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ACX1000 and ACX1100 Universal Metro Routers Quick Start

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ACX1000 and ACX1100 Routers Quick Start Description

This Quick Start contains information you need to install and configure the router quickly. For complete installation instructions, see the *ACX1000 and ACX1100 Universal Access Routers Hardware Guide* at https://www.juniper.net/documentation/.

> **WARNING**: This Quick Start contains a summary of safety warnings in "Safety Warnings" on page 20. For a complete list of warnings for this router, including translations, see the *ACX1000 and ACX1100 Universal Access Routers Hardware Guide* at https://www.juniper.net/documentation/.

The ACX Universal Metro Router is principally designed for high-density access and pre-aggregation and is environmentally hardened. The router can be used as a cell site router or pre-aggregation device for mobile backhaul and a CPE for business or residential access.

The routers are single-board routers with a built-in Routing Engine and one Packet Forwarding Engine. The Packet Forwarding Engine has one “pseudo” Flexible PIC Concentrator (FPC 0). Because there is no switching fabric, the single Packet Forwarding Engine takes care of packet forwarding.

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

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

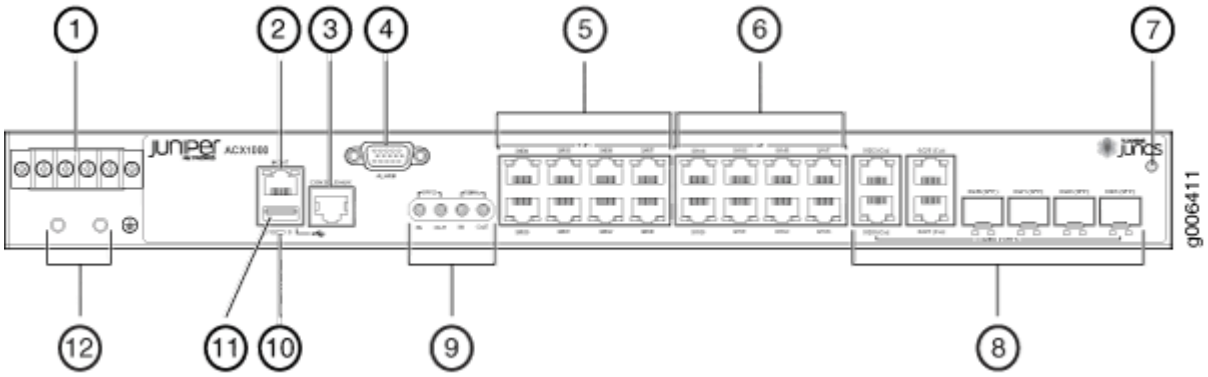
The compact routers are one rack unit (U; that is, 1.75 in., or 4.45 cm) tall. Several routers can be stacked in a single floor-to-ceiling rack for increased port density per unit of floor space.

The ACX1000 and ACX1100 routers contain twelve Gigabit Ethernet ports, eight of which are RJ-45 ports. The ports labeled **COMBO PORTS** provide an additional four RJ-45 ports or four Gigabit Ethernet SFP ports. You can only use one set of combination ports at a time.

The ACX1000 router also contains eight T1/E1 ports.

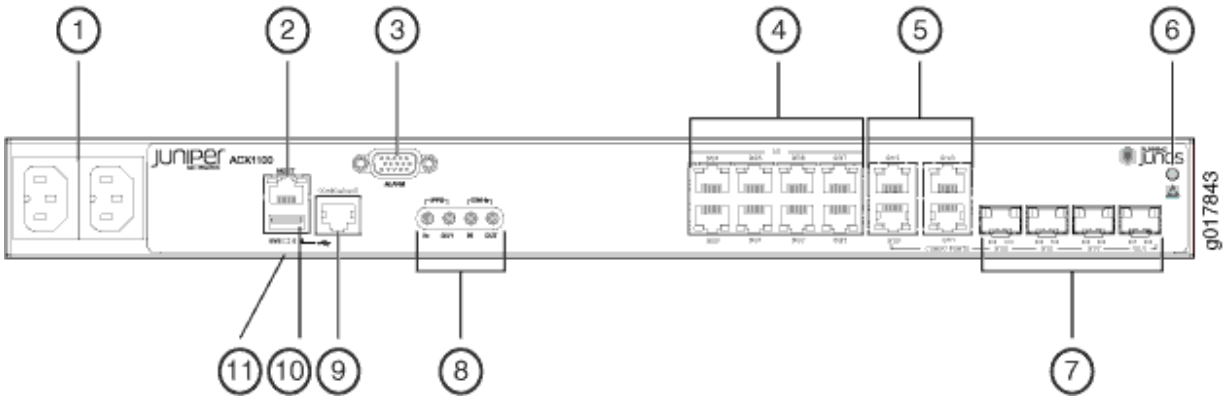
Figure 1 on page 2 shows the front panel of the ACX1000 router. Figure 2 on page 2 and Figure 3 on page 3 show the front panel of the ACX1100 router.

Figure 1: Front Panel of the ACX1000 Router



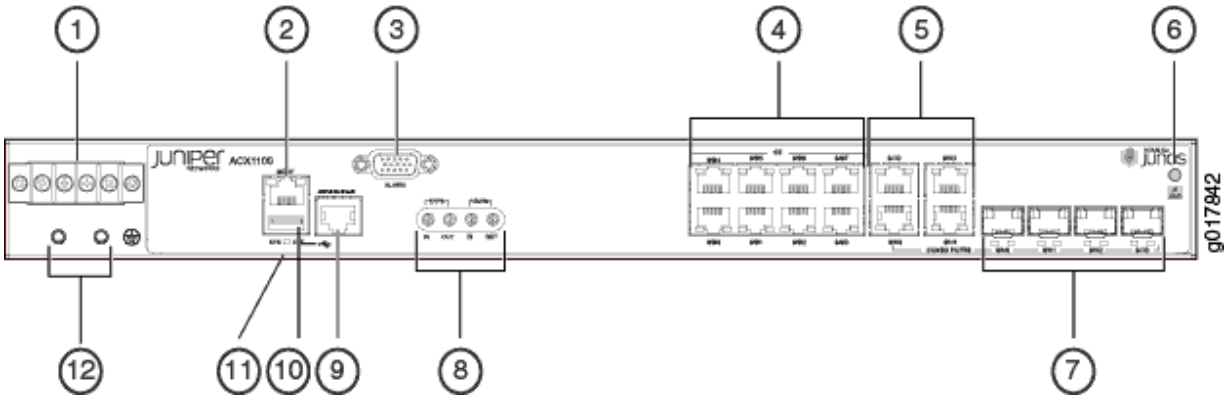
1– DC terminals	7– ESD point
2– Management Ethernet port	8– Combination Gigabit Ethernet RJ-45 and SFP ports
3– Console or auxiliary port	9– 1-PPS and 10-MHz GPS input and output
4– Alarm input and output contacts	10– System (**SYS**) LED
5– T1/E1 ports	11– USB port
6– Gigabit Ethernet (**GE**) ports	12– Grounding terminals

Figure 2: Front Panel of the AC-Powered ACX1100 Router



1– AC inlets	7– Combination Gigabit Ethernet SFP ports
2– Management Ethernet port	8– 1-PPS and 10-MHz GPS input and output
3– Alarm input and output contacts	9– Console or auxiliary port
4– Gigabit Ethernet (**GE**) ports	10– USB port
5– Combination Gigabit Ethernet RJ-45 ports	11– System (**SYS**) LED
6– ESD point	

Figure 3: Front Panel of the DC-Powered ACX1100 Router



1– DC terminals	7– Combination Gigabit Ethernet SFP ports
2– Management Ethernet port	8– 1-PPS and 10-MHz input and output
3– Alarm input and output contacts	9– Console or auxiliary port
4– Gigabit Ethernet (**GE**) ports	10– USB port
5– Combination Gigabit Ethernet RJ-45 ports	11– System (**SYS**) LED
6– ESD point	12– Grounding terminals

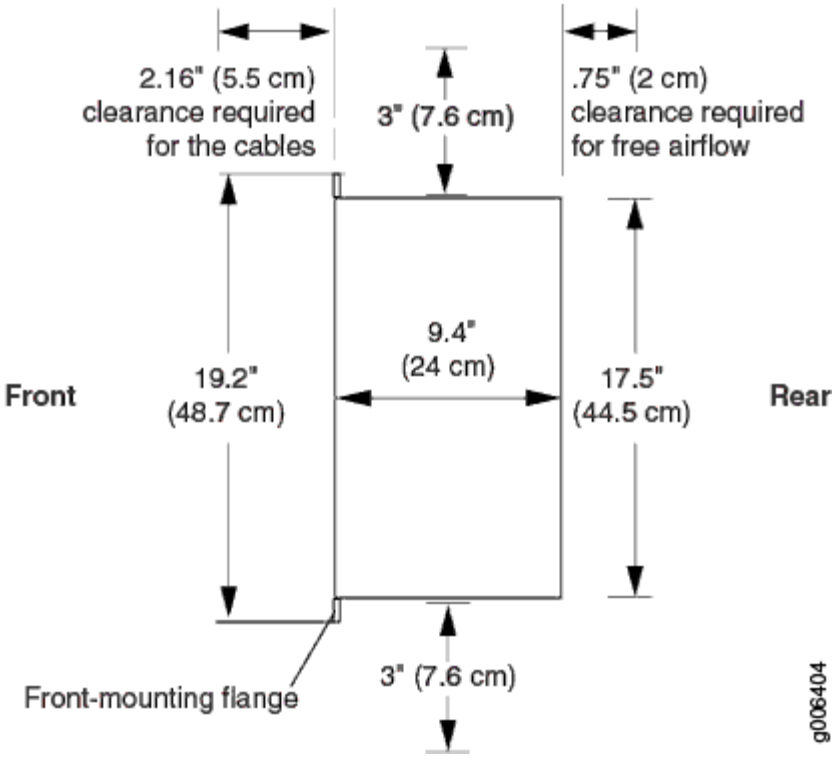
Step 1: Prepare the Site for Installation

Prepare your site for installation by observing the following guidelines:

- You can install the router in a four-post rack or cabinet or an open-frame rack.
- The rack rails must be spaced widely enough to accommodate the chassis's external dimensions: 1.75 in. (4.4 cm) high, 9.4 in. (24 cm) deep, and 17.5 in. (44 cm) wide. The outer edges of the mounting brackets extend the width to 19.2 in. (48.7 cm).
- One person must be available to lift the router while another secures the router to the rack.
- The rack must be strong enough to support the weight of the fully configured router, up to 7 lb (3.2 kg).
- For service personnel to remove and install hardware components, allow at least 2.16 in. (5.5 cm) in front of the router.
- The rack or cabinet must have an adequate supply of cooling air.

- Ensure that the cabinet allows the chassis hot exhaust air to exit from the cabinet without recirculating into the router.
- When deploying the router in environments where the router may operate between 131° F (55° C) and 149° F (65° C), allow a 1 rack unit (U) gap above and below the router.
- When installing the router in a cabinet, ensure that the bottom of the cabinet is closed and there is no opening.
- You must install the router into a rack that is secured to the building structure.
- Mount the router at the bottom of the rack if it is the only unit in the rack.
- When mounting the router in a partially filled rack, load the rack from the bottom to the top, with the heaviest component at the bottom of the rack.
- Install the router only in restricted areas, such as dedicated equipment rooms and equipment closets, in accordance with Articles 110-16, 110-17, and 110-18 of the National Electrical Code, ANSI/NFPA 70.

Figure 4: ACX Series Rack Clearance and Chassis Dimensions



Step 2: Install the Router

IN THIS SECTION

- Tools Required to Install the Router in a Rack | 5
- Install the Mounting Brackets | 5
- Install the ACX Series Router in the Rack | 6

Tools Required to Install the Router in a Rack

To install the router in a rack, you need the following tools:

- Phillips (+) screwdriver, number 2
- ESD grounding wrist strap

Install the Mounting Brackets

Two mounting brackets for front or rear mounting ship with the router (see Figure 5 on page 6 and Figure 6 on page 6).

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

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

Figure 5: Installing the Mounting Brackets to the Front of the ACX Series Router

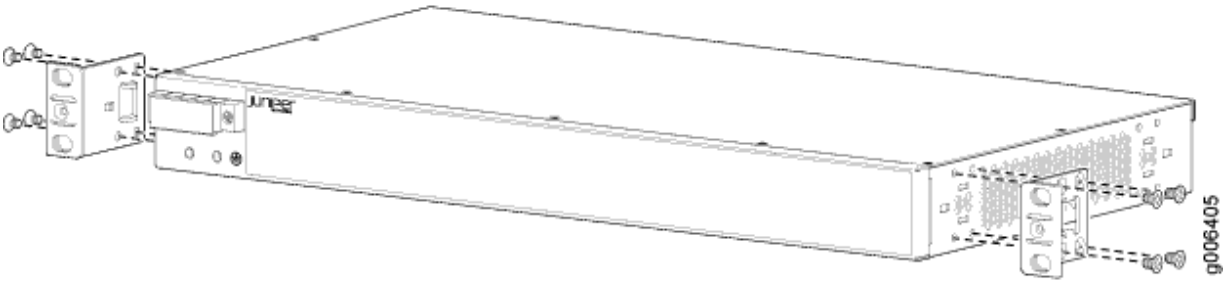
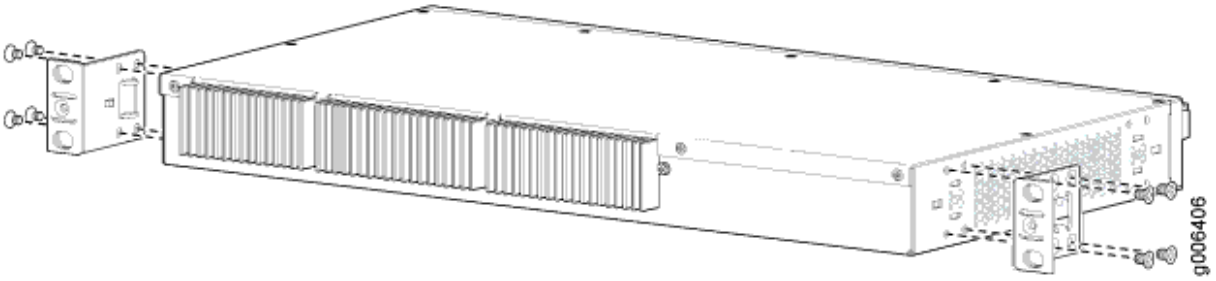


Figure 6: Installing the Mounting Brackets to the Rear of the ACX Series Router



Install the ACX Series Router in the Rack

The router can be installed horizontally in a rack or cabinet.

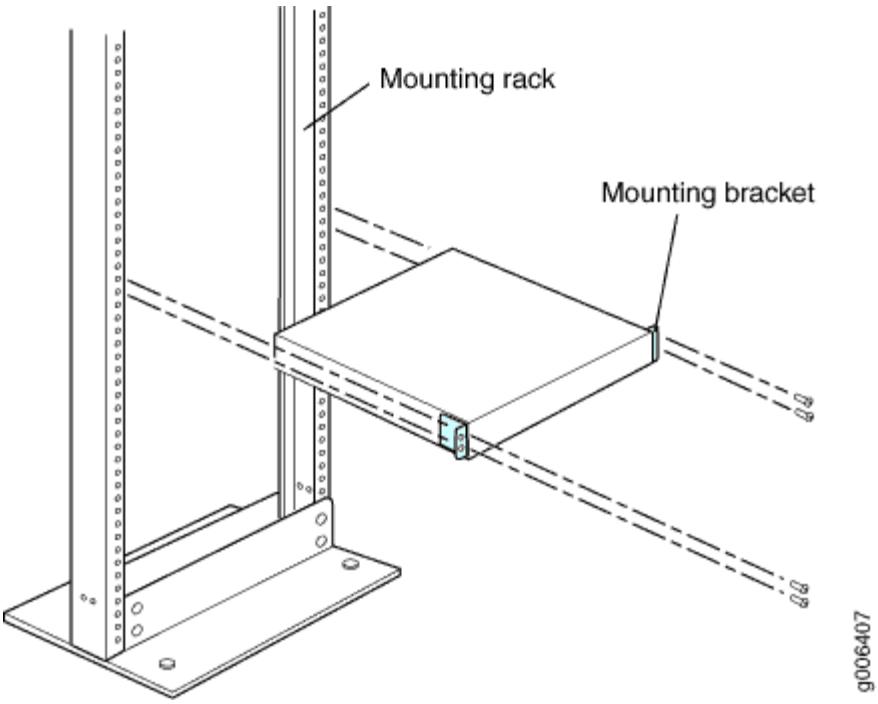
NOTE: For additional installation options, contact JTAC.

One person must be available to lift the router while another secures the router to the rack. The chassis weighs approximately 7 lb (3.2 kg). To install the chassis (see Figure 7 on page 7):

1. Ensure that the rack is in its permanent location and is secured to the building. Ensure that the installation site allows adequate clearance for both airflow and maintenance.
2. Position the router in front of the rack or cabinet.
3. Have one person grasp both sides of the router, lift the router, and position it in the rack, aligning the mounting bracket holes with the threaded holes in the rack rails. Make sure the chassis is level.
4. Have the second person install a mounting screw into each of the open mounting holes aligned with the rack, starting from the bottom.

5. Visually inspect the alignment of the router. If the router is installed properly in the rack, all the mounting screws on one side of the rack should be aligned with the mounting screws on the opposite side, and the router should be level.

Figure 7: Installing the Front-Mounted Router in the Rack



Step 3: Ground the ACX1000 and ACX1100 Router

IN THIS SECTION

- Tools Required to Ground the Router | 8
- Connect the Grounding Cable | 8

You must ground the router before connecting to power.

Tools Required to Ground the Router

To ground the router, you need the following tools:

- Phillips (+) screwdriver, number 2
- ESD grounding wrist strap
- Two SAE 10-32 screws and paint piercing washers (not provided)
- Grounding lug, Panduit LCD06-10A or equivalent (not provided)
- Grounding cable, minimum 6 AWG (13.3 mm^2) 90° C wire (not provided)

Connect the Grounding Cable

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

1. Verify that a licensed electrician has attached the cable lug, which is provided with the router, to the grounding cable.
2. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an approved site ESD grounding point. See the instructions for your site.
3. Ensure that all grounding surfaces are clean and brought to a bright finish before you make grounding connections.
4. Connect the grounding cable to a proper earth ground.
5. Detach the ESD grounding strap from the site ESD grounding point.
6. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an ESD grounding point.
7. Place the grounding cable lug over the grounding points on the front of the chassis (see Figure 8 on page 9).
8. Secure the grounding cable lug with the washers and screws. The holes are sized for SAE 10-32 screws. Apply 4.34 lb-in (0.49 Nm) of torque to each screw. Do not overtighten the screw. (Use a number 2 Phillips screwdriver.)

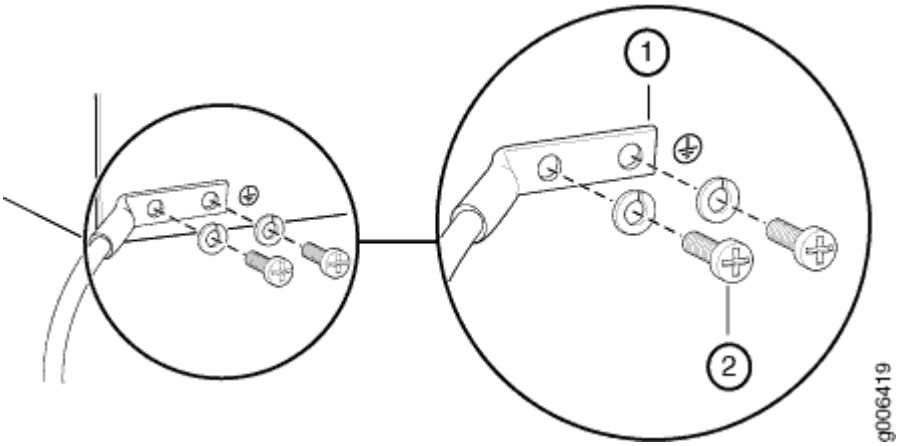
> **CAUTION**: Ensure that each grounding cable lug seats flush against the surface of the grounding points as you are tightening the screws. Ensure that each screw is properly

threaded into the grounding points. Applying installation torque to the screw when improperly threaded may result in damage to the terminal.

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

9. Dress the grounding cable, and verify that it does not touch or block access to router components, and that it does not drape where people could trip on it.

Figure 8: Grounding Points on the ACX Series Router



1– Grounding lug

2– SAE 10-32 screw and washer

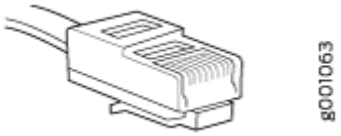
Step 4: Connect External Devices and Cables

IN THIS SECTION

Tools Required to Connect External Devices and Cables | 10

- Connect the ACX Series Router to a Network for Out-of-Band Management | 11
- Connect the ACX Series Router to a Management Console or Auxiliary Device | 11
- Connect Network Interface Cables to the ACX Series Router | 11

Figure 9: Ethernet Cable Connector



Tools Required to Connect External Devices and Cables

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

- Ethernet cable with an RJ-45 connector attached (not provided)
- RJ-45 to DB-9 serial port adapter (not provided)

  NOTE: We no longer include the RJ-45 console cable with the DB-9 adapter as part of the device package. If the console cable and adapter are not included in your device package, or if you need a different type of adapter, you can order the following separately:

  - RJ-45 to DB-9 adapter (JNP-CBL-RJ45-DB9)
  - RJ-45 to DB-9 adapter (JNP-CBL-RJ45-DB9)
  - RJ-45 to USB-C adapter (JNP-CBL-RJ45-USBC)

  If you want to use RJ-45 to USB-A or RJ-45 to USB-C adapter you must have X64 (64-Bit) Virtual COM port (VCP) driver installed on your PC. See, https://ftdichip.com/drivers/vcp-drivers/ to download the driver.

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

Connect the ACX Series Router to a Network for Out-of-Band Management

1. Turn off the power to the management device.
2. Plug one end of the Ethernet cable (Figure 9 on page 10 shows the connector) into the **MGMT** port on the front of the chassis. Figure 1 on page 2, Figure 2 on page 2, and Figure 3 on page 3 show the port.
3. Plug the other end of the cable into the network device.

Connect the ACX Series Router to a Management Console or Auxiliary Device

1. Turn off the power to the console or auxiliary device.
2. Plug the RJ-45 end of the serial cable (Figure 9 on page 10 shows the connector) into the **CONSOLE/AUX** port on the front panel. Figure 1 on page 2, Figure 2 on page 2, and Figure 3 on page 3 show the port.
3. Plug the female DB-9 end into the device's serial port.

Connect Network Interface Cables to the ACX Series Router

1. Have ready a length of the type of cable used by the network ports. For cable specifications, see the *ACX1000 and ACX1100 Universal Access Routers Hardware Guide*.

   NOTE: Shielded cables are required for outside deployment.

2. Remove the rubber safety plug from the cable connector port.

   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.

3. Insert the cable connector into the cable connector port on the faceplate.
4. Arrange the cable to prevent it from dislodging or developing stress points. Secure the cable so that it is not supporting its own weight as it hangs to the floor. Place excess cable out of the way in a neatly coiled loop.

CAUTION: Avoid bending 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.

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.

Step 5: Connect Power to the ACX Series Router

IN THIS SECTION

- Connect AC Power to an AC-Powered ACX1100 Router | 13
- Connect DC Power to a DC-Powered ACX1000 or ACX1100 Router | 13

Depending on your configuration, your router uses either AC or DC power supplies. Perform the appropriate procedures for each power supply in your router.

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

Connect AC Power to an AC-Powered ACX1100 Router

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

- AC power cords

1. Locate power cords that have a plug appropriate for your geographical location. For more information, see the *ACX1000 and ACX1100 Universal Access Routers Hardware Guide*.
2. Attach an ESD grounding strap to your bare wrist, and connect the other end of the strap to an ESD grounding point.
3. Insert the appliance coupler end of the power cord into the appliance inlet on the power supply.
4. Insert the power cord plug into an external AC power source receptacle.

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

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

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

Connect DC Power to a DC-Powered ACX1000 or ACX1100 Router

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

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

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

Table 1: ACX Series DC Power System Input Voltage

Nominal Voltage	Specification
+24	Operating range: +18 to +30 VDC
–48	Operating range: –39 to –56 VDC
–60	Operating range: –39 to –72 VDC

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to one of the ESD points on the chassis. For more information about ESD, see the *ACX1000 and ACX1100 Universal Access Routers Hardware Guide*.
2. Switch off the dedicated customer site circuit breakers. Ensure that the voltage across the DC power source cable leads is 0 V and that there is no chance that the cable leads might become active during installation.
3. Remove the clear plastic cover protecting the terminal on the faceplate.
4. Verify that the DC power cables are correctly labeled before making connections to the power supply. In a typical power distribution scheme where the return is connected to chassis ground at the battery plant, you can use a multimeter to verify the resistance of the –48V and return DC cables to chassis ground:

   For –48V and –60V:

   a. The cable with very large resistance (indicating an open circuit) to chassis ground is the DC input cable (**–**).

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

   For +24V:

   a. The cable with very low resistance (indicating a closed circuit) to chassis ground is the DC input cable (**–**).

   b. The cable with very large resistance (indicating an open circuit) to chassis ground is the return cable (**+**).
5. Remove the screws and flat washers from the terminals.
6. Secure each power cable lug to the terminal with the flat washers and screw (see Figure 10 on page 16). Apply between 8 lb-in. (0.9 Nm) and 9 lb-in. (1.02 Nm) of torque to each screw. Do not overtighten the screw. (Use a number 2 Phillips screwdriver.)

   a. Secure the positive DC source power cable lug to the return (**+**) terminal.

b. Secure the negative DC source power cable lug to the input (–) terminal.

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

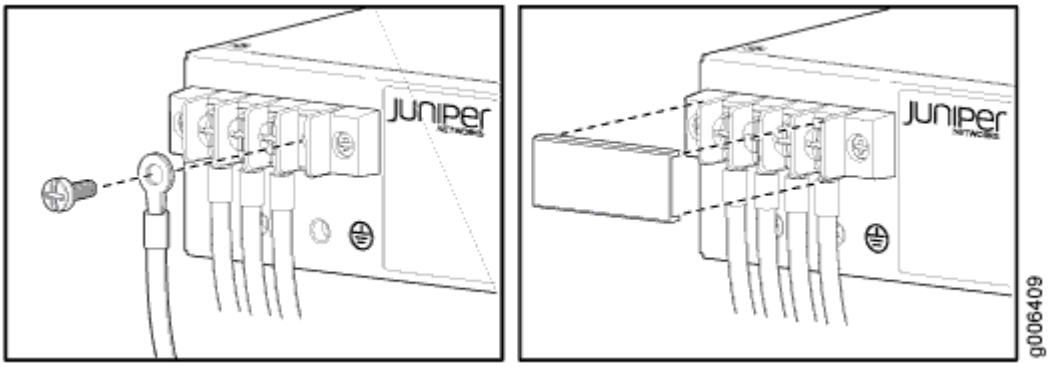
> **CAUTION**: The maximum torque rating of the terminal screws on the DC power supply is 9 lb-in. (1.02 Nm). The terminal screws may be damaged if excessive torque is applied. Use only a torque-controlled driver to tighten screws on the DC power supply terminals. Use an appropriately sized driver, with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

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

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

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

Figure 10: Connecting DC Power to the Router



Step 6: Perform Initial Software Configuration

IN THIS SECTION

- Enter Configuration Mode | **16**
- Configure User Accounts and Passwords | **17**
- Configure System Attributes | **18**
- Commit the Configuration | **19**

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

To configure the software:

Enter Configuration Mode

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

3. Start the CLI.

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

4. Enter configuration mode.

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

Configure User Accounts and Passwords

For information about using an encrypted password or an SSH public key string (DSA or RSA), see the *Junos OS System Basics Configuration Guide*.

1. Add a password to the root administration user account. Enter a clear-text password.

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

2. Create a management console user account.

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

3. Set the user account class to **super-user**.

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

Configure System Attributes

1. Configure the name of the router. If the name includes spaces, enclose the name in quotation marks (“ ”).

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

2. Configure the router’s domain name.

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

3. Configure the IP address and prefix length for the router’s Ethernet interface.

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

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

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

5. Configure the IP address of a DNS server.

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

6. (Optional) Configure the static routes to remote subnets with access to the management port. Access to the management port is limited to the local subnet. To access the management port from a remote subnet, you need to add a static route to that subnet within the routing table. For more information about static routes, see the *Junos OS System Basics Configuration Guide*.

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

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

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

Commit the Configuration

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

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

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

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

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

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

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

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

Safety Warnings

WARNING: See installation instructions before connecting the router. This is a summary of safety warnings. For a complete list of warnings for this router, including translations, see the *ACX1000 and ACX1100 Universal Access Routers Hardware Guide* at https://www.juniper.net/documentation/.

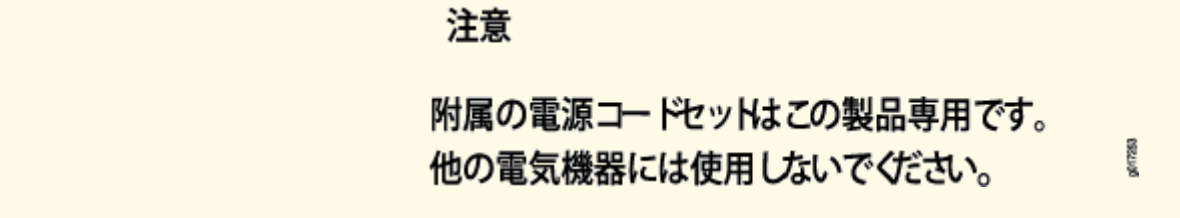
WARNING: The intrabuilding port(s) of the router is suitable for connection to intrabuilding or unexposed wiring or cabling only. The intrabuilding port(s) of the router MUST NOT be metallically connected to interfaces that connect to the OSP or its wiring. These interfaces are designed for use as intrabuilding interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE, Issue 4) and require isolation from the exposed OSP cabling. The addition of primary protectors is not sufficient protection to connect these interfaces metallically to OSP wiring.

CAUTION: Before removing or installing components of a router, attach an ESD strap to an ESD point, and place the other end of the strap around your bare wrist. Failure to use an ESD strap could result in damage to the router.

CAUTION: Use an external surge protective device (SPD) at the AC input of the router.

- Only trained and qualified personnel should install or replace the router.
- Perform only the procedures described in this quick start or the *ACX1000 and ACX1100 Universal Access Routers Hardware Guide*. Other services should be performed by authorized service personnel only.
- Read the installation instructions before you connect the router to a power source.
- Before installing the router, read the guidelines for site preparation in the *ACX1000 and ACX1100 Universal Access Routers Hardware Guide* to make sure that the site meets power, environmental, and clearance requirements for the router.
- When installing the router, do not use a ramp inclined more than 10 degrees.
- To prevent injury, keep your back straight and lift with your legs, not your back.
- Mount the router at the bottom of the rack if it is the only unit in the rack.
- When mounting the router in 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 devices, install the stabilizers before mounting or servicing the router in the rack.
- When removing or installing an electrical component, always place it component-side up on a flat antistatic surface or in an electrostatic bag.
- When you install the router, always make the ground connection first and disconnect it last.
- Wire the DC power supply using the appropriate lugs. Always connect the ground wire first and disconnect it last.
- Do not work on the system or connect or disconnect cables during electrical storms.
- 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 become welded to the terminals.
- Failure to observe these safety warnings can result in serious physical injury.
- AC power cable warning (Japan):

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



- The recommended maximum ambient temperature is 158° F (70° C). For safe operation take into consideration the internal temperature within the rack.
- Note the hot surface warning label on the top rear of the chassis.

Compliance Statements for Data Center

- The equipment is suitable for installation as part of the Common Bonding Network (CBN).
- The equipment is suitable for installation in locations where the National Electrical Code (NEC) applies.
- The battery return connection is to be treated as an isolated DC return (that is, DC-I), as defined in GR-1089-CORE.
- You must provision a readily accessible device outside of the equipment to disconnect power. The device must also be rated based on local electrical code practice.

Compliance Statements for EMC Requirements

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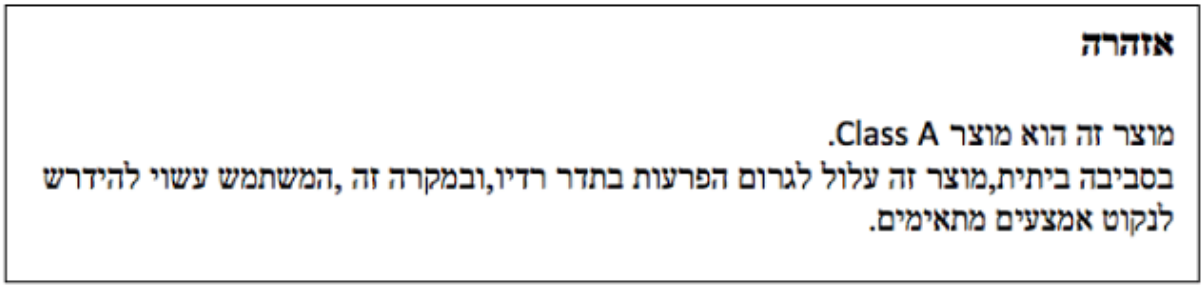
Canada

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

European Community

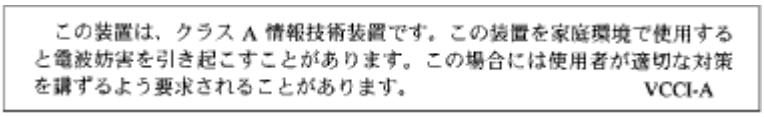
This is a Class A product. In a domestic environment, this product might cause radio interference in which case the user might be required to take adequate measures.

Israel



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

Japan



The preceding translates as follows:

This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this product is used near a radio or television receiver in a domestic environment, it might cause radio interference. Install and use the equipment according to the instruction manual. VCCI-A.

United States

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

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