tools available:

- ESD grounding strap.
- Antistatic bag, one for each component.
- If you are returning the chassis, an appropriate screwdriver for the mounting screws used on your rack or cabinet.

## Packing an ACX6160 for Shipping

To pack an ACX6160 for shipping:

1. Power off the ACX6160 and remove the AC power cords or DC power cables. See ["Powering Off the ACX6160" on page 66](#).
2. Remove the cables that connect the ACX6160 to all external devices. See ["Disconnecting a Fiber-Optic Cable from the ACX6160" on page 81](#).
3. Remove all field-replaceable units (FRUs) from the router. See:
  - [Figure 27 on page 69](#)
  - [Figure 29 on page 72](#)
4. Remove the ACX6160 from the rack or cabinet. See ["Uninstalling the ACX6160" on page 87](#).
5. Place the ACX6160 in an antistatic bag.
6. Place the ACX6160 in the shipping carton.
7. Place the packing foam on top of and around the ACX6160.
8. If you are returning accessories or FRUs with the ACX6160, pack them as instructed in ["Packing ACX6160 Components for Shipping" on page 100](#).
9. Close the top of the cardboard shipping box and seal it with packing tape.
10. Write the Return Materials Authorization (RMA) number on the exterior of the box to ensure proper tracking.

## Packing ACX6160 Components for Shipping



**CAUTION:** Do not stack ACX6160 components. Return individual components in separate boxes if they do not fit together on one level in the shipping box.

To pack and ship ACX6160 components:

1. Place individual FRUs in antistatic bags.
2. Ensure that the components are adequately protected with packing materials and packed so that the pieces are prevented from moving around inside the carton.
3. Close the top of the cardboard shipping box and seal it with packing tape.
4. Write the RMA number on the exterior of the box to ensure proper tracking.

# 7

CHAPTER

## Safety and Compliance Information

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# General Safety Guidelines and Warnings

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

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

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



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

## Definitions of Safety Warning Levels

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

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



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

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



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

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



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

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

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

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

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

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

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

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

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

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

## Qualified Personnel Warning



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

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

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

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

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

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

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

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

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

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

## Warning Statement for Norway and Sweden



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

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

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

# Fire Safety Requirements

## IN THIS SECTION

- [Fire Suppression | 107](#)
- [Fire Suppression Equipment | 107](#)

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

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

## Fire Suppression

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

## Fire Suppression Equipment

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

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

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

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

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

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

## Installation Instructions Warning



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

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

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

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

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

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

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

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

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

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

## Chassis and Component Lifting Guidelines

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

## Restricted Access Warning



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

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

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

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

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

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

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

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

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

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

## Ramp Warning



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

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

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

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

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

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

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

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

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

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

## Rack-Mounting and Cabinet-Mounting Warnings

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



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

## Grounded Equipment Warning



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

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

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

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

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

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

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

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

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

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

## Laser and LED Safety Guidelines and Warnings

### IN THIS SECTION

- [General Laser Safety Guidelines | 117](#)
- [Class 1 Laser Product Warning | 117](#)
- [Class 1 LED Product Warning | 118](#)
- [Laser Beam Warning | 118](#)

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.

## 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 kytkettyä, vältä säteilylle altistumista äläkä katso avoimiin aukkoihin.

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

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

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

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

**Aviso** Dada a possibilidade de emissão de radiação invisível através do orifício da via de acesso, quando esta não tiver nenhum cabo de fibra conectado, deverá evitar 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.

## Maintenance and Operational Safety Guidelines and Warnings

### IN THIS SECTION

- [Battery Handling Warning | 120](#)
- [Jewelry Removal Warning | 122](#)
- [Lightning Activity Warning | 123](#)
- [Operating Temperature Warning | 124](#)
- [Product Disposal Warning | 125](#)

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

### Battery Handling Warning



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

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

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

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

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

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

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

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

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

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

## Jewelry Removal Warning



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

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

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

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

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

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

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

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

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

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

## Lightning Activity Warning



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

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

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

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

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

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

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

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

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

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

## Operating Temperature Warning



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

**Waarschuwing** Om te voorkomen dat welke switch van de Juniper Networks router dan ook oververhit raakt, dient u deze niet te bedienen op een plaats waar de maximale aanbevolen omgevingstemperatuur van 40° C wordt overschreden. Om te voorkomen dat de luchtstroom wordt beperkt, dient er minstens 15,2 cm speling rond de ventilatie-openingen te zijn.

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

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

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

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

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

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

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

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

## Product Disposal Warning



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

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

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

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

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

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

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

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

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

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

## General Electrical Safety Guidelines and Warnings



**WARNING:** Certain ports on the device are designed for use as intrabuilding (within-the-building) interfaces only (Type 2 or Type 4 ports as described in *GR-1089-CORE*) and require isolation from the exposed outside plant (OSP) cabling. To comply with NEBS (Network Equipment-Building System) requirements and protect against lightning surges and commercial power disturbances, the intrabuilding ports *must not* be metalically connected to interfaces that connect to the OSP or its wiring. The intrabuilding ports on the device are suitable for connection to intrabuilding or unexposed wiring or cabling only. The addition of primary protectors is not sufficient protection for connecting these interfaces metalically to OSP wiring.

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



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

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

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

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

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

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

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

## Action to Take After an Electrical Accident

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

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

# Prevention of Electrostatic Discharge Damage

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

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

If a grounding strap is not available, hold the component in its antistatic bag (see [Figure 40 on page 129](#)) 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).

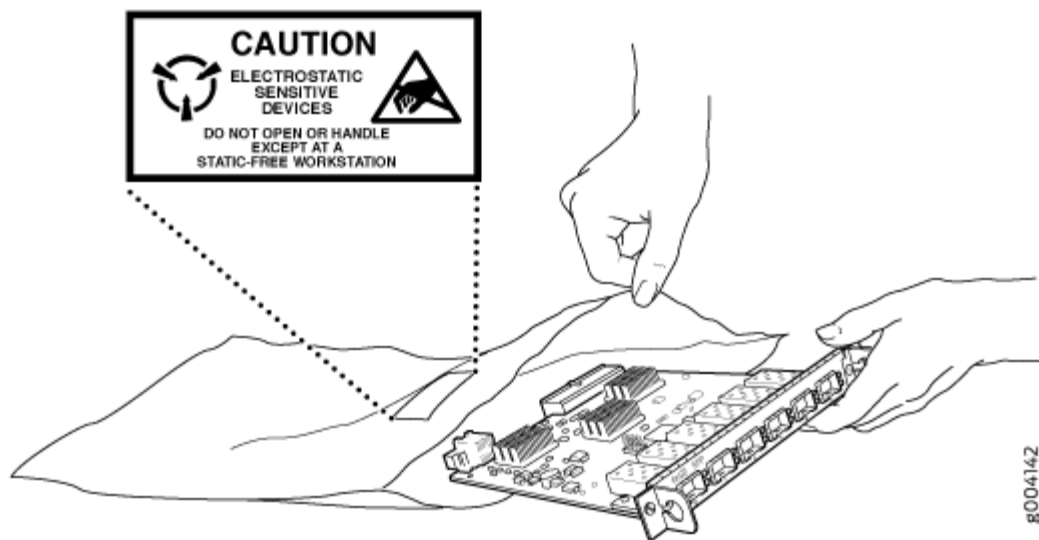
- When handling any component that is subject to ESD damage and that is removed from the device, make sure the equipment end of your ESD wrist strap is attached to the ESD point on the chassis.

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 40 on page 129](#)). If you are returning a component, place it in an antistatic bag before packing it.

Figure 40: 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.

## DC Power Electrical Safety Guidelines

- A DC-powered device is equipped with a DC terminal block that is rated for the power requirements of a maximally configured device.
- For permanently connected equipment, a readily accessible disconnect device shall be incorporated external to the equipment.

- For pluggable equipment, the socket-outlet shall be installed near the equipment and shall be easily accessible.
- Be sure to connect the ground wire or conduit to a solid central office earth ground.
- A closed loop ring is recommended for terminating the ground conductor at the ground stud.
- Run two wires from the circuit breaker box to a source of 48 VDC.
- A DC-powered device that is equipped with a DC terminal block is intended only for installation in a restricted-access location. In the United States, a restricted-access area is one in accordance with Articles 110-16, 110-17, and 110-18 of the National Electrical Code ANSI/NFPA 70.

**NOTE:** Primary overcurrent protection is provided by the building circuit breaker. This breaker must protect against excess currents, short circuits, and earth grounding faults in accordance with NEC ANSI/NFPA 70.

- Ensure that the polarity of the DC input wiring is correct. Under certain conditions, connections with reversed polarity might trip the primary circuit breaker or damage the equipment.
- The marked input voltage of –48 VDC for a DC-powered device is the nominal voltage associated with the battery circuit, and any higher voltages are only to be associated with float voltages for the charging function.
- Because the device is a positive ground system, you must connect the positive lead to the terminal labeled **RTN**, the negative lead to the terminal labeled –48 VDC, and the earth ground to the device grounding points.

## DC Power 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.

**Varoitius** 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.

**Varoitius** Oikea yhdistettävä kytkentäjäjestys on maajohto maajohtoon, +RTN varten +RTN, -48 V varten -48 V. Oikea irrotettava kytkentäjäjestys on -48 V varten -48 V, +RTN varten +RTN, maajohto maajohtoon.

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

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

**Avvertenza** Mostra la morsettiera dell alimentatore CC. Cablare l'alimentatore CC usando i connettori adatti all'estremità del cablaggio, come illustrato. La corretta sequenza di cablaggio è da massa a massa, da positivo a positivo (da linea ad L) e da negativo a negativo (da neutro a N). Tenere presente che il filo di massa deve sempre venire collegato per primo e scollegato per ultimo.

**Advarsel** Riktig tilkoples tilkopplingssekvens er jord til jord, +RTN til +RTN, -48 V til -48 V. Riktig frakoples tilkopplingssekvens er -48 V til -48 V, +RTN til +RTN, jord til jord.

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

**¡Atención!** Wire a fonte de alimentação de DC Usando os talões apropriados 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 aansluitpunten, zoals het gesloten-lus type of het grijperschop type waarbij de aansluitpunten omhoog wijzen. Deze aansluitpunten dienen de juiste maat voor de draden te hebben en dienen zowel de isolatie als de geleider vast te klemmen.

**Varoitus** Jos säikeellinen johdin on tarpeen, käytä hyväksyttyä johdinliitintä, esimerkiksi suljettua silmukkaa tai kourumaista liitintä, jossa on ylöspäin käännetyt kiinnityskorvat. Tällaisten liitintöjen 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 forcilla 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 ledere.

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

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

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

## Multiple Power Supplies Disconnection Warning



**WARNING:** The network device has more than one power supply connection. All connections must be removed completely to remove power from the unit completely.

**Waarschuwing** Deze eenheid heeft meer dan één stroomtoevoerverbinding; alle verbindingen moeten volledig worden verwijderd om de stroom van deze eenheid volledig te verwijderen.

**Varoitus** Tässä laitteessa on useampia virtalähdekytkentöjä. Kaikki kytkennät on irrotettava kokonaan, jotta virta poistettaisiin täysin laitteesta.

**Avertissement** Cette unité est équipée de plusieurs raccordements d'alimentation. Pour supprimer tout courant électrique de l'unité, tous les cordons d'alimentation doivent être débranchés.

**Warnung** Diese Einheit verfügt über mehr als einen Stromanschluß; um Strom gänzlich von der Einheit fernzuhalten, müssen alle Stromzufuhren abgetrennt sein.

**Avvertenza** Questa unità ha più di una connessione per alimentatore elettrico; tutte le connessioni devono essere completamente rimosse per togliere l'elettricità dall'unità.

**Advarsel** Denne enheten har mer enn én strømtilkobling. Alle tilkoblinger må kobles helt fra for å eliminere strøm fra enheten.

**Aviso** Este dispositivo possui mais do que uma conexão de fonte de alimentação de energia; para poder remover a fonte de alimentação de energia, deverão ser desconectadas todas as conexões existentes.

**¡Atención!** Esta unidad tiene más de una conexión de suministros de alimentación; para eliminar la alimentación por completo, deben desconectarse completamente todas las conexiones.

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

## TN Power Warning



**WARNING:** The device is designed to work with a TN power system.

**Waarschuwing** Het apparaat is ontworpen om te functioneren met TN energiesystemen.

**Varoitus** Kojie 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.

# ACX6160 Regulatory Standard Compliances

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## ACX6160 Regulatory Standard Compliances

### IN THIS SECTION

- [Compliance Statement for Argentina | 139](#)

ACX6160 routers comply with the following standards:

- Safety
  - CAN/CSA-C22.2 No. 60950-1, Safety of Information Technology Equipment
  - UL 60950-1 Information Technology Equipment - Safety - Part 1: General Requirements
  - EN 60950-1: 2006/ A2: 2013- Safety of Information Technology Equipment
  - IEC 60950-1: 2005/ A2: 2013- Information Technology Equipment - Safety - Part 1: General Requirements (with country deviations)
  - EN 60825-1 Safety of Laser Products - Part 1: Equipment Classification, Requirements and User's Guide
- EMC
  - EN 300 386 V1.6.1 (2012-09) Electromagnetic compatibility and Radio spectrum Matters (ERM); Telecommunication network equipment; Electro Magnetic Compatibility (EMC) requirements
  - EN 300 386 V2.1.1 (2016-07) Telecommunication network equipment; Electro Magnetic Compatibility (EMC) requirements; Harmonized Standard covering the essential requirements of the Directive 2014/30/EU

- EN 55032:2015 (CISPR 32:2015) Electromagnetic compatibility of multimedia equipment - Emission requirements
- EN 55024:2010 (CISPR 24:2010) Information technology equipment - Immunity characteristics - Limits and methods of measurement
- EN 55035:2017 (CISPR 35:2016) Electromagnetic compatibility of multimedia equipment - Immunity requirements
- IEC/EN 61000 Immunity Test
- AS/NZS CISPR 32:2015 Australia/New Zealand Radiated and Conducted Emissions
- FCC 47 CFR Part 15 USA Radiated and Conducted Emissions
- IC ICES-003 Canada Radiated and Conducted Emissions
- VCCI-CISPR 32:2016 Japanese Radiated and Conducted Emissions
- BSMI CNS 13438 Taiwan Radiated and Conducted Emissions (at 10 Meter)
- KN 32 and KN 35 Korea Radiated Emission and Immunity Characteristics (at 10 Meter)
- KN 61000 Korea Immunity Test
- IEC/EN 61000 Immunity Test
- TEC/SD/DD/EMC-221/05/OCT-16 (Supersedes No. TEC/EMI/TEL-001/01/FEB-09) India EMC standard
- Juniper Inductive GND (JIG)
- NEBS Level 3
  - GR-1089-CORE, Issue 6: EMC and Electrical Safety—Generic Criteria for Network Telecommunications Equipment
    - The battery return connection is to be treated as an Isolated DC return (DC-I), as defined in GR-1089-CORE.
  - GR-63-CORE: NEBS, Physical Protection
    - The equipment is suitable for installation as part of the Common Bonding Network (CBN).

## Compliance Statement for Argentina

EQUIPO DE USO IDÓNEO.

# Compliance Statements for the ACX6160 Routers

## IN THIS SECTION

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- [European Community | 141](#)
- [Israel | 141](#)
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- [Korea | 142](#)
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This topic describes the compliance statements for the ACX6160 routers.

## Canada

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

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

The Industry Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational, and safety requirements. Industry Canada does not guarantee the equipment will operate to the users' satisfaction.

Before installing this equipment, users should ensure that it is permissible to connect the equipment to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the inside wiring associated with a single line individual service may be extended by means of a certified connector assembly. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.



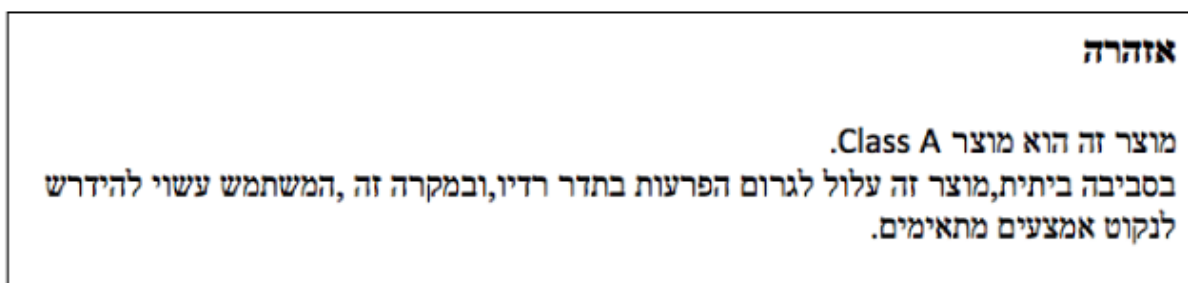
**CAUTION:** Users should not attempt to make electrical ground connections by themselves, but should contact the appropriate inspection authority or an electrician, as appropriate.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

## European Community

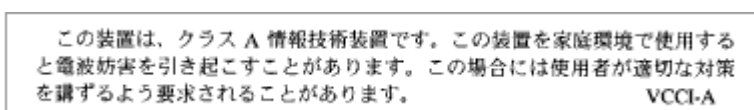
This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

## Israel



Translation from Hebrew–Warning: This product is Class A. In residential environments, the product may cause radio interference, and in such a situation, the user may be required to take adequate measures.

## Japan



The preceding translates as follows:

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

VCCI-A

## Korea

이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

Korean Class A Warning

g040913

The preceding translates as follows:

This equipment is Industrial (Class A) electromagnetic wave suitability equipment and seller or user should take notice of it, and this equipment is to be used in the places except for home.

## Taiwan

警告使用者：  
這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

Chinese Class A warning

g0600018

The preceding translates as follows:

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

## United States

The QFX Series device has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

### RELATED DOCUMENTATION

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