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MX301 Universal Routing Platform Hardware Guide

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MX301 Universal Routing Platform Hardware Guide

The information in this document is current as of the date on the title page.

YEAR 2000 NOTICE

Juniper Networks hardware and software products are Year 2000 compliant. Junos OS has no known time-related limitations through the year 2038. However, the NTP application is known to have some difficulty in the year 2036.

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About This Guide

Use this guide to install hardware and perform initial software configuration, routine maintenance, and troubleshooting for the MX301 Router.

After completing the installation and basic configuration procedures covered in this guide, refer to the Junos OS documentation for information about further software configuration.

1

CHAPTER

Fast Track: Initial Installation

IN THIS CHAPTER

Fast Track to Rack Installation and Power

SUMMARY

This procedure guides you through the simplest steps to install your MX301 Router in a rack and connect it to power. Have more complex installation needs? See "Install the MX301" on page 91.

IN THIS SECTION

Install the MX301 in a Rack

You can install the Juniper Networks® MX301 Router in a two-post rack, a four-post threaded-hole rack, or a four-post square-holed rack. We'll walk you through the steps to install an AC-powered device in a four-post square-holed rack.

Before you install, review the following:

- *Site Guidelines and Requirements*
- General Safety Guidelines and warnings
- "Unpack the MX301" on page 89

Ensure that you have the following tools and parts available:

- An electrostatic discharge (ESD) grounding strap (provided)
- A pair of front-mounting and rear-floating rails (provided with the RMK)

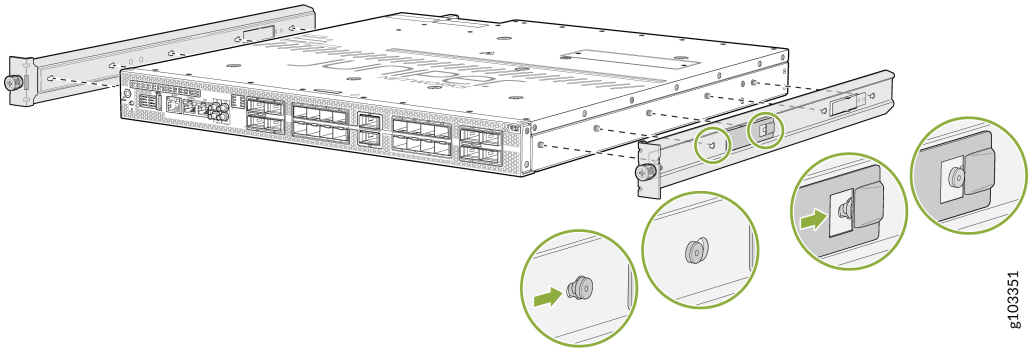
  These mounting rails attach to the front and rear rack posts.
- A pair of chassis brackets (provided with the RMK)

  You must attach these brackets to the device if not preinstalled.

NOTE: Juniper provides the four-post rack mounting kit (JNP301-4PST-RMK) with the MX301. If the four-post kit is lost or damaged, you can order a replacement.

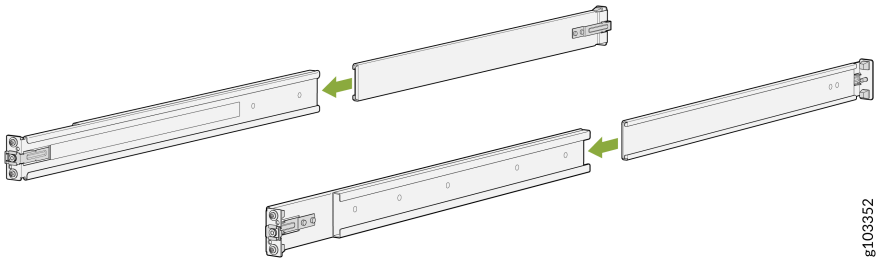
1. Wrap and fasten one end of the ESD cable grounding strap around your bare wrist. Connect the other end to a site ESD point.
2. Install the chassis bracket to the chassis by aligning the keyholes on the chassis bracket with the shoulder screws on the chassis. Slide the chassis bracket toward the rear of the chassis.

Figure 1: Install the Chassis Brackets



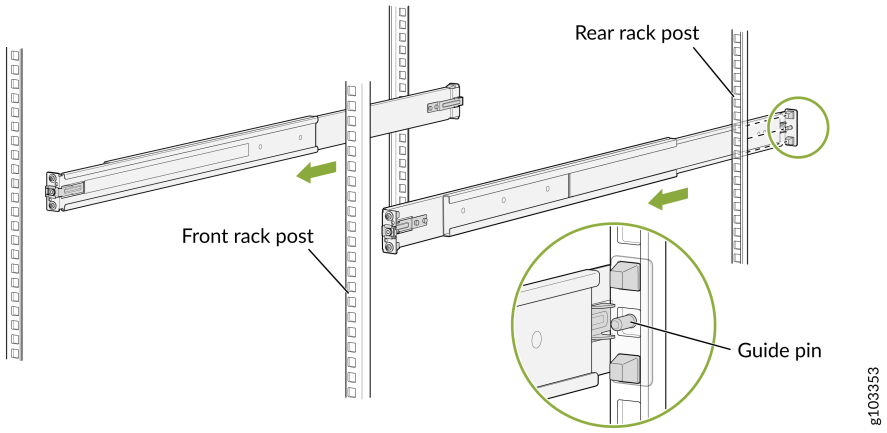
3. Assemble the mounting rails by sliding the rear-floating rails into the respective front-mounting rails.

Figure 2: Assemble the Mounting Rails



4. Install the mounting rails on the four-post rack:
   a. Use the guide pin to align the guide blocks of the rear-floating rails with the corresponding rear post holes. Pull the rear-floating rails toward the front of the rack to lock the rail in place. You will hear a distinct click sound when the latch locks into the corresponding rack holes.

Figure 3: Secure Rear-Floating Rails



b. Align the guide blocks of the front-mounting rails with the front post holes. Push the front-mounting rails toward the rear of the rack to lock the rails in place. You will hear a distinct click sound when the latch locks into the corresponding rack holes.

Figure 4: Secure Front-Mounting Rails

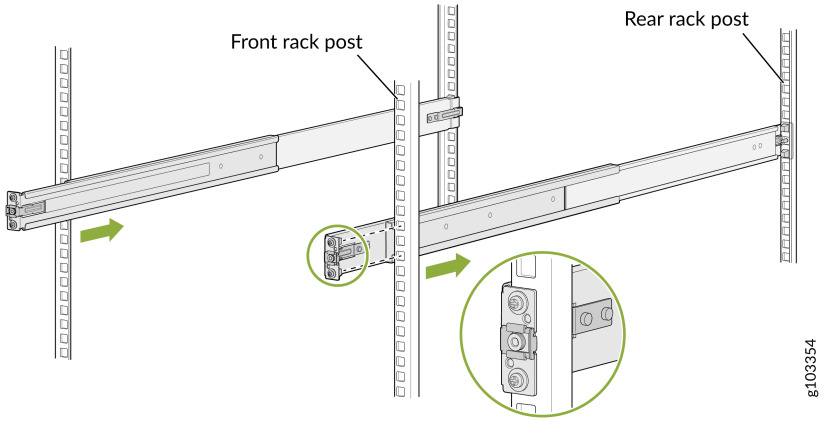
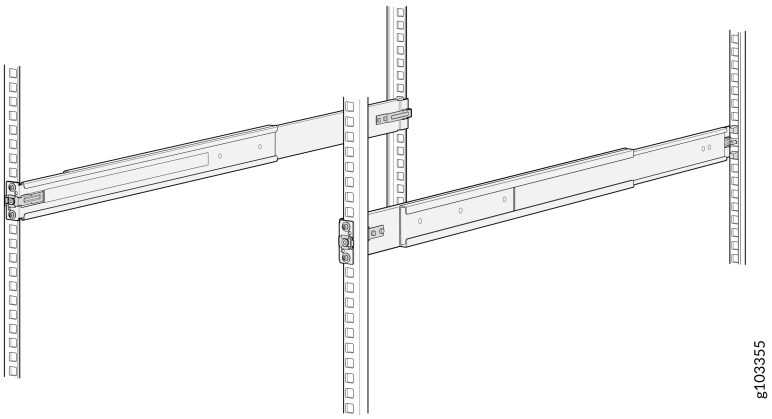


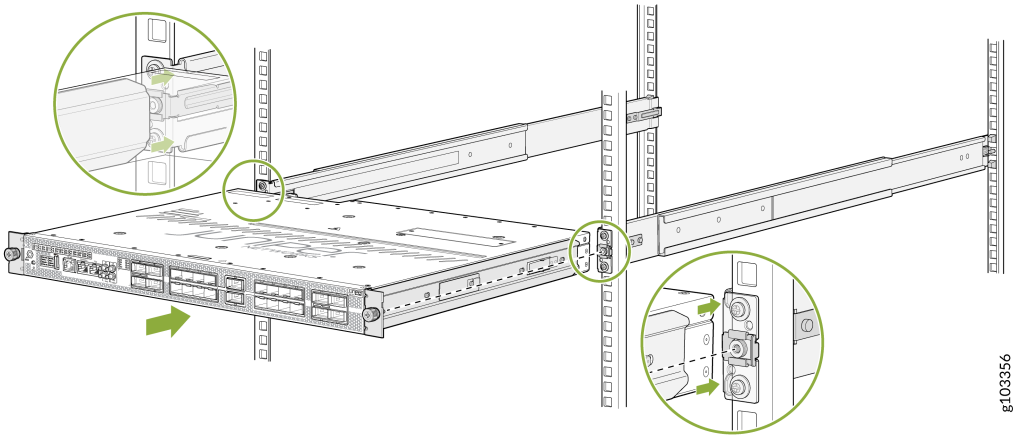
Figure 5: Both Mounting Rails Installed and Secured



c. Visually confirm that you have locked the front and rear latches into the mounting rails. The mounting rails should now be securely installed on the rack.

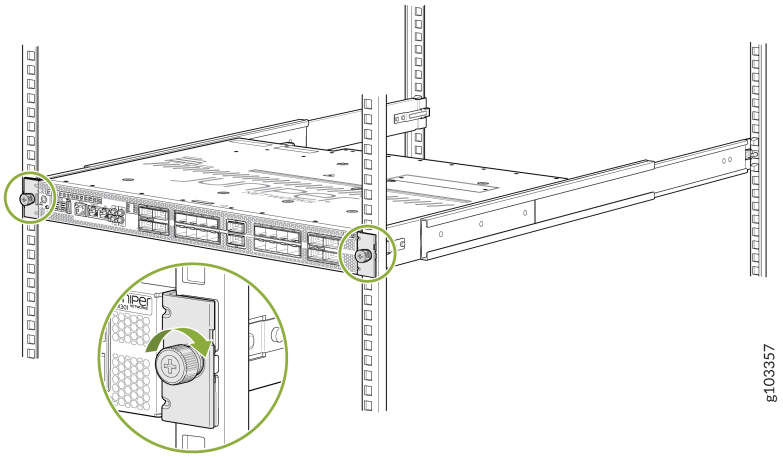
5. Lift the device and position it in the rack, aligning the chassis brackets with the mounting rails. Slide the device all the way into the channels of the rack mounting rails.

Figure 6: Slide the MX301 into the Rack



6. Tighten the two thumbscrews (in a clockwise direction) to secure the device.

Figure 7: Tighten the Thumbscrews



Connect to Power

IN THIS SECTION

To connect the MX301 Router to AC power, you must perform the following tasks:

Ground the MX301 Router

To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the MX301 to an earth ground before you connect it to power.

NOTE: Before you connect the earth ground and the protective earthing terminal of the device, ensure that a licensed electrician attaches an appropriate grounding terminal to the grounding cable. Using a grounding cable with an incorrectly attached terminal can damage the device.

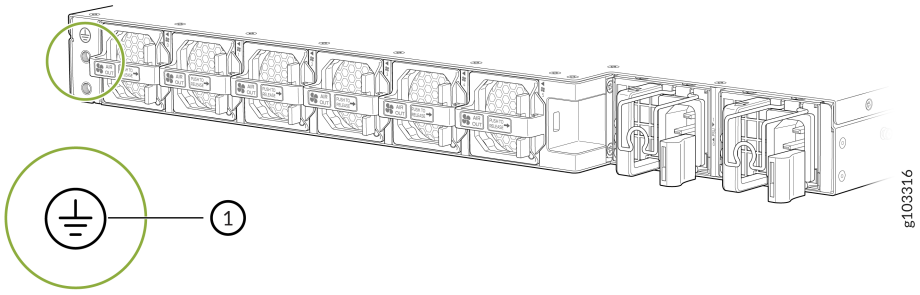
Before connecting the device to an earth ground, ensure that you have the following parts and tools:

- An electrostatic discharge (ESD) grounding strap.
- A grounding cable for your device—The grounding cable must be 6 AWG (4.11 mm^2) stranded wire and rated 90 °C or according to the local electrical code.
- A grounding 2-hole terminal lug for your grounding cable—The grounding terminal lug attaches to the chassis grounding point.
- A Phillips (+) screwdriver, number 2 to tighten the screw.

To ground the MX301 Router:

1. Ensure that all grounding surfaces are clean and brought to a bright finish before making the grounding connections.
2. Connect the grounding cable to a proper earth ground, such as the rack in which you mount the device.
3. Using the Phillips screwdriver, remove the screws from the chassis grounding point.

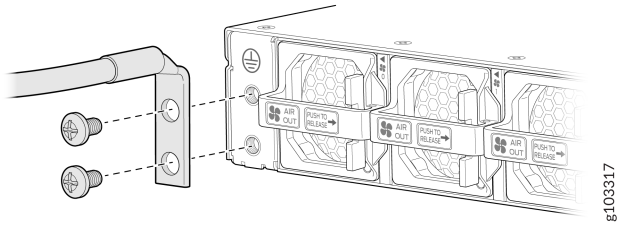
Figure 8: Grounding Point on the MX301



1– Grounding point

4. Secure the terminal lug attached to the other end of the ground cable to the chassis grounding point. Use the screws that you removed from the chassis grounding point in the earlier step.

Figure 9: Connect the Grounding Cable to the MX301



5. Verify that the grounding cable does not touch or block access to the device components. Make sure that the cable does not trail across the floor where people could trip over it.

> **NOTE**: Ensure that the device is permanently connected to ground during its operation.

Connect the Power Cord and Power On the MX301 Router

For information about the supported AC power cord specifications on your device, see "MX301 Power System" on page 42.

> **CAUTION**: Do not mix AC, DC, and HVAC/DC power supply units (PSUs) in the same chassis.

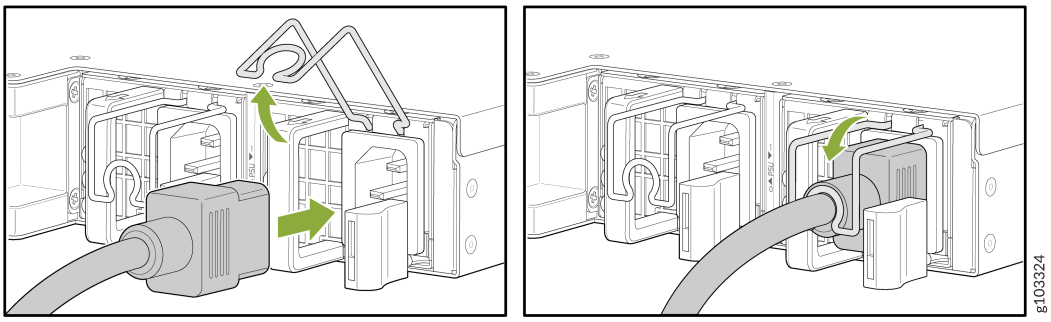
Before you begin to connect the device to AC power:

- Ensure that you have connected the chassis to an earth ground.
- Ensure that you have a power cord appropriate for your geographical location available to connect the device to AC power (see "JPSU-850W-AC-AFO" on page 43).
- Ensure that you familiarize yourself with AC Power Electrical Safety Guidelines and Action to Take After an Electrical Accident.
- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage.
- Ensure that you have an ESD grounding strap.
- If not already installed, install the PSUs in the device (see "Install the JPSU-850W-AC-AFO" on page 69).

To connect the power cord and power on the device:

1. Lift the power cord retainer on the AC PSU. See Figure 10 on page 9.
2. Locate the AC power cords shipped with the MX301. The cords have plugs appropriate for your geographical location.
3. Insert the coupler end of the power cord into the power inlet of the AC PSU.
4. Pull down the power cord retainer onto the power cord.

Figure 10: Connect Power Cord to the MX301 AC PSU



5. If the AC power source outlet has a power switch, set it to the off (O) position.
6. Insert the power cord plug into the AC power source outlet.

> **NOTE**: Connect each PSU to a dedicated AC power feed and a dedicated external circuit breaker. We recommend that you use a minimum of 16 A (250 VAC), or as permitted by the local code.

7. If the AC power source outlet has a power switch, set it to the on (|) position.

Onboard, Configure, and Monitor MX301

SUMMARY

This topic provides you with pointers to onboard, configure, and monitor MX301 routers using Juniper

IN THIS SECTION

Routing Director, Juniper Routing Assurance, or Junos OS CLI.

- Juniper Routing Assurance | 0
- Junos OS CLI | 0

Juniper Routing Director

You can use Juniper Routing Director (formerly Juniper Paragon Automation) to onboard, manage, and monitor MX301. See the Juniper Routing Director Documentation page for more information.

Juniper Routing Assurance

The MX301 is a cloud-ready router, and you can onboard and monitor the performance of the router through the Juniper Routing Assurance portal. You can use the routing insights that Juniper Routing Assurance provides to proactively respond to network events and anomalies. See Table 1 on page 10 for more information.

Table 1: Onboard and Monitor MX301 Using Juniper Routing Assurance

If you want to	Then
Setup Juniper Routing Assurance, onboard routers, and monitor their performance	See Juniper Routing Assurance and Onboard Routers Using Juniper Routing Assurance.
Use the Juniper Routing Assurance	See Juniper Routing Assurance User Guide.
See all documentation available for Mist AI Routing	Visit Juniper Routing Assurance documentation.

Junos OS CLI

You can configure the MX301 using the Junos OS CLI. See Table 2 on page 10 for more information.

Table 2: Configure MX301 Using the Junos OS CLI

If you want to	Then
Customize basic configuration	See "Configure Root Authentication and Management Interface from the CLI" on page 138 on MX301.

Table 2: Configure MX301 Using the Junos OS CLI *(Continued)*

If you want to	Then
Explore software features supported on the MX301	See Feature Explorer.
Configure Junos OS features on the MX301	See User Guides.
Stay up-to-date about new and changed features, and known and resolved issues	See Junos OS Release Notes.

2

CHAPTER

Device Overview

IN THIS CHAPTER

MX301 Overview

SUMMARY

Learn about the hardware features and use cases of the MX301 Router.

IN THIS SECTION

Meet the MX301

The Juniper Networks® MX301 Universal Routing Platform is a next-generation edge router engineered to deliver robust networking capabilities across a wide range of network deployment scenarios. The router provides flexible connectivity options with 26 WAN ports that offer port configurations from native 1/10 Gigabit Ethernet (GbE) up to 400GbE. The MX301 can deliver a maximum throughput of 1.6 terabit per second (Tbps) and has a compact 1-U fixed form factor. The MX301 is a power efficient router with usage as low as 0.3 watt (W) per Gb. The MX301 router runs on Junos OS.

The MX301 is ideal for high-density, high-throughput networking deployments in enterprise, cloud, service provider edge, and AI edge clustering use cases.

Figure 11: MX301 Front Panel

Figure 12: MX301 Rear Panel (AC Variant)

Table 3: MX301 Description

Form factor	1 U
Chassis type	Fixed configuration
Operating system	Junos OS
Power system variants	AC, DC, and HVAC/DC
Cooling system variants	Only front-to-back airflow (airflow out or AFO)
Port configuration	• Four 400 Gigabit Ethernet (GbE) QSFP56-DD ports • Six 100GbE QSFP28 ports • 16 1/10/25/50GbE SFP form factor ports All ports are Media Access Control Security (MACsec) capable.
Storage	400 GB (2x200 GB) NVMe PCIe Gen 3 M.2 SSD
Memory	128 GB (4x32 GB) DDR4
Throughput	1.6 Tbps
Managed using	• Juniper® Routing Director • Juniper® Routing Assurance • Junos OS CLI

For a list of device configurations and their specifications, see "MX301 Configurations" on page 26.

Where Can You Use the MX301?

Here are some possible use cases for the MX301:

- Edge and core deployments—The MX301 has a 1-U compact form factor with interfaces configurable from 1GbE to 400GbE that supports up to 1.6 Tbps of throughput. This makes the MX301 ideal for

enterprises to connect to service providers, and public or private cloud networks. The device can also be used for large branch offices and core deployments.

- Distributed deployments—The MX301 can handle large subscriber sessions with capabilities to scale to the demands of modern broadband networks. The compact form factor, low power requirements, and integrated service functions make the MX301 ideal for distributed deployments on a broadband service provider's network.
- Secure VPN router—With support for inline MACsec, IPSec encryption, and advanced VPN services, the MX301 can strengthen network integrity and deliver robust security for modern distributed networks.
- Edge aggregation for AI—The MX301 is optimized to provide distributed AI inference, low-latency service, automation, and real-time analytics. The router uses inline MACsec, IPsec, and PTP to secure and manage autonomous AI traffic.

Why Upgrade to the MX301?

The MX301 enhances the capabilities of the MX204.

Table 4: Compare the MX301 and MX204

Category	Feature	MX301	MX204
Physical Specifications	Form Factor	1 U	1 U
	Fixed/Modular Chassis?	Fixed	Fixed
	Dimensions (HxWxD)	1.75 x 17.28 x 17.71 in. (4.45 x 44 x 45 cm)	1.72 x 17.6 x 18.5 in. (4.45 x 44.7 x 47.5 cm)
	Weight	• 25.53 lb (AC) • 25.33 lb (DC) • 25.45 lb (HVAC/DC)	• 23.15 lb (AC) • 23.15 lb (DC)
Power System	PSU Variants	AC, DC, and HVAC/DC	AC and DC
	Quantity	2 (AC, DC, or HVAC/DC)	2 (AC or DC)

Table 4: Compare the MX301 and MX204 *(Continued)*

Category	Feature	MX301	MX204
Cooling System	Fan Modules	6	3
Storage and Memory	SSD	400 GB (2x200 GB)	200 GB (2x100 GB)
	DRAM	128 GB (4x32 GB)	32 GB
Port Configuration	Ports	• Four 400GbE QSFP-DD ports • Six 100GbE QSFP28 ports • 16 1/10/25/50GbE SFP ports	• Four 4x10/40/100GbE QSFP28/QSFP+ ports • Eight 1/10GbE SFP+ ports
	MACsec capability	Line rate MACsec supported on all WAN ports	-
Management	Juniper® Routing Assurance	✓	✓
	Juniper® Routing Director	✓	✓
Performance	Bandwidth	1.6 Tbps	400 Gbps
	Power Efficiency	0.3 W per Gb	0.9 W per Gb

For the complete performance data, see the MX301 and MX Series 5G Universal Routing Platforms datasheets.

For a detailed list of features on MX301, see Feature Explorer.

For a detailed comparison of hardware features, see Hardware Compatibility Tool.

MX301 Field-Replaceable Units

SUMMARY

Learn about the field-replaceable units in the MX301.

IN THIS SECTION

Field-replaceable units (FRUs) are components that you can replace at your site. There are two types of FRUs:

- Hot-insertable and hot-removable—You can remove and replace these components without powering off the device or disrupting the device functions.
- Hot-pluggable—You can remove and replace these components without powering off the device, but the device function is interrupted until you replace the component.

Table 5: MX301 FRUs

FRU	Type
Power supply units	Hot-insertable and hot-removable, if redundant
Fan modules	Hot-insertable and hot-removable, if redundant
Transceivers	Hot-insertable and hot-removable

MX301 Software Features

SUMMARY

This topic describes the key software features available on the MX301.

IN THIS SECTION

For a complete list of all software features supported on the MX301, see Feature Explorer.

Some key features are listed below:

Table 6: MX301 Software Features

Feature Category	Documentation
Access protocols	Broadband Subscriber Access Protocols User Guide
Broadband network gateway (BNG) control and user plane separation (CUPS)	BNG CUPS User Guide
EVPN-VXLAN	EVPN-VXLAN Guide
Inline services	Adaptive Services Interfaces User Guide for Routing Devices
Layer 3 Routing Protocols	MPLS Applications User Guide
	Multicast Protocols User Guide
Routing policies and firewall filters	Routing Policies, Firewall Filters, and Traffic Policers User Guide
Security services	Security Services Administration Guide
Subscriber management	Subscriber Management Getting Started Guide
Virtualized Routing Engines	Junos OS Software Installation and Upgrade

3

CHAPTER

Chassis

IN THIS CHAPTER

MX301 Chassis

SUMMARY

Learn about the components in the MX301 chassis.

IN THIS SECTION

The MX301 chassis is a rigid sheet-metal structure that houses all components of the device.

MX301 Specifications

Table 7: Physical Specifications

Specification	Value
Height	1.75 in. (4.45 cm)
Width	17.28 in. (44 cm)
Depth	17.71 in. (45 cm)
Weight	As shipped: 34.81 lb (15.79 kg) Fully-loaded: • With AC PSU: 25.53 lb (11.58 kg) • With DC PSU: 25.33 lb (11.49 kg) • With HVAC/DC PSU: 25.45 lb (11.54 kg)

Table 8: Environmental Specifications

Specification	Value
Operating altitude	0 ft to 6000 ft (0 m to 1829 m)

Operating temperature	**With 100G optics and below:**
	• Telco NEBS environment short term GR 63—0 °C to 55 °C up to 6000 ft (32 °F to 131 °F up to 1829 m)
	• Above 6000 ft up to 16000 ft (1829 m up to 4877 m), the device will experience an ambient temperature degradation of 1 °C per 1000 ft (33.8 °F per 304.8 m). For example:
	  • 0 °C to 54 °C at 7000 ft (32 °F to 129.2 °F at 2133.6 m)
	  • 0 °C to 45 °C at 16000 ft (32 °F to 113 °F at 4877 m)
	With 400G optics:
	• DC NEBS environment—0 °C to 40 °C up to 6000 ft (32 °F to 104 °F up to 1829 m)
	• Above 6000 ft up to 16000 ft (1829 m up to 4877 m), the device will experience an ambient temperature degradation of 1 °C per 1000 ft (33.8 °F per 304.8 m). For example:
	  • 0 °C to 39 °C at 7000 ft (32 °F to 102.2 °F at 2133.6 m)
	  • 0 °C to 30 °C at 16000 ft (32 °F to 86 °F at 4877 m)

Storage temperature	-40 °C to 70 °C (-40 °F to 158 °F)
Relative humidity (operating) (noncondensing)	5% to 90%
Relative humidity (nonoperating) (noncondensing)	5% to 90%

Table 8: Environmental Specifications *(Continued)*

Specification	Value
Seismic tolerance	Designed to meet Telcordia Technologies Zone 4 earthquake requirements.
Average Thermal Output	300 W x 3.412 = 1024 BTU/hour
Acoustic noise level	Typical: 58 through 67 dBA

MX301 Front Panel

Figure 13: MX301 Front Panel Components

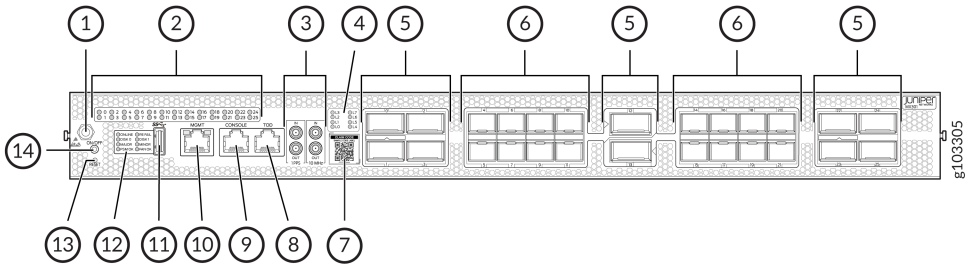


Table 9: Components on the MX301 Front Panel

Callout	Item	Description
1	ESD point	Electrostatic discharge (ESD) point.
2	WAN port LEDs	26 LEDs (labeled **0**–**25**) to indicate the status of each of the 26 network ports.
3	**1PPS** and **10 MHz** GPS input and output ports	1-PPS and 10-MHz input and output external clocking ports with DIN connectors.
4	Lane LEDs	Eight LEDs (labeled **L0**–**L7**) to indicate the lane position.

Table 9: Components on the MX301 Front Panel *(Continued)*

Callout	Item	Description
5	QSFP ports	10 QSFP form factor ports where: • Four QSFP56-DD ports support up to 400GbE speeds • Six QSFP28 ports support up to 100GbE speeds
6	SFP ports	16 SFP form factor ports support up to 50GbE speeds.
7	Claim code	Use the QR code to claim, onboard, and monitor your device to Juniper® Routing Director and Juniper® Routing Assurance.
8	Time of day (**TOD**) port	Ensures precise time synchronization by connecting to external timing sources.
9	**CONSOLE** port	Enables you to connect a laptop directly to the MX301 console port and manage the device using the CLI. The port uses an RJ-45 serial connection.
10	Management port (**MGMT**)	Enables you to connect the MX301 to a management network and perform out-of-band management remotely. The management port uses an autosensing RJ-45 Ethernet connector (supports 10-Mbps, 100-Mbps, and 1000-Mbps port speeds).
11	USB port	A USB 3.0 Type A port for plugging in USB storage devices to install Junos OS manually.
12	Chassis LEDs	Eight LEDs to indicate component status, system status, and troubleshooting information at a glance.
13	**RESET** push button	To reset the device, briefly press the **RESET** push button. To enter BIOS reset mode, press and hold the **RESET** push button for approximately 10 seconds.

Table 9: Components on the MX301 Front Panel *(Continued)*

Callout	Item	Description
14	**ON/OFF** push button	To take the device offline, press the **ON/OFF** push button for approximately 4 seconds. To bring the device online, press the **ON/OFF** push button momentarily.

MX301 Rear Panel

Figure 14: MX301 Rear Panel Components (AC Variant)

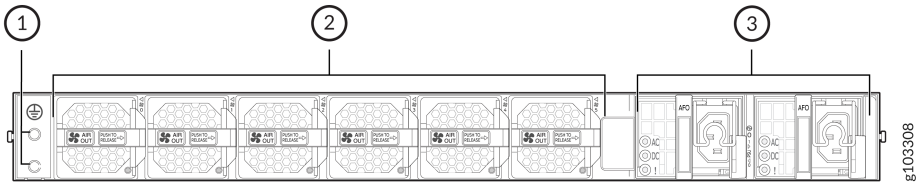


Table 10: Components on the MX301 Rear Panel (AC Variant)

Callout	Item	Description
1	Grounding point	Enables you to connect a grounding cable to earth ground and attach it to the MX301 grounding point to ground the device.
2	Fan modules	Six airflow out (AFO) fan modules (5+1 redundancy)
3	AC PSU	Two 850-W AC PSUs (1+1 redundancy)

Figure 15: MX301 Rear Panel Components (DC Variant)

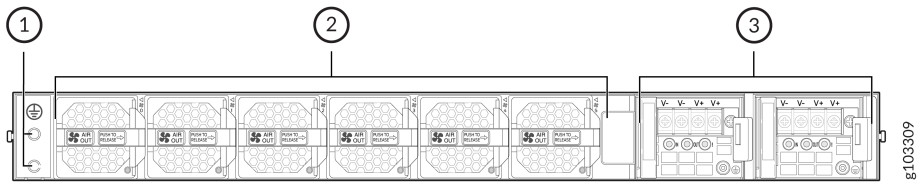


Table 11: Components on the MX301 Rear Panel (DC Variant)

Callout	Item	Description
1	Grounding point	Enables you to connect a grounding cable to earth ground and attach it to the MX301 grounding point to ground the device.
2	Fan modules	Six airflow out (AFO) fan modules (5+1 redundancy)
3	DC PSUs	Two 850-W DC PSUs (1+1 redundancy)

Figure 16: MX301 Rear Panel Components (HVAC/DC Variant)

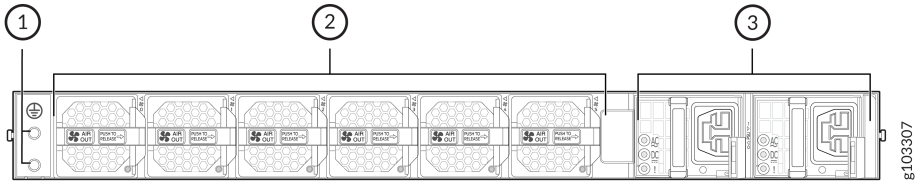


Table 12: Components on the MX301 Rear Panel (HVAC/DC Variant)

Callout	Item	Description
1	Grounding point	Enables you to connect a grounding cable to earth ground and attach it to the MX301 grounding point to ground the device.
2	Fan modules	Six airflow out (AFO) fan modules (5+1 redundancy)
3	HVAC/DC PSUs	Two 850-W high voltage AC/DC PSUs (1+1 redundancy)

MX301 Configurations

SUMMARY

Learn about the various configurations for the MX301.

IN THIS SECTION

The MX301 is available in the following configuration:

Table 13: MX301 Hardware Configurations

Name	Configuration

MX301-HW-BASE	• Chassis (MX301-CHAS-BB)
	• One of the following power supply units (PSUs):
	  • Two AC PSUs (JPSU-850WAC-AFO-BB)
	  • Two DC PSUs (JPSU-850WDC-AFO-BB)
	  • Two HVAC/DC PSUs (JPSU-850WHV-AFO-BB)
	• Six fan modules (JNP-FAN3-1RU)

MX301 Chassis LEDs

SUMMARY

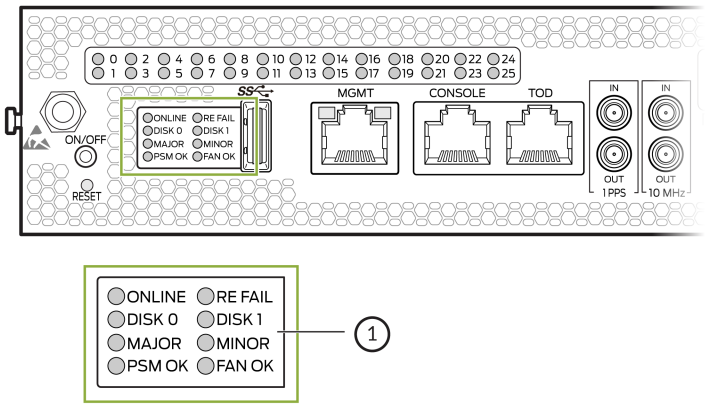
This topic describes the status LEDs for the chassis and ports on the MX301.

IN THIS SECTION

The LEDs on the MX301 indicate the status of the device and its components. You can also use the LEDs for troubleshooting.

Chassis Status LEDs

Figure 17: Chassis Status LEDs



1– Chassis status LEDs

Table 14: Chassis Status LEDs

Label	LED Color	LED State	Description
ONLINE	Green	On steadily	Device is online and working as intended.
		Blinking	Device is booting.
	Unlit		Device is offline.
RE FAIL	Green	On steadily	Device is operating normally.
	Red	Blinking	Indicates a fault condition in the device.
	Unlit		Device is offline.
DISK 0	Green	Blinking	SSD0 is being accessed by the device.
	Unlit		SSD0 is not active or not being accessed.

Table 14: Chassis Status LEDs *(Continued)*

Label	LED Color	LED State	Description
DISK 1	Green	Blinking	SSD1 is being accessed by the device.
	Unit		SSD1 is not active or not being accessed.
MAJOR	Red	On steadily	Indicates a critical condition that can cause the device to stop functioning. Possible causes include component failure, or a major software failure.
	Unlit		No major alarms are present.
MINOR	Amber	On steadily	Indicates a serious but non-fatal error condition such as a maintenance alert or increase in component temperature.
	Unlit		No minor alarms are present.
PSM OK	Green	On steadily	Both power supply modules are operating normally.
	Yellow	On steadily	Indicates an error condition in one or both power supply modules.
FAN OK	Green	On steadily	All fan modules are operating normally.
	Yellow	On steadily	Indicates an error condition in one or all fan modules.

Management Port Status LEDs

Figure 18: Management Port Status LEDs

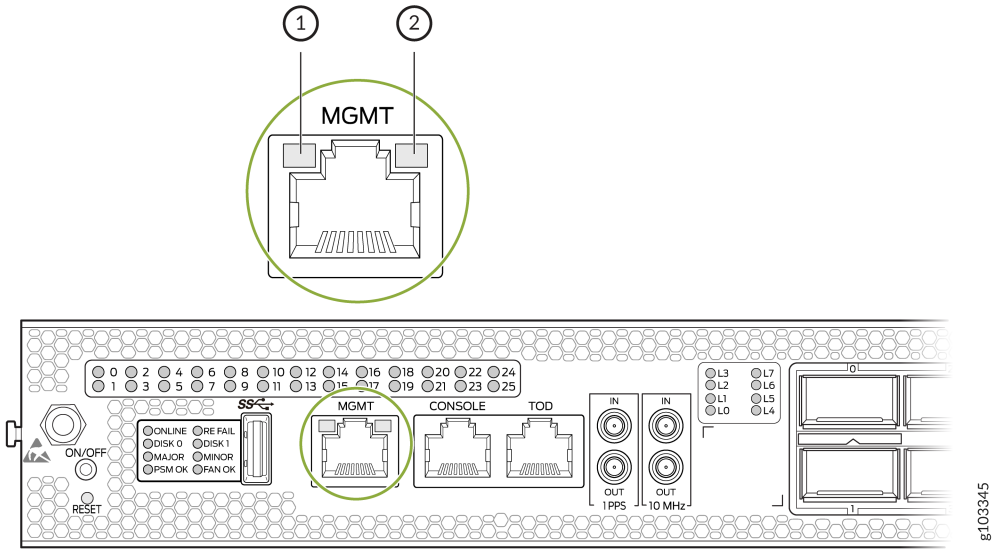
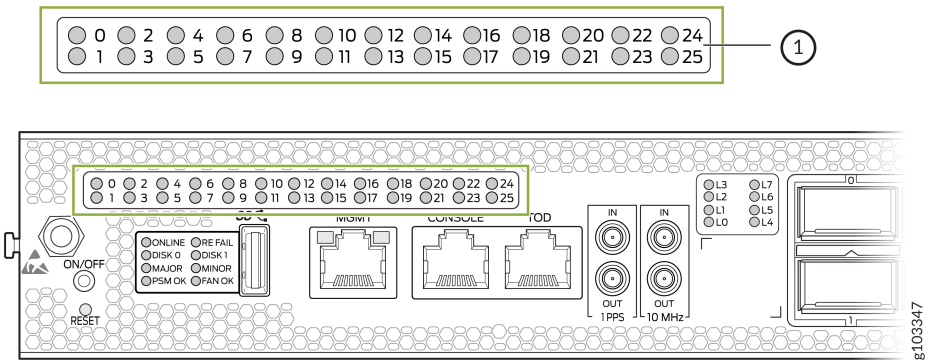


Table 15: Management Port Status LEDs

Callout	Label	LED Color	LED State	Description
1	Status	Green	On steadily	The port speed is 1000 Mbps (1 Gbps).
		Yellow	On steadily	The port speed is 10 Mbps or 100 Mbps.
		Unlit		The link is down.
2	Link Activity	Green	Blinking	A link is established and there is link activity.

WAN Port Status LEDs

Figure 19: WAN Port Status LEDs



1– WAN port status LEDs

The WAN port status LEDS on the MX301 (labeled **0** through **25** for each of the available WAN port) can operate in different display modes:

- Normal—The port status LED represents the port state or a breakout port state. This is the default mode.
- Lane Display—When lane display is on, the router cycles through the ports for the lane status display. Only one port is selected and the display mode for that port changes to lane display while the other ports remain in normal display mode. The corresponding array of lane status LEDs displays the status of each individual lane for the selected port (see Table 17 on page 34).

  NOTE: Ports with all individual links in *Up* state are skipped and are not considered for lane status display, thereby reducing the time needed to cycle through all the ports.

- Port Location—The port location (beacon) command (`require chassis port-led <start|stop> fpc-slot` *`slot`* `pic-slot` *`slot`* `port` *`port`* `[duration` *`time`*`]`) is initiated for a port or a group of ports for a certain period of time. The default duration is five minutes if the `duration` keyword is not specified.

  NOTE: The port location command will temporarily override the port LEDs selected for lane display. All other ports will remain in normal display mode.

See Table 16 on page 32 for the port LED color and blinking state depending on the port configuration, port state, port configuration mode, inserted transceivers, and port display modes.

Table 16: WAN Port Status LEDs

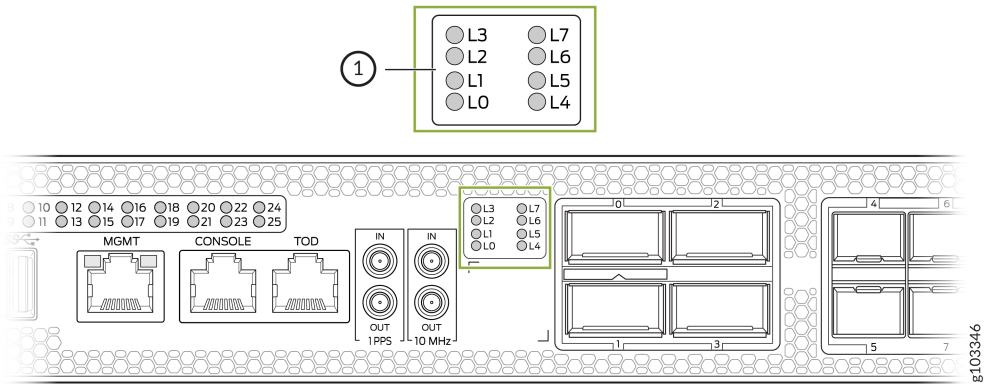
Transceiver Inserted?	Breakout Cable Configuration State	Explicitly Disabled?	Port State	Color - Normal	Color - Port Location On	Color - Lane Display (if available)
Any	No breakout	No	Up	Green	Blinking green	–
Yes	No breakout	No	Down because of transceiver hardware failure	Red	Blinking red	–
Yes	No breakout	No	Down because of a loss of signal (LOS) or Down because of loss of signal (LOS) detection	Off	Blinking green	–
Any	No breakout	No	Down because of any fault except LOS and transceiver hardware failure	Amber	Blinking amber	–
Any	No breakout	Yes	Port disabled in the CLI	Amber	Blinking amber	–
No	Any	No	Anything except disabled port, but no transciever is present	Off	Blinking green	–
Any	Breakout	No	All breakout ports are up	Green	Blinking green	Blinking green

Table 16: WAN Port Status LEDs *(Continued)*

Transceiver Inserted?	Breakout Cable Configuration State	Explicitly Disabled?	Port State	Color - Normal	Color - Port Location On	Color - Lane Display (if available)
Yes	Breakout	No	Hardware failure because of transceiver initialization error at the port level	Red	Blinking red	Blinking red
Yes	Breakout	No	All breakout ports down with an LOS	Off	Blinking green	Blinking green
Any	Breakout	Any	Any state other than the states described in this table.	Amber	Blinking amber	Blinking amber

Lane Status LEDs

Figure 20: Lane Status LEDs



1– Lane status LEDs	

The MX301 provides eight separate LEDs (labeled **L0** through **L7**) to display the status of ports operating in breakout mode.

The lane status LEDs can be activated for a port if:

- The port is configured in breakout mode.
- Transceiver is plugged in.
- Port location is activated for one port only.

Table 17 on page 34 describes the lane status LED.

Table 17: Lane Status LEDs

Transceiver Inserted?	Breakout Cable Configuration State	Explicitly Disabled?	Port State	Color
Yes	Breakout	No	Up	Green
Yes	Breakout	No	Down because of loss of signal (LOS) detection	Off
Yes	Breakout	No	Down because of transceiver hardware failure	Red
Yes	Breakout	No	Down because of any fault except LOS and transceiver hardware failure	Amber
Yes	Breakout	Yes	The breakout port is disabled in the CLI.	Amber

CHAPTER 4

Ports and Channelization

IN THIS CHAPTER

MX301 Ports and Interfaces

SUMMARY

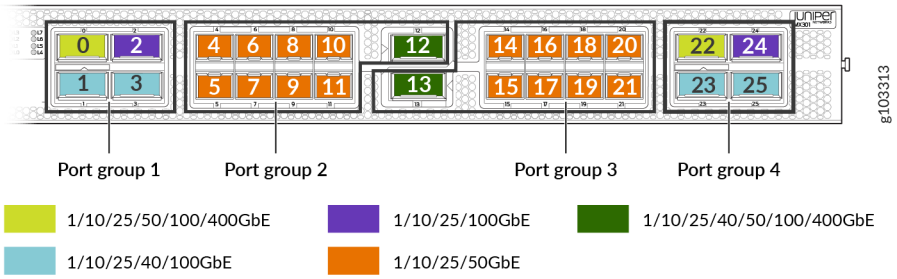
This topic describes the ports on the MX301 and their corresponding Junos OS interfaces.

IN THIS SECTION

Network Ports on the MX301

The MX301 router supports a maximum throughput of 1.6 Tbps through the WAN ports located in the front panel. A total of 26 WAN ports exist, divided into four groups. Each group is capable of a maximum of 400-Gbps throughput (see Figure 21 on page 36). Depending on the optics and the ports used, the router can support speeds of 400 Gbps, 100 Gbps, 50 Gbps, 40 Gbps, 25 Gbps, 10 Gbps, and 1 Gbps.

Figure 21: WAN Port Group Arrangement



NOTE: All port groups support up to 400GbE.

Table 18 on page 37 summarizes the port speed capability of MX301.

Table 18: MX301 Network Ports

Form Factor	Port Component	Port Count	Port Number	Speeds Supported
QSFP	QSFP56-DD	2	0, 22	• 400GbE • 4x100GbE • 8x50GbE • 3x100GbE • 2x100GbE • 100GbE • 1x25GbE • 1x10GbE • 1GbE
		2	12, 13	• 400GbE • 4x100GbE • 8x50GbE • 3x100GbE • 2x100GbE • 100GbE • 4x25GbE • 4x10GbE • 40GbE • 4x1GbE

Table 18: MX301 Network Ports *(Continued)*

Form Factor	Port Component	Port Count	Port Number	Speeds Supported
	QSFP28	4	1, 3, 23, 25	• 100GbE • 4x25GbE • 40GbE • 4x10GbE • 1x25GbE • 1x10GbE • 4x1GbE • 1GbE
		2	2, 24	• 100GbE • 1x25GbE • 1x10GbE • 1GbE
SFP	SFP, SFP+, SFP28, SFP56	16	4–11, 14–21	• 50GbE • 1x25GbE • 1x10GbE • 1GbE

See the Port Checker Tool for information on port combinations, port speeds, and channelizations supported on the MX301.

See the Hardware Compatibility Tool for a list of all supported optics for the MX301.

Interface Naming on the MX301

The ports on the MX301 have interfaces associated with them in Junos OS. These interfaces follow the naming convention described below:

type-fpc/pic/port:channel

- type—Media type of the interface. For some interfaces, the media type depends on the transceiver plugged into the physical port.
  - ge—1 Gigabit Ethernet (GbE) interface
  - xe—10 GbE interface
  - et—25/40/50/100/200/400 GbE interfaces
- fpc—Flexible PIC Concentrator. On the MX301, FPC number is **0**.
- pic—Physical Interface Card. On the MX301, PIC number is **0**.
- port—You can check the port number from the front panel of the MX301.
- channel—Applicable only for channelized interfaces.

Interfaces on the MX301

Each network port on the MX301 has a unique interface on Junos OS associated with it.

You can use the `show chassis hardware` and `show interfaces terse` commands to view the hardware, installed transceivers, and corresponding interfaces.

The example below shows the actual hardware or transceivers plugged into a device and how Junos OS creates the corresponding interfaces. The output has been truncated to only show the relevant sections.

```
host@device> show chassis hardware
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                RF497             JNP301 [MX301]
Routing Engine 0          BUILTIN      BUILTIN           RE 3500 10C 128G
CB 0             REV 31   750-182793   EBBZ2126          Control Board
FPC 0                     BUILTIN      BUILTIN           FPC-BUILTIN
  PIC 0                   BUILTIN      BUILTIN           MRATE PIC 4x400G/14x100G/8x50G
    Xcvr 2       REV 01   740-061001   1P1C42A615257     QSFP28-100G-CU3M
    Xcvr 4       REV 02   740-011613   AM15372BEJD       SFP-SX
    Xcvr 5       REV 02   740-011613   PH34NPC           SFP-SX
    Xcvr 6       REV 01   740-031980   APG1HNF           SFP+-10G-SR
    Xcvr 7       REV 01   740-011613   PDL07BM           SFP-SX
    Xcvr 8       REV 02   740-011613   PPH0HX8           SFP-SX
    Xcvr 10      REV 02   740-011613   PJH4R1A           SFP-SX
    Xcvr 11      REV 02   740-013111   D332818           SFP-T
```

```
    Xcvr 13      REV 01   740-085351   1F2CZ7A72300E     QSFP56-DD-400GBASE-DR4
    Xcvr 22      REV 04   740-157132   2E4CZFAA19002     QSFP56-DD-400G-ZR
    Xcvr 23      REV 01   740-061405   1A3CQ1A8210HP     QSFP-100GBASE-SR4
```

```
host@device> show interfaces terse
Interface               Admin Link Proto    Local                 Remote
ge-0/0/4                up    up
ge-0/0/4.16386          up    up
ge-0/0/5                up    up
ge-0/0/5.16386          up    up
xe-0/0/6:0              up    up
xe-0/0/6:0.16386        up    up
ge-0/0/7                up    up
ge-0/0/7.16386          up    up
ge-0/0/8                up    up
ge-0/0/8.16386          up    up
ge-0/0/10               up    up
ge-0/0/10.16386         up    up
et-0/0/13:0             up    up
et-0/0/13:0.16386       up    up
et-0/0/13:1             up    up
et-0/0/13:1.16386       up    up
et-0/0/13:2             up    up
et-0/0/13:2.16386       up    up
et-0/0/13:3             up    up
et-0/0/13:3.16386       up    up
```

5

CHAPTER

Power System

IN THIS CHAPTER

MX301 Power System

SUMMARY

The MX301 power system includes AC, DC, and HVAC/DC power supply units (PSUs) with related power cords and cables. The PSUs operate within certain ranges and are equipped with status indicator LEDs.

IN THIS SECTION

The MX301 uses two 850-W AC, DC, or HVAC/DC PSUs with support for 1+1 redundancy. The PSUs are preinstalled at the factory. The PSUs in the MX301 are hot-insertable and hot-removable field-replaceable units (FRUs). If one PSU fails, you can replace it without powering off or disrupting the routing function. The other PSU balances the electrical load without interruption. A fan in each PSU provides cooling. The PSUs are located at the rear of the MX301.

The MX301 supports the following PSUs:

AC	DC	HVAC/DC
"JPSU-850W-AC-AFO" on page 43	"JPSU-850W-DC-AFO" on page 51	"JPSU-850W-HV-AFO" on page 58

CAUTION: Avoid mixing:

- AC and DC PSUs in the same chassis.
- PSUs with different ratings in the same chassis.
- PSUs with different airflow directions in the same chassis.
- PSUs and fan modules with different airflow directions in the same chassis.

The maximum and typical power consumption of the system depends on the type of power supply.

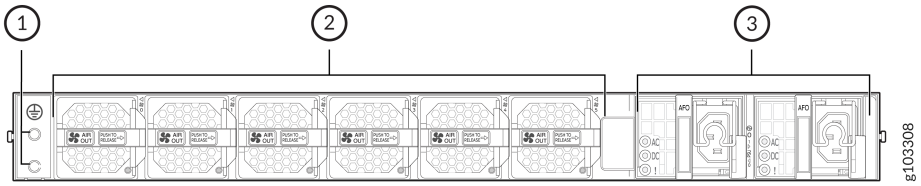
JPSU-850W-AC-AFO

IN THIS SECTION

JPSU-850W-AC-AFO

Figure 22 on page 43 shows the location of the PSUs on the back panel.

Figure 22: MX301 Rear Panel with AC PSUs



1– Grounding point	3– AC PSU (2 units)
2– Fan modules (6 units)	

Figure 23 on page 44 shows the components on the JPSU-850-AC-AFO PSU.

Figure 23: JPSU-850W-AC-AFO PSU (Front view)

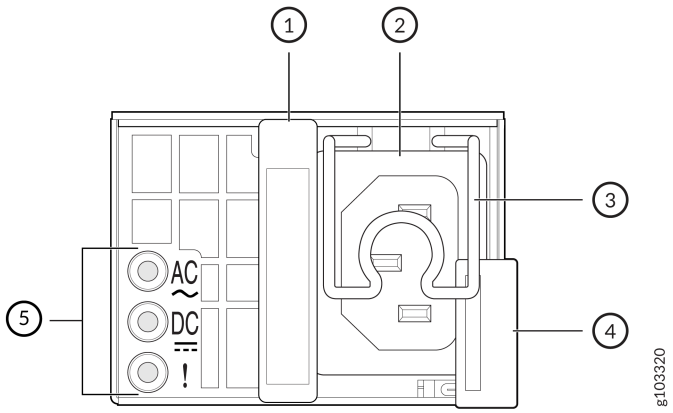


Table 19 on page 44 describes the components on the JPSU-850W-AC-AFO.

Table 19: Components on the JPSU-850W-AC-AFO PSU (Front View)

Callout	Name
1	Handle
2	Power inlet
3	Power cord retainer
4	Release latch
5	Power status LEDs

Figure 24 on page 45 shows the components on the JPSU-850W-AC-AFO PSU in isometric view.

Figure 24: JPSU-850W-AC-AFO PSU (Isometric View)

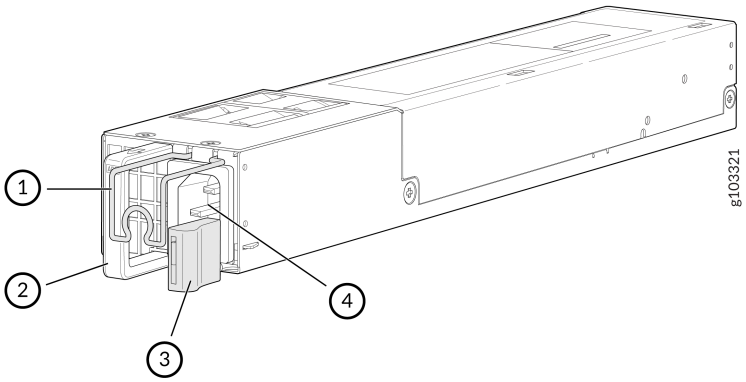


Table 20 on page 45 describes the components on the JPSU-850W-AC-AFO in isometric view.

Table 20: Components on the JPSU-850W-AC-AFO PSU (Isometric View)

Callout	Name
1	Power cord retainer
2	Handle
3	Release latch
4	Power inlet

JPSU-850W-AC-AFO Specifications

Table 21 on page 45 lists the physical specifications of the JPSU-850W-AC-AFO PSU. The power specifications are listed in Table 22 on page 46.

Table 21: Physical Specifications

Specification	Value
Height	1.73 in. (4.4 cm)

Table 21: Physical Specifications *(Continued)*

Specification	Value
Width	2.14 in. (5.45 cm)
Depth	13 in. (33 cm)
Weight	2.26 lb (1.025 kg) per unit
Airflow	AFO

Table 22: Electrical Specifications

Specification	Value
Maximum power output	850 W
AC input voltage	Operating ranges: • 85 VAC through 132 VAC Typical: 120 VAC • 170 VAC through 264 VAC Typical: 230 VAC
AC input current rating	• 10 A through 6.4 A @ 85 VAC through 132 VAC Typical: 7 A @ 120 VAC • 5 A through 3.2 A @ 170 VAC through 264 VAC Typical: 3.7 A @ 230 VAC
AC input line frequency	Typical: 50 Hz through 60 Hz

Table 22: Electrical Specifications *(Continued)*

Specification	Value
Circuit breaker rating	The overcurrent protection for the device is provided by the building installation. Ensure that the branch circuit breaker is rated at no more than 16 A in the EU, 20 A in the USA, or as required by the local code.

JPSU-850W-AC-AFO LEDs

Each JPSU-850W-AC-AFO has three status LEDs on the PSU faceplate (see Figure 25 on page 47).

Figure 25: JPSU-850W-AC-AFO LEDs

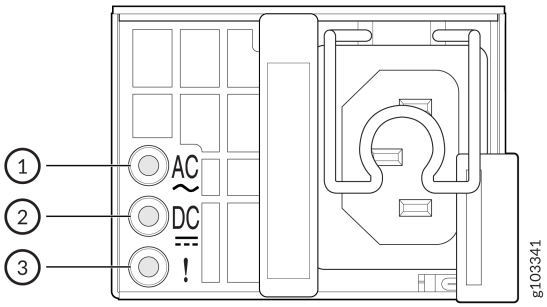


Table 23 on page 47 describes the JPSU-850W-AC-AFO PSU status LEDs.

Table 23: JPSU-850W-AC-AFO Status LEDs Description

Callout	Label	LED Color	LED State	Description
1	**AC** (input)	Unlit	Off	The PSU is disconnected from the power source or the PSU is not receiving power.
		Green	On Steadily	The PSU is receiving power.
2	**DC** (output)	Unlit	Off	The PSU is experiencing overcurrent or power limit.

Table 23: JPSU-850W-AC-AFO Status LEDs Description *(Continued)*

Callout	Label	LED Color	LED State	Description
		Green	On Steadily	The PSU is sending out power correctly.
3	! (Fault)	Amber	On Steadily	An error has been detected in the PSU. Replace the PSU as soon as possible. To maintain proper airflow through the chassis, leave the PSU installed in the chassis until you are ready to replace it.

NOTE:

- If the **AC** LED and **DC** LED are unlit, either the AC power cord is not installed properly or the PSU fuse has failed.
- If the **AC** LED is lit green and **DC** LED is unlit, the AC PSU is installed properly, but the PSU is off in a 5 Voltage Standby (VSB) mode.
- If the **AC** LED is lit green, **DC** LED is unlit, and the **!** fault LED is lit amber, the PSU has shut down due to a failure.

You can get additional information about the status of the PSUs using the `show chassis power` command and the `show chassis power detail` command. Here are some examples of the CLI output:

MX301 with Two AC PSUs

```
user@device> show chassis power
PEM 0:
  State:     Offline
  Capacity:  850 W (maximum 850 W)
  AC input:  Not ready
  DC output: 0 W (zone 0, 0.00 A at 0.00 V, 0% of capacity)

PEM 1:
  State:     Online
  Capacity:  850 W (maximum 850 W)
  AC input:  OK (INP1 feed expected, INP1 feed connected)
  DC output: 132 W (zone 0, 11.00 A at 12.06 V, 15% of capacity)
```

```
System:
  Zone 0:
      Capacity:          850 W (maximum 850 W)
      Allocated power:   820 W (30 W remaining)
      Actual usage:      132 W
  Total system capacity: 850 W (maximum 850 W)
  Total remaining power: 30 W



user@device> show chassis power detail
PEM 0:
  State:     Offline
  Capacity:  850 W (maximum 850 W)
  AC input:  Not ready
  DC output: 0 W (zone 0, 0.00 A at 0.00 V, 0% of capacity)

PEM 1:
  State:     Online
  Capacity:  850 W (maximum 850 W)
  AC input:  OK (INP1 feed expected, INP1 feed connected)
  DC output: 126 W (zone 0, 10.50 A at 12.06 V, 14% of capacity)

System:
  Zone 0:
      Capacity:          850 W (maximum 850 W)
      Allocated power:   820 W (30 W remaining)
      Actual usage:      126 W
  Total system capacity: 850 W (maximum 850 W)
  Total remaining power: 30 W

Item                 Used(W)
  Fan Tray 0              2
  Fan Tray 1              1
  Fan Tray 2              1
  Fan Tray 3              1
  Fan Tray 4              1
  Fan Tray 5              2
  RE0/CB0                53
  FPC 0                  83
```

Supported AC Power Cords on the JPSU-850W-AC-AFO

A detachable AC power cord is supplied with the AC PSUs. The coupler is type C19 as described by the International Electrotechnical Commission (IEC) standard 60320. Table 24 on page 50 lists the default power cord that is provided for each country. The plug end of the power cord fits into the power source outlet that is standard for your geographical location.

CAUTION: The AC power cord provided with each PSU is intended for use with that PSU only and not for any other use.

NOTE: In North America, AC power cords must not exceed 4.5 meters in length to comply with National Electrical Code (NEC) Sections 400-8 (NFPA 75, 5-2.2) and 210-52 and Canadian Electrical Code (CEC) Section 4-010(3). The cords supplied with the router are in compliance with these requirements.

Table 24: Supported AC Power Cords

Country/Geographical Region	Cord Set Rating	Plug Standard	Spare Juniper Model Number
Argentina	250 VAC, 10 A, 50 Hz	IRAM2073	CBL-EX-PWR-C13-AR
Australia	250 VAC, 10 A, 50 Hz	AS/NZ 3109-1996	CBL-EX-PWR-C13-AU
Brazil	250 VAC, 10 A, 50 Hz	NBR 14136 Type BR/3	CBL-EX-PWR-C13-BR
China	250 VAC, 10 A, 50 Hz	GB 1002-1996	CBL-EX-PWR-C13-CH
Europe	250 VAC, 10 A, 50 Hz	CEE (7) VII	CBL-EX-PWR-C13-EU
India	250 VAC, 10 A, 50 Hz	IS 1293	CBL-EX-PWR-C13-IN
Israel	250 VAC, 10 A, 50 Hz	SI 32/1971 Type IL/3G	CBL-EX-PWR-C13-IL
Italy	250 VAC, 10 A, 50 Hz	CEI 23-16/VII	CBL-EX-PWR-C13-IT

Table 24: Supported AC Power Cords *(Continued)*

Country/Geographical Region	Cord Set Rating	Plug Standard	Spare Juniper Model Number
Japan	125 VAC, 12 A, 50 Hz or 60 Hz	JIS C8303	CBL-EX-PWR-C13-JP
North America	125 VAC, 13 A, 60 Hz	CAN/CSA No. 49-92	CBL-EX-PWR-C13-US
	250 VAC, 13 A, 60 Hz	NEMA L6-15	
	250 VAC, 13 A, 60 Hz	NEMA 6-15	
South Africa/India	250 VAC, 10 A, 50 Hz	SABS 164/1:1992 Type ZA/3	CBL-EX-PWR-C13-SA
South Korea	250 VAC, 10 A, 60 Hz; 250 VAC, 13 A, 60 Hz	KSC 8305; K60884-1	CBL-EX-PWR-C13-KR
Switzerland	250 VAC, 10 A, 50 Hz	SEV 1011 SEV 1991; EN 60320 C13	CBL-EX-PWR-C13-SZ
Taiwan	125 VAC, 11 A and 15 A, 50 Hz	NEMA 5-15P Type N5-15P	CBL-EX-PWR-C13-TW
United Kingdom	250 VAC, 10 A, 50 Hz	BS 1363/A	CBL-EX-PWR-C13-UK

JPSU-850W-DC-AFO

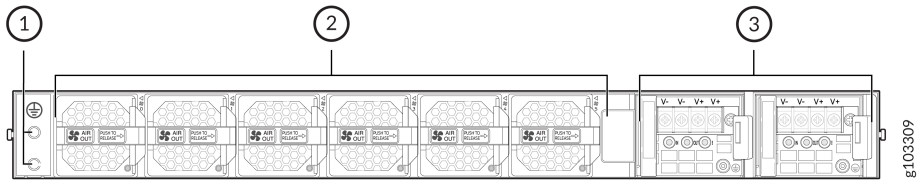
IN THIS SECTION

- DC Power Cable Specifications | 0

JPSU-850W-DC-AFO

Figure 26 on page 52 shows the location of the PSUs on the rear panel.

Figure 26: MX301 Rear Panel with DC PSUs



1– Grounding point	3– DC PSU (2 units)
2– Fan modules (6 units)	

Figure 27 on page 52 shows the components on the JPSU-850W-DC-AFO PSU.

Figure 27: JPSU-850W-DC-AFO PSU (Front View)

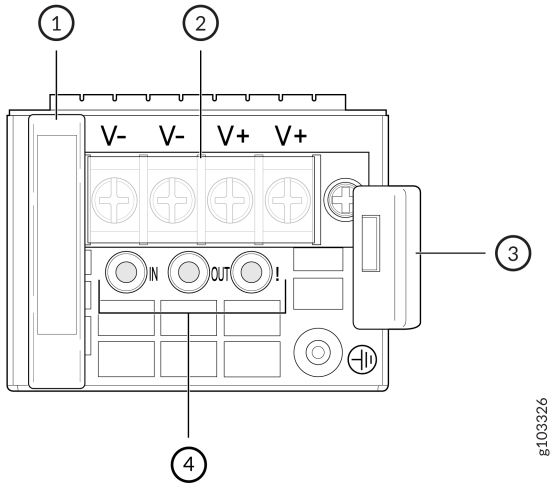


Table 25 on page 53 describes the components on the JPSU-850W-DC-AFO.

Table 25: Components on the JPSU-850W-DC-AFO PSU (Front View)

Callout	Name
1	Handle
2	Terminal block cover
3	Release latch
4	Power status LEDs

Figure 28 on page 53 shows the components on the JPSU-850W-DC-AFO PSU in isometric view.

Figure 28: JPSU-850W-DC-AFO PSU (Isometric View)

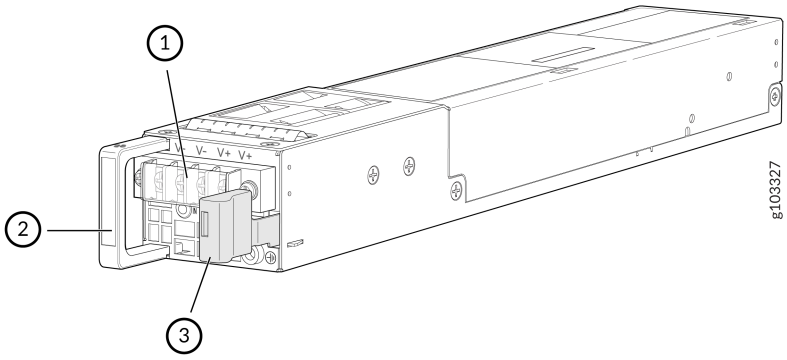


Table 26 on page 53 describes the components on the JPSU-850W-DC-AFO in isometric view.

Table 26: Components on the JPSU-850W-DC-AFO PSU (Isometric View)

Callout	Name
1	Terminal block cover
2	Handle
3	Release latch

JPSU-850W-DC-AFO Specifications

Table 27 on page 54 lists the physical specifications of the JPSU-850W-DC-AFO PSU. The power specifications are listed in Table 28 on page 54.

Table 27: Physical Specifications

Specification	Value
Height	1.73 in. (4.4 cm)
Width	2.14 in. (5.45 cm)
Depth	13 in. (33 cm)
Weight	2.16 lb (0.98 kg) per unit
Airflow	AFO

Table 28: Electrical Specifications

Specification	Value
Maximum power output	850 W
DC input voltage	-40 VDC through -72 VDC Typical: -48 VDC
DC input current rating	21 A through 11 A @ -40 VDC through -72 VDC Typical: 18 A @ -48 VDC
Circuit breaker rating	30 A

NOTE: We recommend that you connect each DC PSU unit to a dedicated DC power source with an output voltage range between -40 VDC through -72 VDC. The wiring

from the dedicated DC power source that connects to the DC PSU unit must be within the same building.

JPSU-850W-DC-AFO LEDs

Each JPSU-850W-DC-AFO has three status LEDs on the PSU faceplate (see Figure 29 on page 55).

Figure 29: JPSU-850W-DC-AFO LEDs

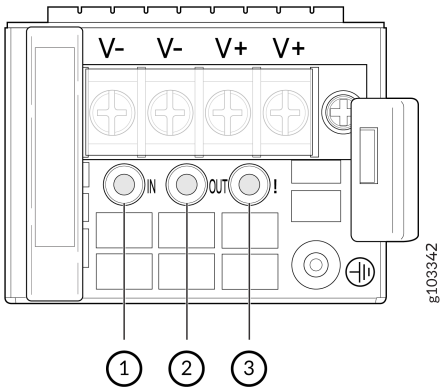


Table 29 on page 55 describes the JPSU-850W-DC-AFO PSU status LEDs.

Table 29: JPSU-850W-DC-AFO Status LEDs Description

Callout	Label	LED Color	LED State	Description
1	**IN** (DC input)	Unlit	Off	The PSU is disconnected from the power source or the PSU is not receiving power.
		Green	On Steadily	The PSU is receiving power.
2	**OUT** (DC output)	Unlit	Off	The PSU is experiencing overcurrent or power limit.
		Green	On Steadily	The PSU is sending out power correctly.

Table 29: JPSU-850W-DC-AFO Status LEDs Description *(Continued)*

Callout	Label	LED Color	LED State	Description
3	! (Fault)	Amber	On Steadily	An error has been detected in the PSU. Replace the PSU as soon as possible. To maintain proper airflow through the chassis, leave the PSU installed in the chassis until you are ready to replace it.

You can get additional information about the status of the PSUs using the `show chassis power` command and the `show chassis power detail` command. Here are some examples of the CLI output:

MX301 with Two DC PSUs

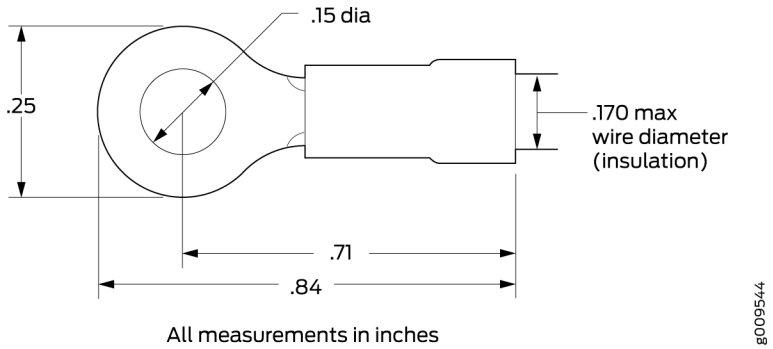
```
user@device> show chassis power
PEM 0:
  State:     Online
  Capacity:  850 W (maximum 850 W)
  DC input:  OK (INP1 feed expected, INP1 feed connected)
  DC output: 148 W (zone 0, 12.25 A at 12.14 V, 17% of capacity)

PEM 1:
  State:     Online
  Capacity:  850 W (maximum 850 W)
  DC input:  OK (INP1 feed expected, INP1 feed connected)
  DC output: 159 W (zone 0, 13.13 A at 12.11 V, 18% of capacity)

System:
  Zone 0:
      Capacity:          1700 W (maximum 1700 W)
      Allocated power:   820 W (880 W remaining)
      Actual usage:      307 W
  Total system capacity: 1700 W (maximum 1700 W)
  Total remaining power: 880 W


user@device> show chassis power detail
PEM 0:
  State:     Online
  Capacity:  850 W (maximum 850 W)
  DC input:  OK (INP1 feed expected, INP1 feed connected)
```

```
  DC output: 148 W (zone 0, 12.25 A at 12.14 V, 17% of capacity)

PEM 1:
  State:     Online
  Capacity:  850 W (maximum 850 W)
  DC input:  OK (INP1 feed expected, INP1 feed connected)
  DC output: 157 W (zone 0, 13.00 A at 12.09 V, 18% of capacity)

System:
  Zone 0:
      Capacity:          1700 W (maximum 1700 W)
      Allocated power:   820 W (880 W remaining)
      Actual usage:      305 W
  Total system capacity: 1700 W (maximum 1700 W)
  Total remaining power: 880 W

Item                Used(W)
  Fan Tray 0            15
  Fan Tray 1            16
  Fan Tray 2            16
  Fan Tray 3            15
  Fan Tray 4            15
  Fan Tray 5            16
  RE0/CB0               57
  FPC 0                 67
```

DC Power Cable Specifications

You must supply four DC power cables that meet the following specifications: 14-16 AWG (2.08 - 1.3 mm^2), minimum 60° C wire, or as required by the local code. The accessory box shipped with the router includes the cable lugs that attach to the terminal of each PSU.

Figure 30: DC Power Cable Lug



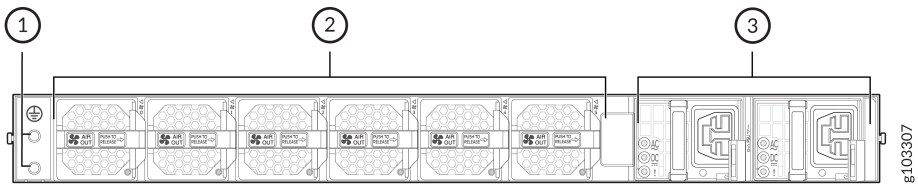
JPSU-850W-HV-AFO

IN THIS SECTION

JPSU-850W-HV-AFO

Figure 31 on page 58 shows the location of the PSUs on the back panel.

Figure 31: MX301 Rear Panel with HVAC/DC PSUs



1– Grounding point	3– HVAC/DC PSU (2 units)

2– Fan modules (6 units)	

Figure 32 on page 59 shows the components on the JPSU-850W-HV-AFO PSU.

Figure 32: JPSU-850W-HV-AFO PSU (Front View)

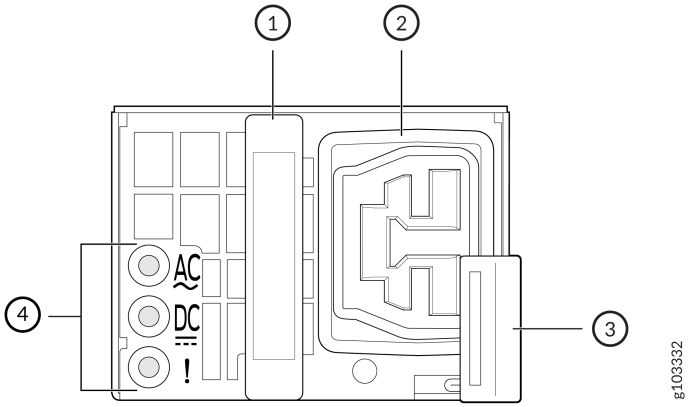


Table 30 on page 59 shows the components on the JPSU-850W-HV-AFO PSU.

Table 30: Components on the JPSU-850W-HV-AFO PSU (Front View)

Callout	Name
1	Handle
2	Power inlet
3	Release latch
4	Power status LEDs

Figure 33 on page 60 shows the components on the JPSU-850W-HV-AFO PSU in isometric view.

Figure 33: JPSU-850W-HV-AFO PSU (Isometric View)

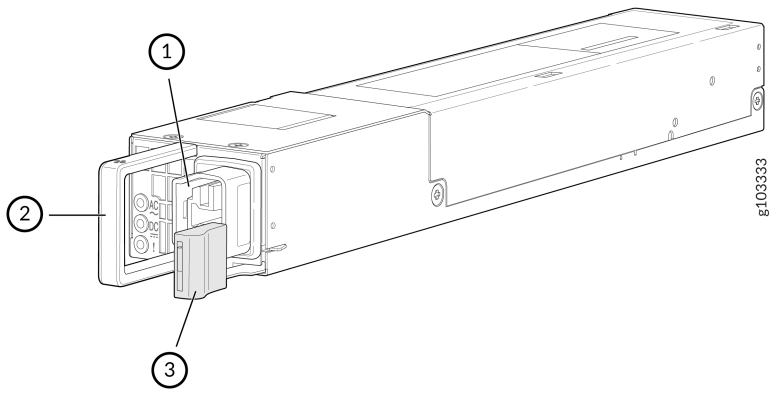


Table 31 on page 60 shows the components on the JPSU-850W-HV-AFO PSU in isometric view.

Table 31: Components on the JPSU-850W-HV-AFO PSU (Isometric View)

Callout	Name
1	Power inlet
2	Handle
3	Release latch

JPSU-850W-HV-AFO Specifications

Table 32 on page 60 lists the physical specifications of the JPSU-850W-HV-AFO PSU. The power specifications are listed in Table 33 on page 61.

Table 32: Physical Specifications

Specification	Value
Height	1.73 in. (4.4 cm)
Width	2.14 in. (5.45 cm)

Table 32: Physical Specifications *(Continued)*

Specification	Value
Depth	13 in. (33 cm)
Weight	2.21 lb (1.005 kg) per unit
Airflow	AFO

Table 33: Electrical Specifications

Specification	Value
Maximum power output	850 W
Input voltage	**HVAC** • 90 VAC through 140 VAC Typical: 100 VAC through 127 VAC • 180 VAC through 305 VAC Typical: 200 VAC through 277 VAC **HVDC** • 190 DC through 400 DC Typical: 240 DC through 380 DC
Input current rating	**AC** • Maximum: 11 A @ 140 VAC • Maximum: 5.5 A @ 305 VAC **DC** • Maximum: 5.5 A @ 400 VAC
Input line frequency for AC input	50 Hz through 60 Hz

Table 33: Electrical Specifications *(Continued)*

Specification	Value
Circuit breaker rating	**HVAC** • 15 A @ 90 VAC through 140 VAC • 10 A @ 190 VAC through 305 VAC **HVDC** • 10 A

JPSU-850W-HV-AFO LEDs

Each JPSU-850W-HV-AFO has three status LEDs on the PSU faceplate (see Figure 34 on page 62).

Figure 34: JPSU-850W-HV-AFO LEDs

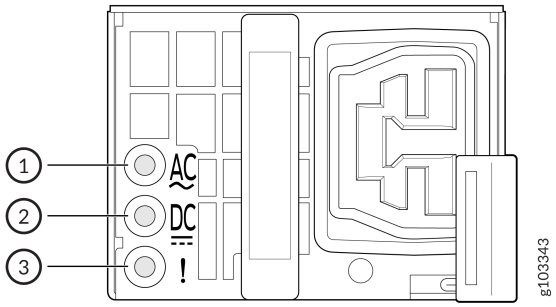


Table 34 on page 62 describes the JPSU-850W-AC-AFO PSU status LEDs.

Table 34: JPSU-850W-HV-AFO Status LEDs Description

Callout	Label	LED Color	LED State	Description
1	**AC** (input)	Unlit	Off	The PSU is disconnected from power source or the PSU is not receiving power.
		Green	On Steadily	The PSU is receiving power.

Table 34: JPSU-850W-HV-AFO Status LEDs Description *(Continued)*

Callout	Label	LED Color	LED State	Description
2	**DC** (output)	Unlit	Off	The PSU is experiencing overcurrent or power limit.
		Green	On Steadily	The PSU is sending out power correctly.
3	**!** (Fault)	Amber	On Steadily	An error has been detected in the PSU. Replace the PSU as soon as possible. To maintain proper airflow through the chassis, leave the PSU installed in the chassis until you are ready to replace it.

You can get additional information about the status of the PSUs using the `show chassis power` command and the `show chassis power detail` command. Here are some examples of the CLI output:

MX301 with Two HVAC/DC PSUs

```
user@device> show chassis power
PEM 0:
  State:     Online
  Capacity:  850 W (maximum 850 W)
  AC input:  OK (INP1 feed expected, INP1 feed connected)
  DC output: 133 W (zone 0, 10.75 A at 12.38 V, 15% of capacity)

PEM 1:
  State:     Online
  Capacity:  850 W (maximum 850 W)
  AC input:  OK (INP1 feed expected, INP1 feed connected)
  DC output: 126 W (zone 0, 10.25 A at 12.39 V, 14% of capacity)

System:
  Zone 0:
      Capacity:          1700 W (maximum 1700 W)
      Allocated power:   820 W (880 W remaining)
      Actual usage:      259 W
  Total system capacity: 1700 W (maximum 1700 W)
  Total remaining power: 880 W
```

```
user@device> show chassis power detail
PEM 0:
  State:     Online
  Capacity:  850 W (maximum 850 W)
  AC input:  OK (INP1 feed expected, INP1 feed connected)
  DC output: 133 W (zone 0, 10.75 A at 12.38 V, 15% of capacity)

PEM 1:
  State:     Online
  Capacity:  850 W (maximum 850 W)
  AC input:  OK (INP1 feed expected, INP1 feed connected)
  DC output: 126 W (zone 0, 10.25 A at 12.39 V, 14% of capacity)

System:
  Zone 0:
      Capacity:          1700 W (maximum 1700 W)
      Allocated power:   820 W (880 W remaining)
      Actual usage:      259 W
  Total system capacity: 1700 W (maximum 1700 W)
  Total remaining power: 880 W

Item                Used(W)
  Fan Tray 0            16
  Fan Tray 1            17
  Fan Tray 2            17
  Fan Tray 3            16
  Fan Tray 4            16
  Fan Tray 5            18
  RE0/CB0               58
  FPC 0                 21
```

Supported Power Cords on the JPSU-850W-HV-AFO

Table 35 on page 65 lists the specifications of the power cord for the high-voltage PSUs provided for countries and regions.

CAUTION: The power cord provided with each PSU is intended for use with that PSU only and not for any other use.

NOTE: In North America, AC power cords must not exceed 4.5 meters in length, to comply with National Electrical Code (NEC) Sections 400-8 (NFPA 75, 5-2.2) and 210-52 and Canadian Electrical Code (CEC) Section 4-010(3). The cords supplied with the router are in compliance.

Table 35: Specifications of the Power Cords for the High-Voltage PSUs

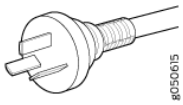
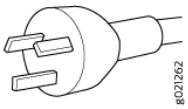
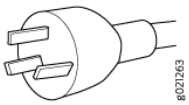
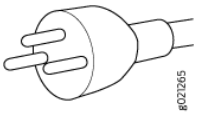
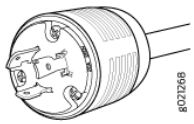
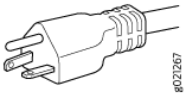
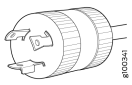
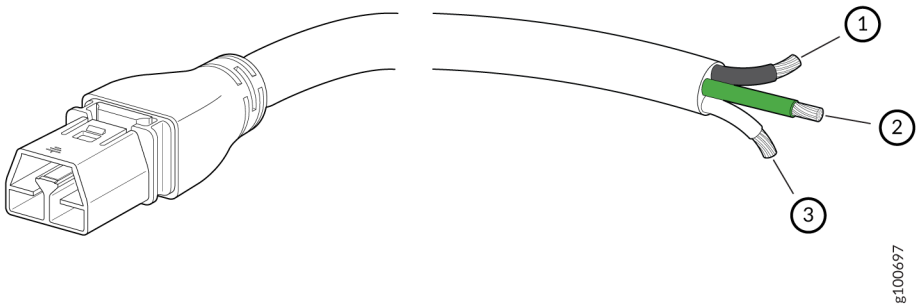
Country/ Geographical Region	Cord Set Rating	Plug Standard	Spare Juniper Model Number	Graphic
Argentina	16 A, 250 VAC	IRAM 2073 Type RA/3	CBL-JNP-SG4-AR	
Australia and New Zealand	15 A, 250 VAC	AS/NZS 4417	CBL-JNP-SG4-AU	
Brazil	16 A, 250 VAC	NBR 14136 Type BR/3	CBL-JNP-SG4-BR	
China	16 A, 250 VAC	GB2099	CBL-JNP-SG4-CH	
Great Britain	13 A, 250 VAC	BS1363	CBL-JNP-SG4-UK	
India	16 A, 250 VAC	SANS 164-1	CBL-JNP-SG4-SA	

Table 35: Specifications of the Power Cords for the High-Voltage PSUs *(Continued)*

Country/ Geographical Region	Cord Set Rating	Plug Standard	Spare Juniper Model Number	Graphic
Israel	16 A, RA, 250 VAC	SI 32/1971 Type IL/3G	CBL-JNP-SG4-IL	
Italy	16 A, 250 VAC	CEI 23-16	CBL-JNP-SG4-IT	
North America	16 A, 250 VAC	Locking NEMA L6-20P	CBL-JNP-SG4-US-L	
	16 A, 250 VAC	NEMA 6-20P	CBL-JNP-SG4-US	
	15 A, 277 V	NEMA I7-20P	CBL-JNP-SG4-HVAC	
South Africa	16 A, 250 VAC	SANS 164-1	CBL-JNP-SG4-SA	
Switzerland	16 A, 250 VAC	CEI 23-50	CBL-JNP-SG4-SZ	
All countries	16 A, 400 VAC	Anderson/straight to bare wire	CBL-PWR2-BARE	See Figure 35 on page 67.

The JPSU-850W-HV-AFO PSU uses an Anderson SAF-D power connector for its HVAC/DC PSU power inlet. The cable has an Anderson connector on one end and bare wire on the other. This bare wire can be used to connect to DC power outlet and is shipped without any lug attached.

Figure 35: Straight, Bare Cable with Anderson Connector



1– Black wire–Return (+)	3– White wire–Neutral
2– Green wire-Ground	

Replace Power Supply Units on the MX301

SUMMARY

Maintaining the MX301 includes removing and installing the power supply units (PSUs).

IN THIS SECTION

The power supply units (PSUs) on the MX301 are hot-removable and hot-insertable field-replaceable units (FRUs) with support for 1+1 redundancy. You can remove and replace a PSU without powering off the MX301 or disrupting the device functions.

CAUTION: Do not mix AC, DC, and HVAC/DC PSUs in the same chassis.

Before you remove or install a PSU, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage.

Ensure that you have the following parts and tools:

- An ESD grounding strap
- An antistatic bag or an antistatic mat
- A replacement PSU
- A blank cover panel (in case you're not replacing the PSU)
- (For DC power supply) Philips (+) screwdriver, number 2

Replace an AC PSU on the MX301

IN THIS SECTION

Remove the JPSU-850W-AC-AFO

SUMMARY

This topic guides you through the steps to remove the JPSU-850W-AC-AFO AC power supply from the MX301 Router.

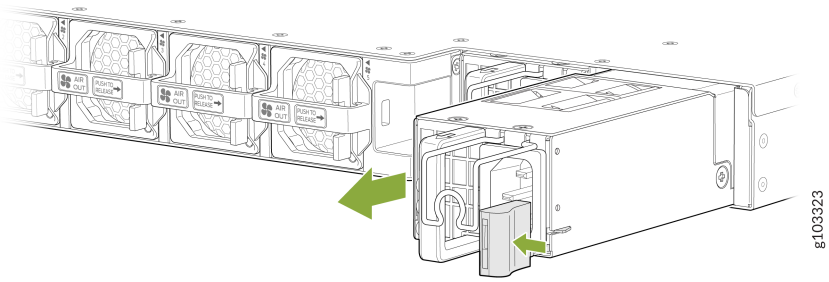
CAUTION: Avoid leaving the PSU slot empty for more than 30 minutes when the device is operational. For optimal airflow, all PSUs must be installed in the chassis.

CAUTION: If you need to replace all the power supplies installed in your MX301, you must power off the MX301 before removing the power supplies.

To remove the JPSU-850W-AC-AFO PSU:

1. Wrap and fasten one end of the ESD cable grounding strap around your bare wrist and connect the other end to a site ESD point.
2. Place the antistatic bag or the antistatic mat on a flat, stable surface.
3. If the AC power source outlet has a power switch, set it to the off (O) position.
4. Unplug the power cord that is connected to the power source outlet.
5. Unplug the power cord from the device inlet of the PSU.
6. Press the release latch located on the right side of the PSU toward the left side (see Figure 36 on page 69).
7. Pull the PSU straight out of the chassis.

Figure 36: Remove the AC PSU



8. Place the PSU in the antistatic bag or on the antistatic mat.
9. If you are not immediately replacing the PSU, install the cover panel over the PSU slot on the chassis.

Install the JPSU-850W-AC-AFO

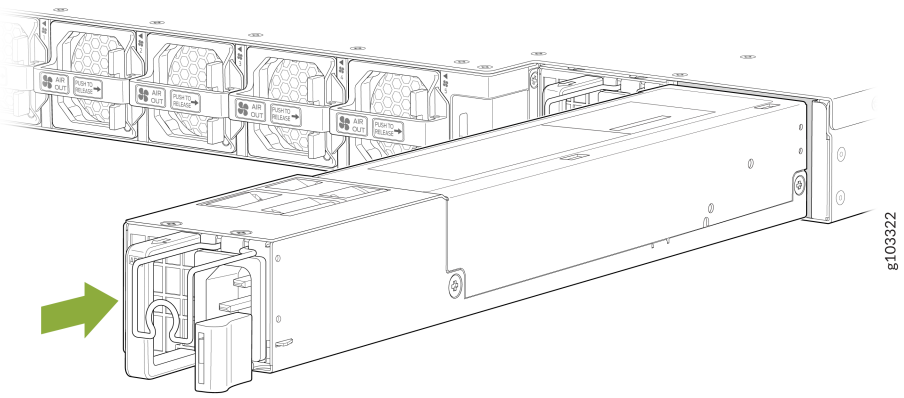
SUMMARY

This topic guides you through the steps to install the JPSU-850W-AC-AFO AC power supply in the MX301 Router.

To install the JPSU-850W-AC-AFO PSU:

1. Wrap and fasten one end of the ESD cable grounding strap around your bare wrist and connect the other end to a site ESD point.
2. If the PSU slot in the chassis has a cover panel on it, remove the cover panel. Save the cover panel for subsequent use.
3. Taking care not to touch the pins, leads, or solder connections on the PSU, remove the PSU from the bag.
4. Using both hands, place the PSU in the PSU slot on the rear panel of the router. Slide the PSU straight into the chassis until the PSU is fully seated in the chassis slot and the release latch slides into place. Ensure that the PSU faceplate is flush with the adjacent PSU faceplate.

Figure 37: Install the AC PSU



5. Connect the power cord (see "Connect AC Power to the MX301" on page 130).

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

Replace a DC PSU on the MX301

IN THIS SECTION

Remove the JPSU-850W-DC-AFO

SUMMARY

This topic guides you through the steps to remove the JPSU-850W-DC-AFO DC PSU from the MX301 Router.

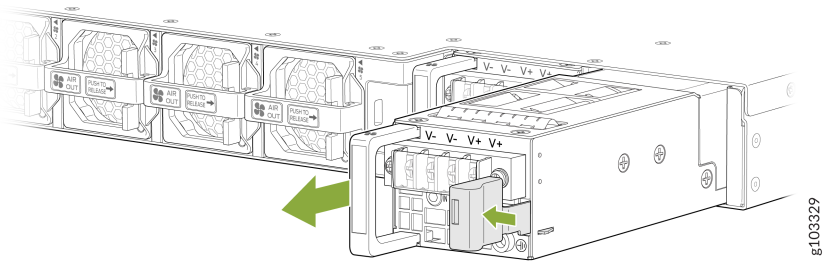
CAUTION: Avoid leaving the PSU slot empty for more than 30 minutes when the device is operational. For optimal airflow, all PSUs must be installed in the chassis.

CAUTION: If you need to replace all the power supplies installed in your MX301, you must power off the MX301 before removing the power supplies.

To remove the JPSU-850W-DC-AFO PSU:

1. Wrap and fasten one end of the ESD cable grounding strap around your bare wrist and connect the other end to a site ESD point.
2. Place the antistatic bag or the antistatic mat on a flat, stable surface.
3. Switch off the external circuit breakers for all cables connected to the PSU. Ensure that the voltage across the power source cable leads is 0 V. You must ensure that the cables do not become active during the PSU removal process.
4. Remove the clear plastic cover protecting the terminal studs on the PSU faceplate.
5. Remove the screws and washers from the terminal studs.
6. Remove the cable terminals from the terminal studs. Carefully move the power cables out of the way.
7. Loosen the captive screws on the lower edge of the PSU faceplate.
8. Press the release latch located on the right side of the PSU toward the left side (see Figure 38 on page 72).
9. Pull the PSU straight out of the chassis.

Figure 38: Remove the DC PSU



10. Place the PSU in the antistatic bag or on the antistatic mat.
11. If you are not immediately replacing the PSU, install the cover panel over the PSU slot on the chassis.

Install the JPSU-850W-DC-AFO

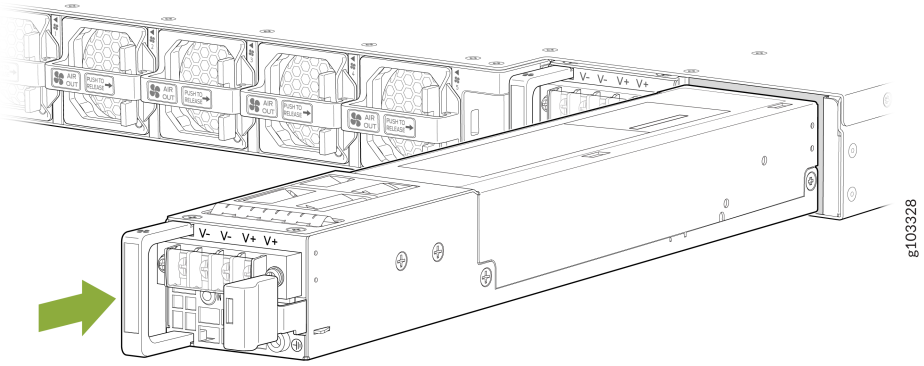
SUMMARY

This topic guides you through the steps to install the JPSU-850W-DC-AFO DC PSU in the MX301 Router.

To install the JPSU-850W-DC-AFO PSU:

1. Wrap and fasten one end of the ESD cable grounding strap around your bare wrist and connect the other end to a site ESD point.
2. Switch off the external circuit breakers for all cables connected to the PSU. Ensure that the voltage across the power source cable leads is 0 V. You must ensure that the cables do not become active during the PSU removal process.
3. If the PSU slot in the chassis has a cover panel on it, remove the cover panel. Save the cover panel for subsequent use.
4. Taking care not to touch the pins, leads, or solder connections on the PSU, remove the PSU from the bag.
5. Using both hands, place the PSU in the PSU slot on the rear panel of the router. Slide the PSU straight into the chassis until the PSU is fully seated in the chassis slot and the release latch slides into place. Ensure that the PSU faceplate is flush with the adjacent PSU faceplate.

Figure 39: Install the DC PSU



6. Tighten the captive screws on the lower edge of the PSU faceplate.
7. Connect the power cables (see "Connect DC Power to the MX301" on page 132).

Replace an HVAC/DC PSU on the MX301

IN THIS SECTION

Remove the JPSU-850W-HV-AFO

SUMMARY

This topic guides you through the steps to remove the JPSU-850W-HV-AFO HVAC/DC PSU from the MX301 Router.

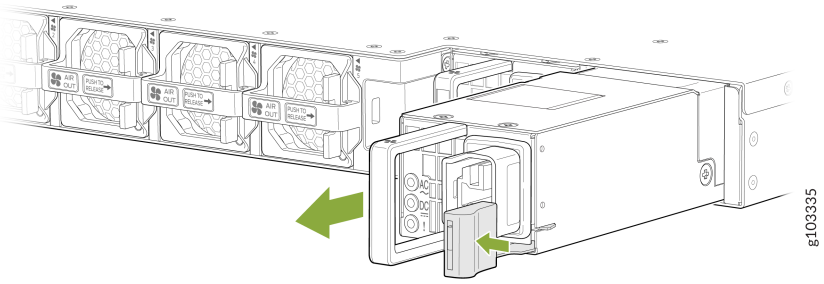
CAUTION: Avoid leaving the PSU slot empty for more than 30 minutes when the device is operational. For optimal airflow, all PSUs must be installed in the chassis.

CAUTION: If you need to replace all PSUs installed in your MX301, you must power off the MX301 before removing the PSUs.

To remove the JPSU-850W-HV-AFO PSU:

1. Wrap and fasten one end of the ESD cable grounding strap around your bare wrist and connect the other end to a site ESD point.
2. Place the antistatic bag or the antistatic mat on a flat, stable surface.
3. Switch off the dedicated circuit breaker for the PSU and remove the power cord from the HVAC/DC power source. Follow the instructions for your site.
4. Press the release latch located on the right side of the PSU toward the left side (see Figure 40 on page 74).
5. Pull the PSU straight out of the chassis.

Figure 40: Remove the HVAC/DC PSU



6. Place the PSU in the antistatic bag or on the antistatic mat.
7. If you are not immediately replacing the PSU, install the cover panel over the PSU slot on the chassis.

Install the JPSU-850W-HV-AFO

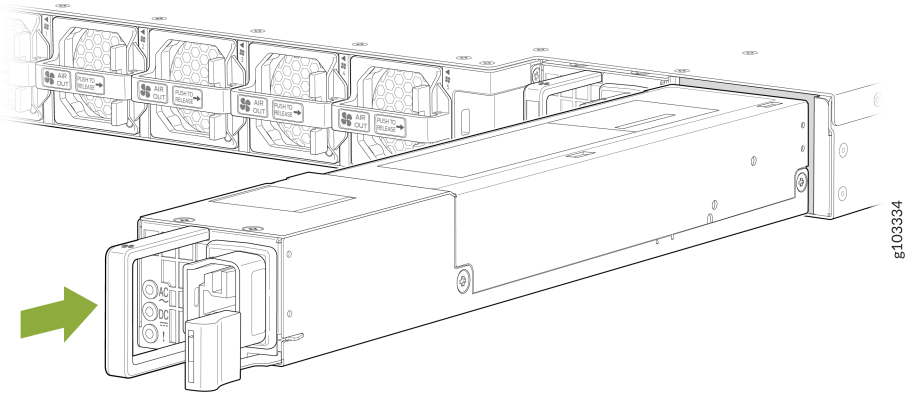
SUMMARY

This topic guides you through the steps to install the JPSU-850W-HV-AFO HVAC/DC PSU in the MX301 Router.

To install the JPSU-850W-HV-AFO PSU:

1. Wrap and fasten one end of the ESD cable grounding strap around your bare wrist and connect the other end to a site ESD point.
2. If the PSU slot in the chassis has a cover panel on it, remove the cover panel. Save the cover panel for subsequent use.
3. Taking care not to touch the pins, leads, or solder connections on the PSU, remove the PSU from the bag.
4. Using both hands, place the PSU in the PSU slot on the rear panel of the router. Slide the PSU straight into the chassis until the PSU is fully seated in the chassis slot and the release latch slides into place. Ensure that the PSU faceplate is flush with the adjacent PSU faceplate.

Figure 41: Install the HVAC/DC PSU



5. Connect the power cords (see "Connect HVAC/DC Power to the MX301" on page 135).

CHAPTER 6

Cooling System

IN THIS CHAPTER

MX301 Cooling System

SUMMARY

The cooling systems on the MX301 work together to keep the temperature of all internal components within the acceptable range. The cooling system components in the MX301 include fan modules and power supply cooling systems.

IN THIS SECTION

The MX301 Router includes six fan modules ("JNP-FAN3-1RU" on page 79) that support 5+1 redundancy. Each fan module uses two 40 mm x 40 mm counter-rotating fans.

The fan modules in the MX301 are hot-insertable and hot-removable field-replaceable units (FRUs). You can install the fans in the fan module slots on the rear of the chassis. The fans are numbered **0** through **5** starting from the fan module closest to the grounding points on the chassis.

Airflow

The MX301 has a front-to-back (**AIR OUT**) cooling system.

In a front-to-back cooling system, cool air enters through the front vents. The fan modules then exhaust hot air through the rear of the chassis. Figure 42 on page 78 shows the airflow through the MX301 chassis.

Figure 42: Airflow Through the MX301 Chassis

Temperature sensors in the chassis monitor the temperature within the chassis. Under normal operating conditions, the fan modules operate at a moderate speed. If a fan fails, the speed of the remaining fans is automatically adjusted to keep the temperature within the acceptable range. If the ambient temperature rises above a threshold, similarly, fan speeds are automatically adjusted to maintain the acceptable temperature range. If the ambient temperature exceeds the specified threshold and the system cannot adequately cool down, the Routing Engine shuts down the router by disabling output power from each power supply.

If one of the fans in a fan module fails, the MX301 Router will raise an alarm for the fan tray slot with the failed fan. The router will however continue to operate without issues. You can leave the fan module with the failed fan in the chassis until a replacement fan module is available. When a replacement fan module is available and if the router is online, you can replace one fan module at a time. During replacement, the router will raise a major alarm for the missing fan module and continue to operate for a certain period after which the router will shut down. For information on how long you can safely replace a fan module under different optics and temperature settings, see Table 36 on page 79. To avoid the router from shutting down, you must replace the fan module within this time.

CAUTION: If you remove more than one fan module while the router is online, the router will shut down within *30 seconds*.

NOTE: To avoid disturbing the airflow and cooling, don't operate the router when a fan module is removed.

Table 36: Fan Replacement Duration

Optics	Ambient Temperature (at Sea Level)	Time Available to Replace a Fan Module (Seconds)
Up to 100G	25 °C (77 °F)	600
	40 °C (104 °F)	240
	55 °C (131 °F)	60
400G	25 °C (77 °F)	500
	40 °C (104 °F)	30

Power Supply Cooling System

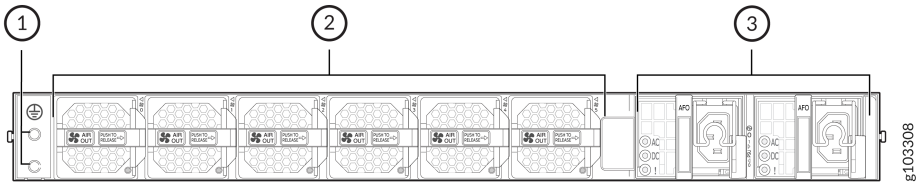
The power supply units (PSUs) are self-cooling with inbuilt fans. The PSUs are located at the rear of the MX301. A baffle directs airflow through an isolated air channel from the front of the chassis specifically to help the PSUs maintain thermal requirements.

JNP-FAN3-1RU

IN THIS SECTION

Figure 43 on page 80 shows the location of the fan modules on the back panel of the MX301.

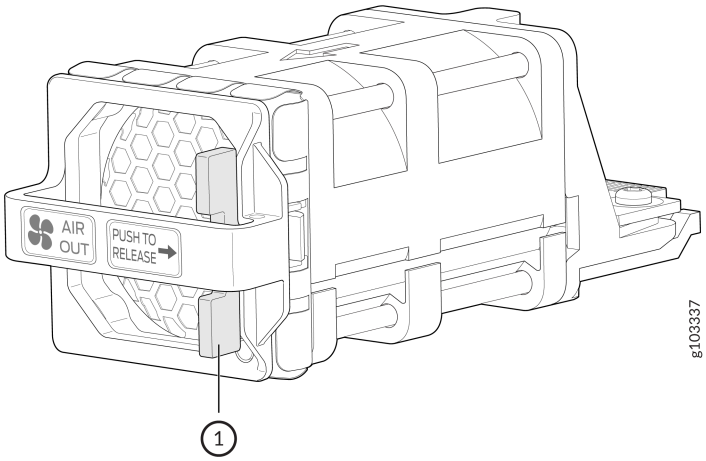
Figure 43: MX301 Rear Panel



1– Grounding point	3– Power supply module (2 units) - AC variant
2– Fan modules (6 units)	

Figure 44 on page 80 shows the JNP-FAN3-1RU fan module.

Figure 44: JNP-FAN3-1RU



NOTE: The **AIR OUT** label and the Juniper Gold handle indicates front-to-back airflow.

Table 37 on page 80 shows the components of the JNP-FAN3-1RU fan module.

Table 37: JNP-FAN3-1RU

Callout	Name
1	Release latch

JNP-FAN3-1RU Specifications

Table 38: Physical Specifications

Specification	Value
Height	1.57 in. (3.98 cm)
Width	1.57 in. (3.98 cm)
Depth	4.46 in. (11.33 cm)
Weight	0.264 lb (0.12 kg) per unit
Airflow	AFO

Table 39 on page 81 shows the power requirements for the fan module.

Table 39: Power Specifications

Specification	Value
Maximum power requirement	112 W (18.6 W per unit)
Typical power requirement	33 W (5.5 W per unit)

JNP-FAN3-1RU LED

You can check the status of each fan module through the `show chassis temperature-thresholds`, `show system alarms`, or `show chassis environment` commands. You can also check the status by looking at the LED of each fan module. The LED is positioned beneath the handle of the fan module, on the right side.

Figure 45 on page 82 shows the location of the LED on the fan module.

Figure 45: JNP-FAN3-1RU LEDs

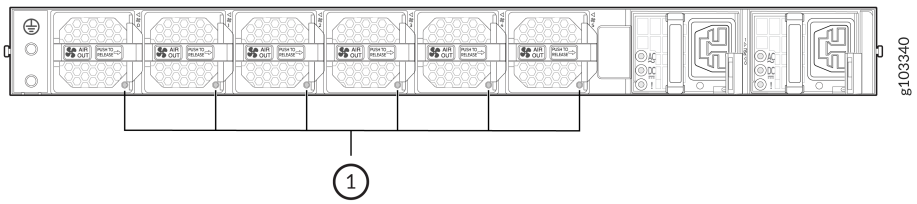


Table 40 on page 82 describes the JNP-FAN3-1RU fan module status LED.

Table 40: JNP-FAN3-1RU Status LED Behavior

Callout	LED Color	State	Description
1	Green	Blinking	Fan module hardware initialization is complete and software initialization is in progress.
		On steadily	Fan module is functioning normally.
	Red	On steadily	The system has detected an error in the fan module. Either a fan in the fan module has failed, or the fan module is seated incorrectly. If the fan has failed, replace the fan module immediately. To maintain proper airflow through the chassis, leave the fan module installed in the chassis until you are ready to replace it.
	Unlit	Off	Fan module is not present, or the fan module is powered off.

You can also get information about the fan modules using the `show chassis fan` command. Here is an example of the CLI output:

MX301 with Six Fan Modules

```
user@device> show chassis fan
Item                      Status   % RPM     Measurement
Fan Tray 0 Fan 0          OK       31%       6600 RPM
Fan Tray 0 Fan 1          OK       31%       6000 RPM
Fan Tray 1 Fan 0          OK       31%       6600 RPM
```

```
Fan Tray 1 Fan 1          OK        33%       6300 RPM
Fan Tray 2 Fan 0          OK        30%       6300 RPM
Fan Tray 2 Fan 1          OK        31%       6000 RPM
Fan Tray 3 Fan 0          OK        31%       6600 RPM
Fan Tray 3 Fan 1          OK        31%       6000 RPM
Fan Tray 4 Fan 0          OK        31%       6600 RPM
Fan Tray 4 Fan 1          OK        31%       6000 RPM
Fan Tray 5 Fan 0          OK        31%       6600 RPM
Fan Tray 5 Fan 1          OK        31%       6000 RPM
```

Replace Fans on the MX301

SUMMARY

A part of the MX301 maintenance involves removing and installing the fan modules.

IN THIS SECTION

On the MX301 Router, you can remove and replace up to one fan module without powering off the router or disrupting the device functions.

Before you remove or install a fan module, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage.

Ensure that you have the following parts and tools:

- An electrostatic discharge (ESD) grounding strap
- An antistatic bag or an antistatic mat
- A replacement fan module

CAUTION: To prevent components in the chassis from overheating and shutting down, you must replace the fan module within a certain period of removing the existing fan module. For information on how long you can safely replace a fan module under different optics and temperature settings, see Table 36 on page 79.

Remove a Fan Module from the MX301

IN THIS SECTION

Remove a JNP-FAN3-1RU

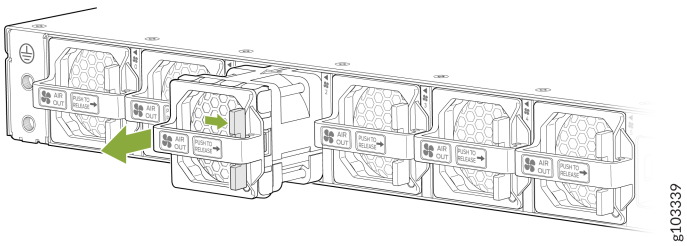
SUMMARY

This topic guides you through the steps to remove the JNP-FAN3-1RU fan module from the MX301 Router.

To remove the JNP-FAN3-1RU fan module:

1. Wrap and fasten one end of the electrostatic discharge (ESD) cable grounding strap around your bare wrist and connect the other end to a site ESD point.
2. Place the antistatic bag or the antistatic mat on a flat, stable surface.
3. Firmly hold the handle on the fan module and push the release latch to the right to release the fan module from the chassis. The direction in which you must push the release latch is indicated by the **Push to Release** label on the handle.

Figure 46: Remove the Fan Module



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

4. Pull firmly to slide the fan module halfway out of the chassis.
5. After ensuring that the fans in the fan module have stopped spinning, slide the fan module completely out of the chassis.
6. Place the fan module in the antistatic bag or on the antistatic mat.

Install a Fan Module in the MX301

IN THIS SECTION

Install a JNP-FAN3-1RU

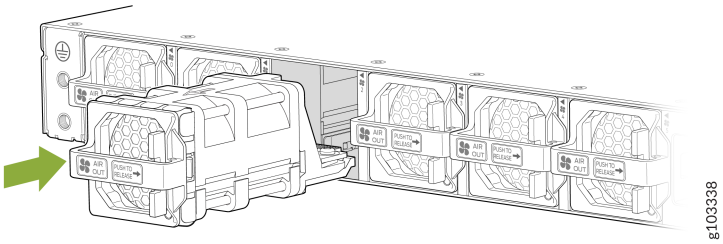
SUMMARY

This topic guides you through the steps to install the JNP-FAN3-1RU fan module in the MX301 Router.

To install the JNP-FAN3-1RU fan module:

1. Wrap and fasten one end of the electrostatic discharge (ESD) cable grounding strap around your bare wrist and connect the other end to a site ESD point.
2. Remove the replacement fan module from its bag.
3. Align the fan module in the fan module slot on the rear panel of the router and slide the module in until it is fully seated. You will hear a distinct click sound when the fan module securely latches into position.

Figure 47: Install the Fan Module



CHAPTER 7

Installation and Setup

IN THIS CHAPTER

MX301 Installation Overview

SUMMARY

This topic lists the steps that you need to follow to get your MX301 up and running.

To install and configure your MX301:

1. Unpack your device as described in "Unpack the MX301" on page 89.
2. Install the device as described in "Install the MX301" on page 91.
3. Connect cables to network devices as described in "Connect the MX301 to the Network" on page 112.
4. Connect the MX301 to external devices as described in "Connect the MX301 to External Devices" on page 120.
5. Connect the grounding cable and power supplies as described in "Connect the MX301 to Power" on page 126. Power on the device.
6. Perform initial configuration by following the instructions in "Configure Junos OS on the MX301" on page 137.

RELATED DOCUMENTATION

Site Guidelines and Requirements

Rack and Cabinet Requirements

Unpack the MX301

SUMMARY

Unpack the MX301 by following the recommended procedure and check that you have received all the components.

IN THIS SECTION

Unpack the MX301

We ship the MX301 in a cardboard carton, secured with foam packing material. The carton also includes an accessory box and a pointer card with links to the quick start instructions. You can use a box cutter or packing knife to slice open the tapes that seals the boxes.

CAUTION: The MX301 has maximum protection inside the shipping carton. Do not unpack the device until you are ready to mount it.

To unpack the device:

1. Move the shipping carton to a staging area as close to the installation site as possible. Also ensure that this area provides you with enough room to remove the device and its components.
2. Position the carton so that the arrows marked on the carton are pointing up.
3. Open the top flaps on the shipping carton.
4. Pull out the packing material holding the device in place.
5. Verify the parts received against the list in "Packing List for the MX301" on page 89.
6. Save the shipping carton and packing materials in case you need to move or ship the device later.

Packing List for the MX301

The shipment includes a packing list. Check the parts you receive in the shipping carton against the items on the packing list. We ship the parts as per the configuration that you order.

If any part on the packing list is missing, contact your customer service representative or contact Juniper customer care from within the U.S. or Canada by telephone at 1-888-314-5822. For international-dial or direct-dial options in countries without toll-free numbers, see https://www.juniper.net/support/requesting-support.html.

Table 41: Parts List for the MX301 Base Configuration

Component	Part Number	Quantity
MX301 Chassis	MX301-CHAS	1
Power supply modules (PSUs)	One of the following: • JPSU-850W-AC-AFO • JPSU-850W-DC-AFO • JPSU-850W-HV-AFO	2
Fan modules	JNP-FAN3-1RU	6
AC power cords appropriate for your geographic location (for AC power supply orders only)	See "JPSU-850W-AC-AFO" on page 43.	2
Accessory Kit (see Table 42 on page 90)	–	1

Table 42: Parts List for the Accessory Kit

Component	Quantity
Rack mount kit—JNP301-4PST-RMK (see Table 43 on page 91)	1
DC power ring terminal lugs, 14-16 AWG, sized for #6 screw (for DC power supply orders only)	8
Grounding ring terminal lug, right-angled and non-insulated	1
SFP and SFP+ transceiver dust cover	16

Table 42: Parts List for the Accessory Kit *(Continued)*

Component	Quantity
QSFP transceiver dust cover	10
Philips M5x10 mm screws with washers	2
ESD wrist strap with cable	1
Documentation roadmap card	1

Table 43: Parts List for the Rack Mount Kit (JNP301-4PST-RMK)

Component	Quantity
Chassis Brackets	2 (one each for left and right sides)
Front-Mounting Rails	2 (one each for left and right sides)
Rear-Floating Rails	2 (one each for left and right sides)

Install the MX301

SUMMARY

This topic guides you through the steps to install the MX301 on two-post racks and four-post racks.

IN THIS SECTION

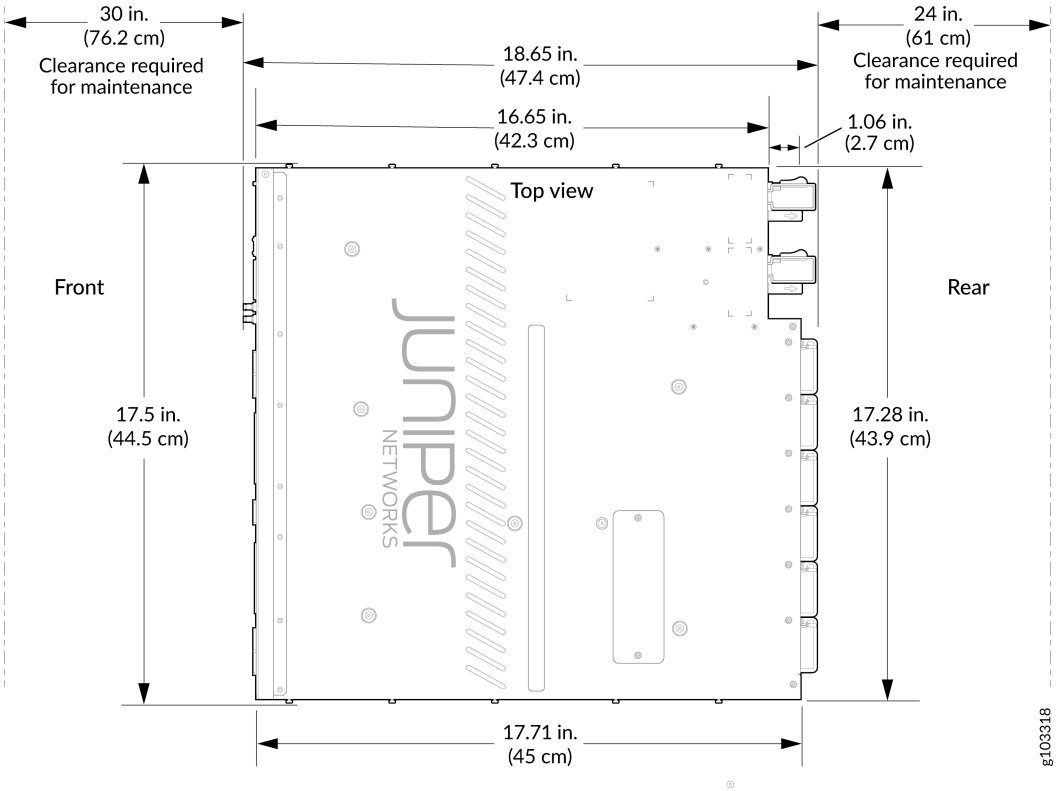
You can mount the MX301:

- On four posts of a 19-in. rack. A four-post rack mounting kit is included with the MX301 Router shipment.
- On two posts of a 19-in. rack. A two-post rack mounting kit can be ordered separately.

Complete these prerequisites before you mount the device:

- Prepare the site for installation as described in *Site Guidelines and Requirements*.
- Ensure that the site has adequate clearance for both airflow and hardware maintenance.

Figure 48: Clearance Requirements for MX301



- Unpack the device as described in "Unpack the MX301" on page 89.
- Ensure that you have all the parts and tools available to mount the MX301 in a rack. See the instructions for the rack installation kit that you are using:
  - "Mount the MX301 Router On a Four-Post Square-Holed Rack Using the JNP301-4PST-RMK Rack Mount Kit" on page 94
  - "Mount the MX301 Router On a Four-Post Threaded-Hole Rack Using the JNP301-4PST-RMK Rack Mount Kit " on page 98
  - "Center Mount the MX301 Router on a Two-Post Rack Using the JNP301-2PST-RMK Rack Mount Kit " on page 104

CAUTION:

- A qualified technician must verify that the rack or cabinet is strong enough to support the device's weight before mounting the device. Have the technician also verify that the rack or cabinet has adequate support at the installation site.
- If you are installing more than one device on a rack or in a cabinet, install the first device at the bottom of the rack.

CAUTION: MX301 Router requires 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 MX301 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 MX301. A fully loaded chassis (with an AC power supply) weighs approximately 25.53 lb (11.58 kg).

NOTE: Ensure that you support the rear of the chassis throughout the process of mounting the device on the rack.

Mount the MX301 Router On a Four-Post Square-Holed Rack Using the JNP301-4PST-RMK Rack Mount Kit

SUMMARY

Mount the MX301 on a four-post square-holed rack on your site by following the recommended procedure below.

Ensure that you have the following tools and parts available:

- An ESD grounding strap (provided)
- A pair of front-mounting and rear-floating rails (provided with the RMK)

  These mounting rails attach to the front and rear rack posts.
- A pair of chassis brackets (provided with the RMK)

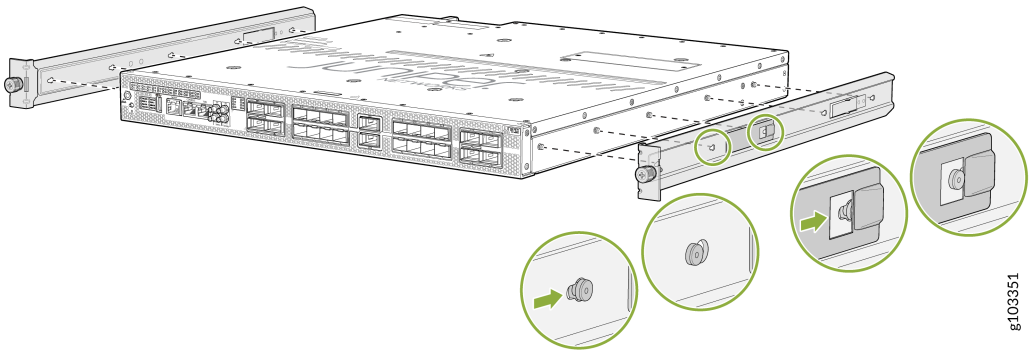
  You must attach these brackets to the device if not preinstalled.

NOTE: Juniper provides the four-post rack mounting kit (JNP301-4PST-RMK) with the MX301. If the four-post kit is lost or damaged, you can order a replacement.

To mount the device on four posts of a square-holed rack using the JNP301-4PST-RMK rack mount kit:

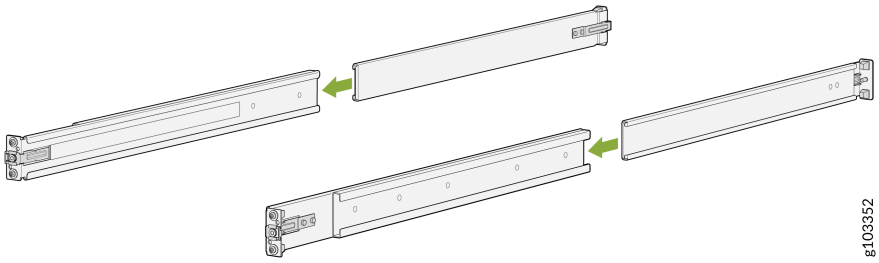
1. Review the General Safety Guidelines and Warnings.
2. Wrap and fasten one end of the electrostatic discharge (ESD) cable grounding strap around your bare wrist. Connect the other end to a site ESD point.
3. Install the chassis bracket to the chassis by aligning the keyholes on the chassis bracket over the shoulder screws on the chassis. Slide the chassis bracket toward the rear of the chassis.

Figure 49: Install the Chassis Brackets



4. Assemble the mounting rails by sliding the rear-floating rails into the respective front-mounting rails.

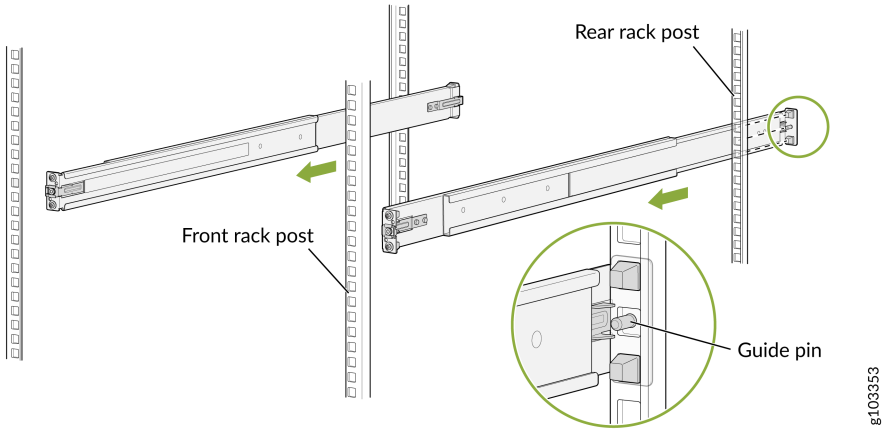
Figure 50: Assemble the Mounting Rails



5. Install the mounting rails on the four-post rack:

a. Use the guide pin to align the guide blocks of the rear-floating rails with the corresponding rear post holes. Pull the rear-floating rails toward the front of the rack to lock the rail in place. You will hear a distinct click sound when each latch locks into the corresponding rack post holes.

Figure 51: Secure Rear-Floating Rails



b. Align the guide blocks of the front-mounting rails with the front post holes. Push the front-mounting rails towards the rear of the rack to lock the rails in place. You will hear a distinct click sound when each latch locks into the corresponding rack post holes.

Figure 52: Secure Front-Mounting Rails

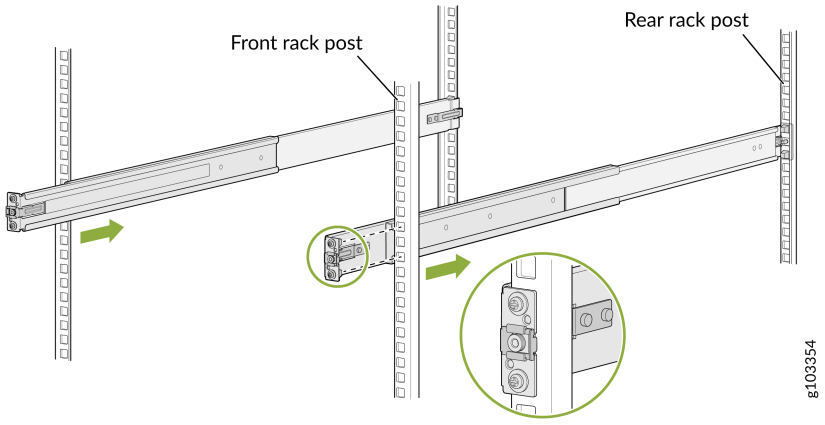
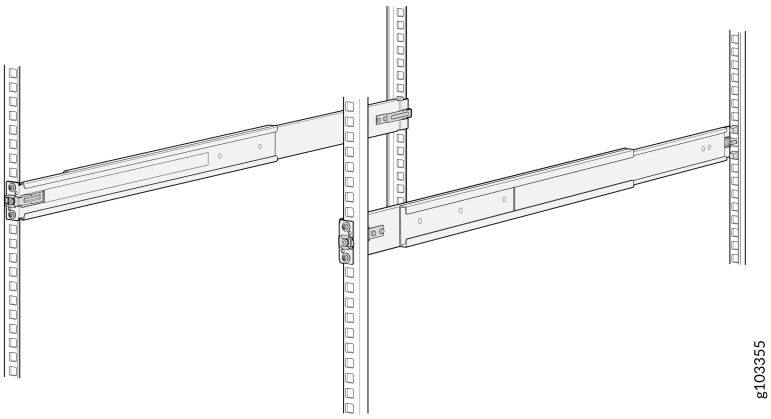


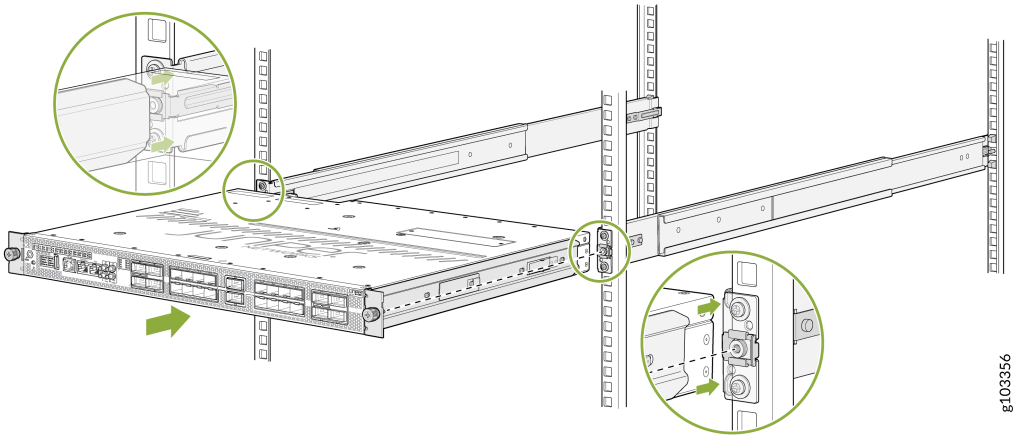
Figure 53: Both Mounting Rails Installed and Secured



c. Visually confirm that you have locked the front and rear latches of the mounting rails into the rack posts. The mounting rails should now be securely installed on the rack.

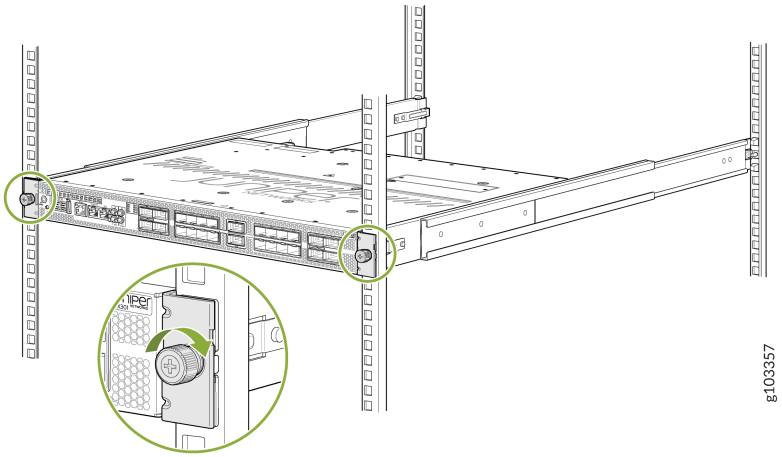
6. Lift the device and position it in the rack, aligning the chassis brackets with the mounting rails. Slide the device all the way into the channels of the rack mounting rails.

Figure 54: Slide the MX301 into the Rack



7. Tighten the two thumbscrews (in a clockwise direction) to secure the device.

Figure 55: Tighten the Thumbscrews



Mount the MX301 Router On a Four-Post Threaded-Hole Rack Using the JNP301-4PST-RMK Rack Mount Kit

SUMMARY

Mount the MX301 on a four-post threaded hole rack on your site by following the recommended procedure below.

Ensure that you have the following tools and parts available:

- An ESD grounding strap (provided)
- A Philips (+) screwdriver, number 2 (not provided)
- Eight screws appropriate for your rack to attach the mounting rails to the rack posts (not provided)
- A pair of front-mounting and rear-floating rails (provided with the RMK)

  These mounting rails attach to the front and rear rack posts.
- A pair of chassis brackets (provided with the RMK)

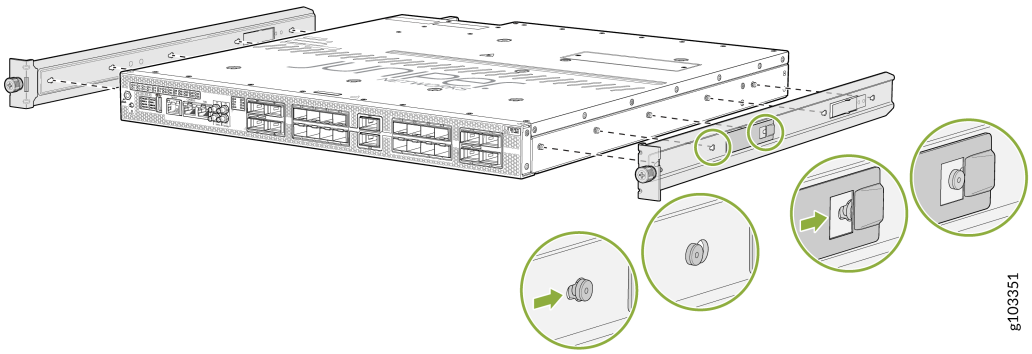
  You must attach these brackets to the device.

NOTE: Juniper provides the four-post rack mounting kit (JNP301-4PST-RMK) with the MX301. If the four-post kit is lost or damaged, you can order a replacement.

To mount the MX301 on four posts of a threaded-hole rack using the JNP301-4PST-RMK rack mount kit:

1. Review the General Safety Guidelines and Warnings.
2. Wrap and fasten one end of the electrostatic discharge (ESD) cable grounding strap around your bare wrist. Connect the other end to a site ESD point.
3. Install the chassis bracket to the chassis by aligning the keyholes on the chassis bracket over the shoulder screws on the chassis. Slide the chassis bracket toward the rear of the chassis.

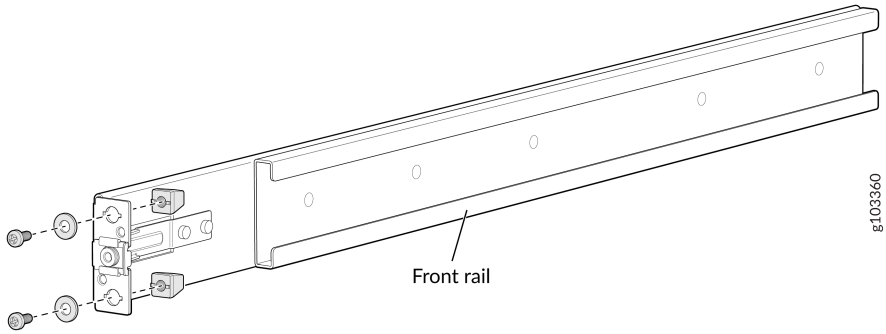
Figure 56: Attach the Chassis Brackets



4. Assemble the mounting rails:
   a. Remove the guide blocks from the front-mounting rails by loosening the screws and washers.

TIP: Retain the guide blocks, screws, and washers for later use.

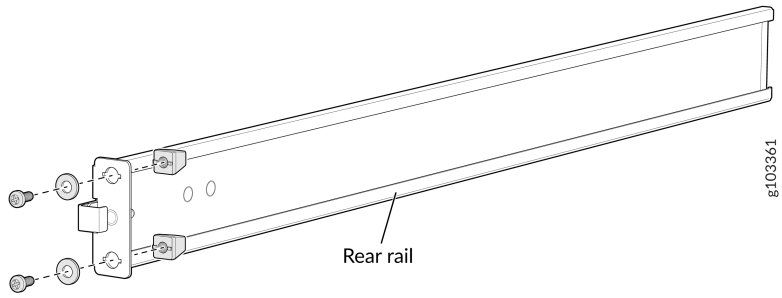
Figure 57: Remove Guide Blocks from Front-Mounting Rail



b. Remove the guide blocks from the rear-floating rails by loosening the screws and washers.

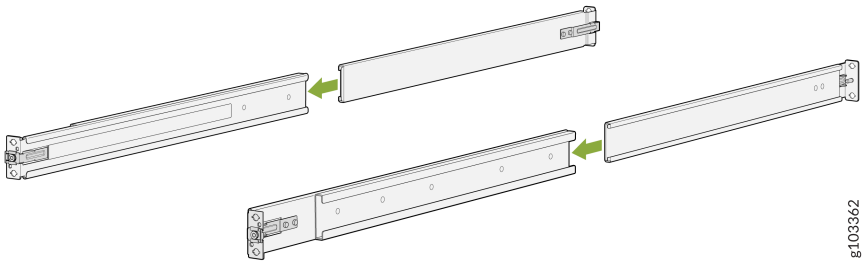
TIP: Retain the guide blocks, screws, and washers for later use.

Figure 58: Remove Guide Blocks from Rear-Floating Rail



c. Slide the rear-floating rails into the front rails.

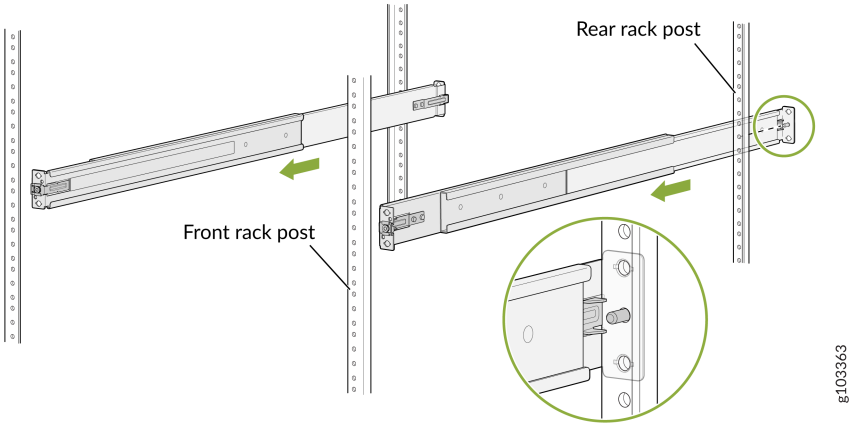
Figure 59: Assemble the Mounting Rails



5. Install the mounting rails on the four-post rack:

   a. Align and insert the guide pins of the rear-floating rails into the corresponding rear-post holes. Pull the rear-floating rails toward the front of the rack to lock the rails in place. You will hear a distinct click sound when each latch locks into the corresponding rack hole.

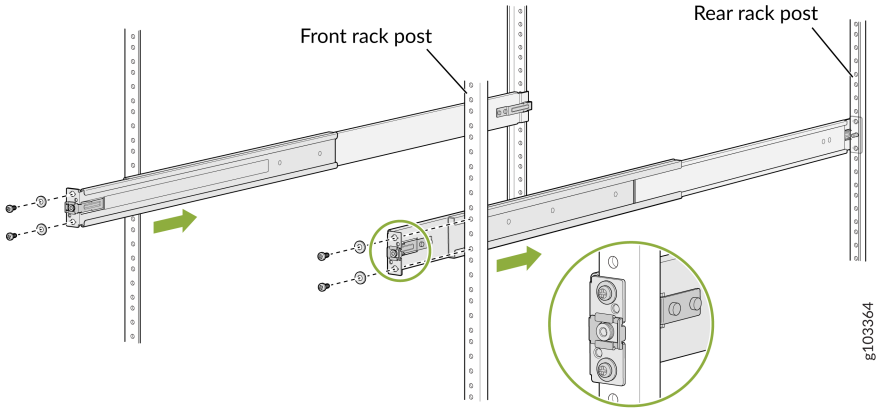
Figure 60: Install Rear-Floating Rails



   b. Align and insert the guide pins of the front-mounting rails into the corresponding front-post holes. Push each front-mounting rail into the corresponding front-post hole toward the rear of the rack to lock the rails in place. You will hear a distinct click sound when each latch locks into the corresponding rack hole.

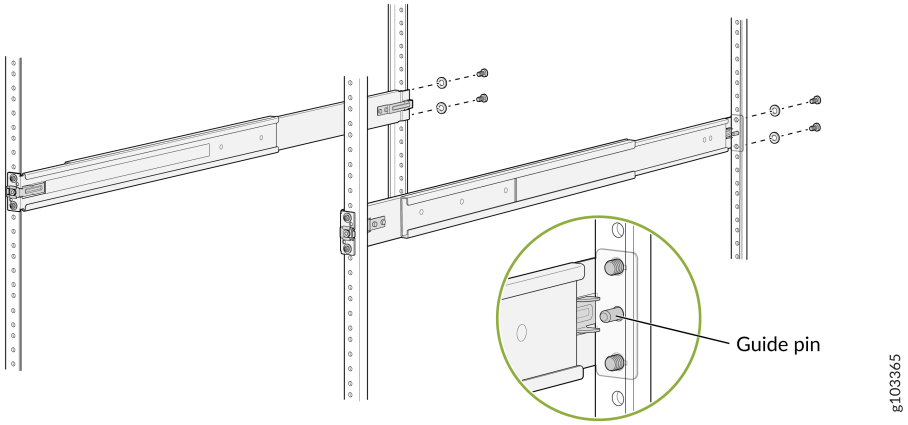
   c. Secure the front-mounting rails to the front rack post by using screws (not provided) appropriate for the thread size of your rack.

Figure 61: Secure the Front-Mounting Rails



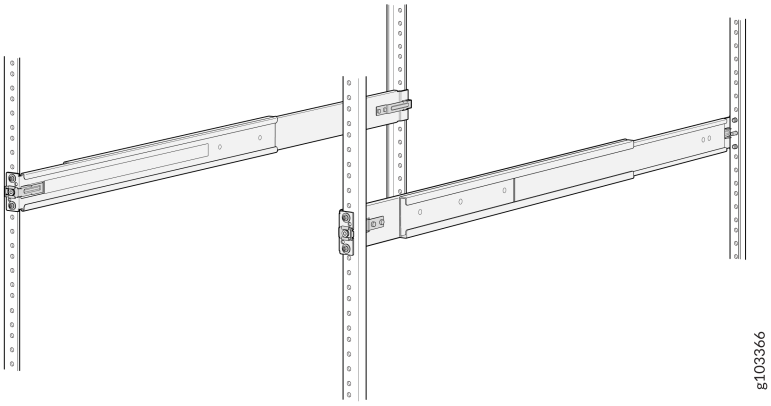
d. Secure the rear-floating rails to the rear rack post by using screws (not provided) appropriate for the thread size of your rack.

Figure 62: Secure the Rear-Floating Rails



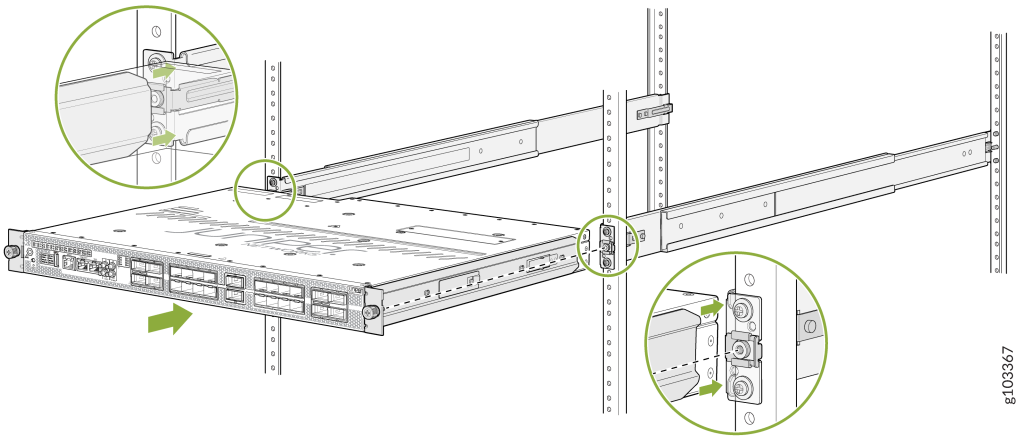
e. Visually confirm that you have locked the front and rear latches of the mounting rails into the rack posts. The mounting rails should now be securely installed on the rack.

Figure 63: Both Mounting Rails Installed and Secured



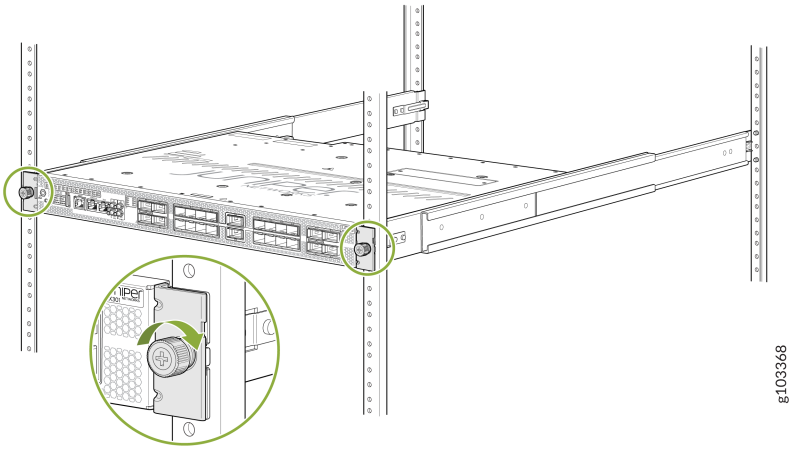
6. Lift the device and position it in the rack, aligning the chassis brackets with the mounting rails. Slide the device all the way into the channels of the mounting rails.

Figure 64: Slide the MX301 into the Rack



7. Tighten the two thumbscrews (in a clockwise direction) to secure the device.

Figure 65: Tighten the Thumbscrews



Center Mount the MX301 Router on a Two-Post Rack Using the JNP301-2PST-RMK Rack Mount Kit

SUMMARY

Mount the MX301 on a two-post rack on your site by following the recommended procedure below.

Ensure that you have the following parts and tools available:

- An ESD grounding strap (provided)
- A pair of chassis brackets (provided with JNP301-2PST-RMK)

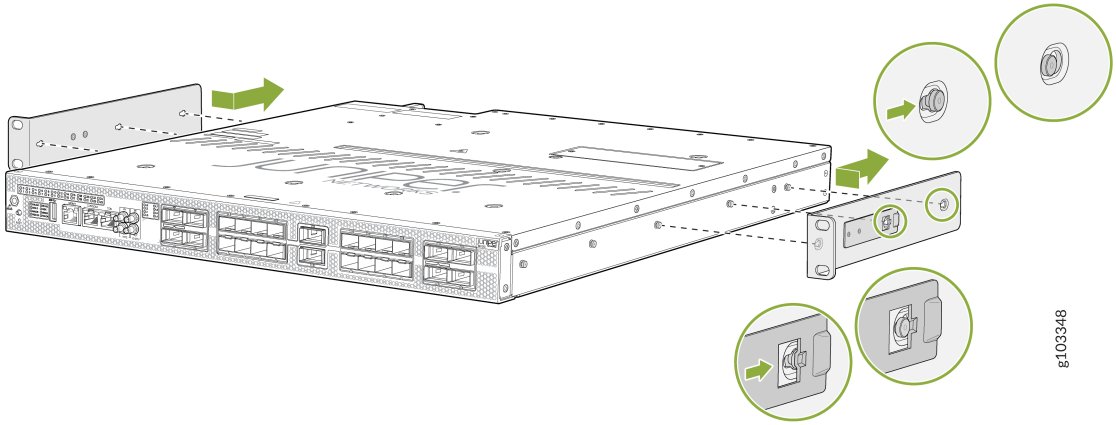
  You must attach these brackets to the device.
- Four Philips M5x12 mm screws to secure the chassis with the chassis brackets to the two posts (provided with JNP301-2PST-RMK)
- Screwdriver appropriate for the mounting screws (not provided)

NOTE: The two-post rack mounting kit (JNP301-2PST-RMK) is not included with MX301. You must order the two-post rack mounting kit separately.

To center mount the MX301 on a two-post rack using the JNP301-2PST-RMK rack mounting kit:

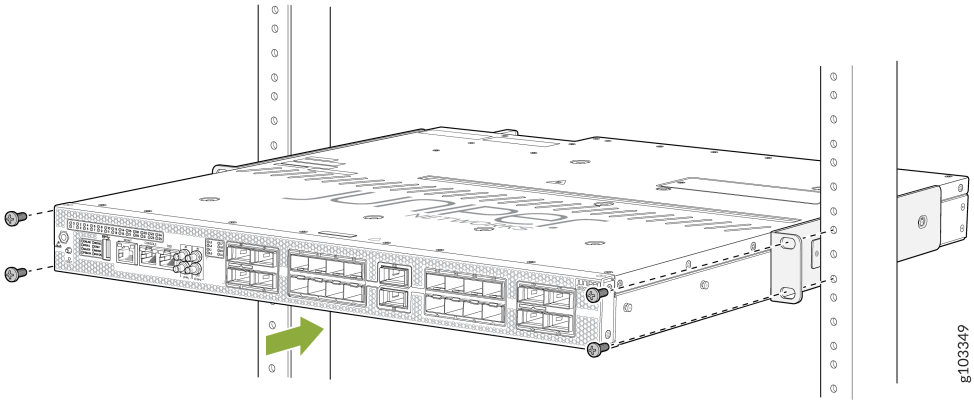
1. Review the General Safety Guidelines and Warnings.
2. Wrap and fasten one end of the electrostatic discharge (ESD) cable grounding strap around your bare wrist. Connect the other end to a site ESD point.
3. Install the chassis bracket to the chassis by aligning the keyholes on the chassis bracket with the three shoulder screws at the rear of the chassis. Slide the chassis brackets toward the rear of the chassis until the chassis brackets lock into place.

Figure 66: Install the Chassis Brackets



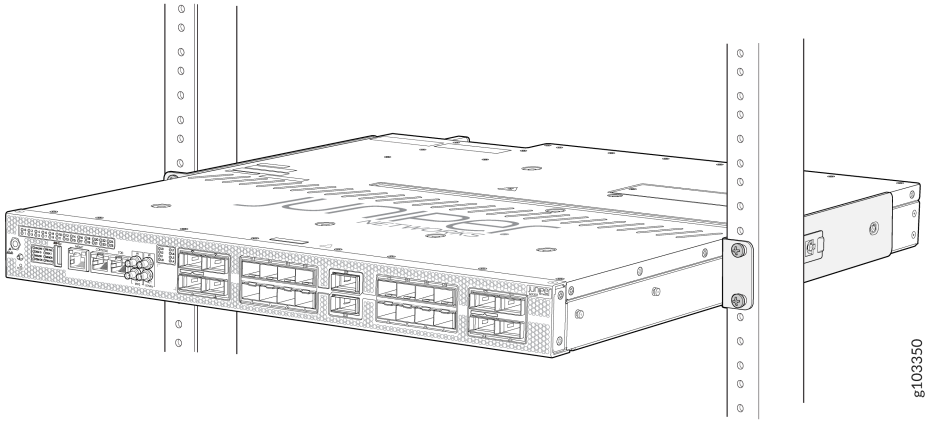
4. Have one person grasp both sides of the device, lift it, and position it in the rack so that the chassis bracket is aligned with the rack post holes.
5. Have a second person secure the chassis to the rack. Tighten the Philips M5x12 mm screws into the holes of the two-post rack. Use cage nuts and washers if your rack requires them.

Figure 67: Attach the MX301 to a Two-Post Rack



6. Inspect the installation making sure that the chassis is level. Verify that the two screws on one rack post is level with the corresponding screws on the other rack post.

Figure 68: Secured MX301 in a Two-Post Rack



MX301 Network Cable and Transceiver Planning

IN THIS SECTION

Pluggable Transceivers and Cables Supported on MX301 Router

You can find the list of transceivers and cables supported on MX301 Router and information about those transceivers and cables at the Hardware Compatibility Tool page.

NOTE: We recommend that you use only optical transceivers, optical connectors, and cables 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.

Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion

IN THIS SECTION

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 a 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.

Calculate Power Budget and Power Margin for Fiber-Optic Cables

IN THIS SECTION

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 page 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:

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 (P_B), 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 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 P_B, you can calculate the power margin (P_M), which represents the amount of power available after subtracting attenuation or link loss (LL) from the 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 44 on page 110 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 44: Estimated Values for Factors Causing Link Loss

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

Table 44: Estimated Values for Factors Causing Link Loss *(Continued)*

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

The following sample calculation for a 2-km-long multimode link with a P_B of 13 dB uses the estimated values from Table 44 on page 110. This example calculates 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 P_M is calculated as follows:

$P_M = P_B - LL$

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

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

$P_M = 7\ dB$

The following sample calculation for an 8-km-long single-mode link with a P_B of 13 dB uses the estimated values from Table 44 on page 110. This example calculates 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 P_M is calculated as follows:

$P_M = P_B - LL$

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

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

$P_M = 5.5\ dB$

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

Connect the MX301 to the Network

SUMMARY

Connecting network cables to the MX301 involves the following steps and safety precautions to prevent equipment damage and personal injury.

IN THIS SECTION

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

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.

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.

Install a Transceiver

Before you install a transceiver in a device, ensure that you have taken the necessary precautions for the safe handling of lasers (see Laser and LED Safety Guidelines and Warnings).

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

Figure 69 on page 114 shows how to install a QSFP+ transceiver. The installation procedure is same for all types of transceivers except the QSFP28 transceivers.

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

To install a 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. 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.

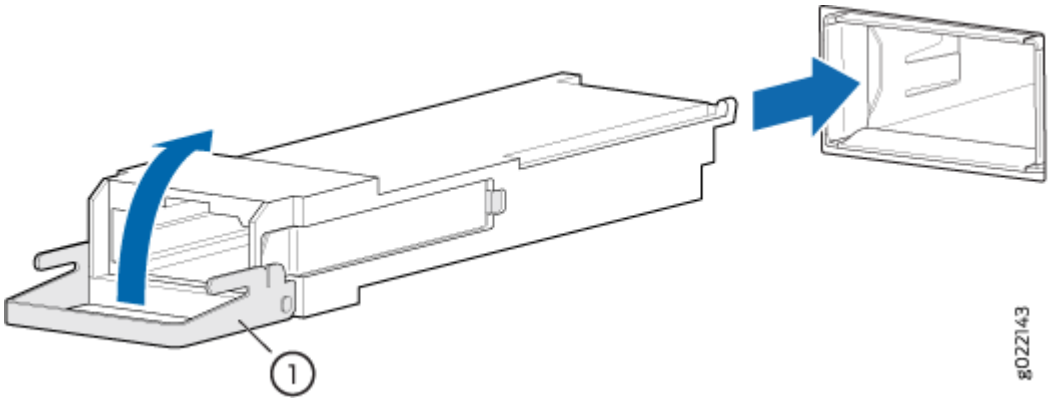
   LASER WARNING: Do not leave a fiber-optic transceiver uncovered except when inserting or removing a cable. The rubber safety cap keeps the port clean and protects your eyes from accidental exposure to laser light.

4. If the port in which you want to install the transceiver is covered with a dust cover, remove the dust cover. 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.
5. Using both hands, carefully place the transceiver in 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 to the port. Misalignment might cause the pins to bend, making the transceiver unusable.

6. Slide the transceiver in gently until it is fully seated. If you are installing a C form-factor pluggable (CFP) transceiver, use your fingers to tighten the captive screws on the transceiver.

Figure 69: Install a Transceiver



Install a QSFP28 Transceiver

Before you 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).

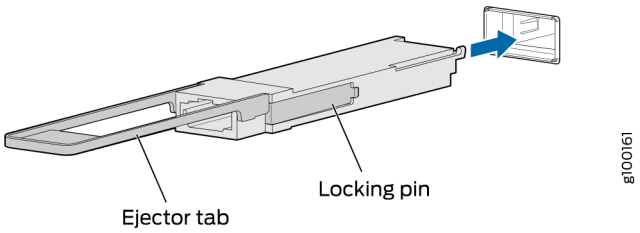
Ensure that you have a rubber safety cap available to cover the transceiver.

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

To install a QSFP28 transceiver:

1. Wrap and fasten one end of an 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.
3. Position the transceiver in front of the port on the device so that the QSFP28 connector faces the port.

Figure 70: Install a QSFP28 Transceiver



4. Slide the 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.

Connect a Fiber-Optic Cable

Before you connect a fiber-optic cable to an optical transceiver installed in a device, ensure that you have taken the necessary precautions for the safe handling of lasers (see Laser and LED Safety Guidelines and Warnings).

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.

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

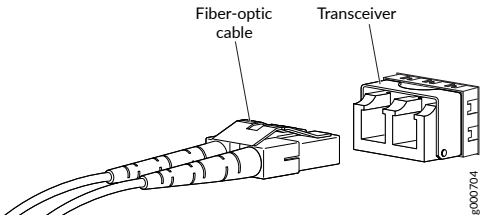
1. If the fiber-optic cable connector is covered with a rubber safety cap, remove the cap. Save the cap for subsequent use.
2. Remove the rubber safety cap from the optical transceiver. Save the cap for subsequent use.

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

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

3. Insert the cable connector into the optical transceiver.

Figure 71: Connect a Fiber-Optic Cable to an Optical Transceiver Installed in a Device



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.

   If there is a cable management system, arrange the cable in the cable management system to prevent the cable from dislodging or developing stress points.

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

MX301 Management Cable Specifications and Pinouts

IN THIS SECTION

MX301 Cable Specifications for Console and Management Connections

Table 45 on page 117 provides the specifications of the cables that connect the router to a management device.

Table 45: Specifications of the Cables for Console and Management Connections

Port on the Router	Cable Specification	Maximum Length	Device Receptacle
Console (**CON**) port	RS-232 (EIA-232) serial cable	2.13 meters	RJ-45
Management (**MGMT**) port	Category 5 cable or equivalent suitable for 1000 BASE-T operation	100 meters	RJ-45

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 USB-A adapter (JNP-CBL-RJ45-USBA)
- 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.

MX301 Management Port Connector Pinouts

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

Table 46 on page 118 provides the pinout information of the RJ-45 management port connector.

Table 46: Pinouts of the RJ-45 Management Port Connector on the MX301

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

MX301 Console Port Connector Pinouts

The console port (labeled **CON**) is an RS-232 serial interface. You must use an RJ-45 connector to connect to a console management device. The default baud rate for the console port is 9600 baud.

Table 47 on page 119 provides the pinout information for the RJ-45 console port connector.

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 router, use a combination of the RJ-45 cable and RJ-45 to DB-9 adapter and a USB to DB-9 plug adapter. You must provide the USB to DB-9 plug adapter.

Table 47: Pinouts of the Console Port Connector on the MX301

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

MX301 BITS Port Connector Pinouts

Table 48 on page 119 provides the pinout information for the BITS port connector.

Table 48: Pinouts of the BITS Port Connector on the MX301

Pin	Signal	Description
1	RX ring	Rx_N connection
2	RX tip	Rx_P connection
3	No connection	—

Table 48: Pinouts of the BITS Port Connector on the MX301 *(Continued)*

Pin	Signal	Description
4	Tx ring	Tx_N connection
5	Tx tip	Tx_P connection
6	No connection	—
7	No connection	—
8	No connection	—

Connect the MX301 to External Devices

SUMMARY

This topic guides you on how to connect your MX301 to external mangement or timing devices.

IN THIS SECTION

You can monitor and manage the MX301 by using a dedicated management channel. Use the management port to connect your device to the management device.

You can also connect the MX301 to external clocking and timing devices.

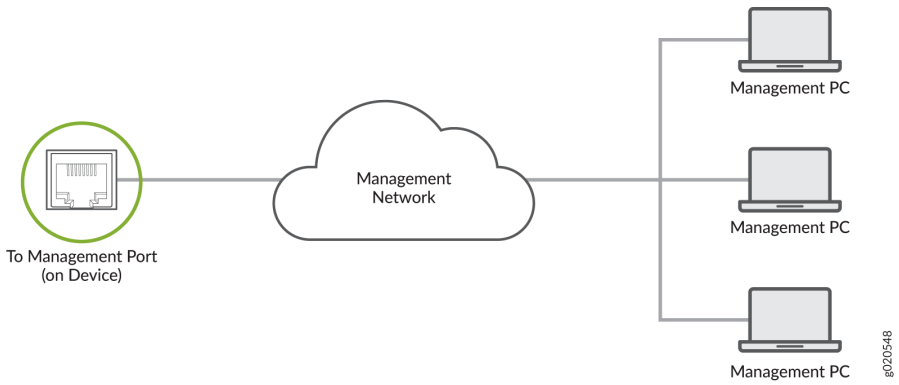
Connect the MX301 to a Network for Out-of-Band Management

Ensure that you have an Ethernet cable that has an RJ-45 connector at each end.

To connect a device to a network for out-of-band management (OOBM):

1. Wrap and fasten one end of an electrostatic discharge (ESD) grounding strap to your bare wrist and connect the other end of the strap to one of the ESD points on the chassis.
2. Connect one end of the Ethernet cable to the management port on the device.
3. Connect the other end of the cable to the management device.

Figure 72: Connect Your Device to a Network for Out-of-Band Management



Connect the MX301 to a Management Console Using an RJ-45 Connector

Ensure that you have an Ethernet cable that has an RJ-45 connector at either end. You will also need the appropriate adapter (not provided) depending upon your console server or management console.

You can separately order the following adapters from Juniper Networks:

- RJ-45 to DB-9 adapter (JNP-CBL-RJ45-DB9)
- RJ-45 to USB-A adapter (JNP-CBL-RJ45-USBA)

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

> **NOTE**: If you want to use the 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.

To connect the device to a management console:

1. Wrap and fasten one end of an electrostatic discharge (ESD) grounding strap to your bare wrist and connect the other end of the strap to one of the ESD points on the chassis.
2. Connect one end of the Ethernet cable to the console port on the device.
3. Connect the other end of the cable to the console server or PC.

Figure 73: Connect Your Device to a Management Console Through a Console Server

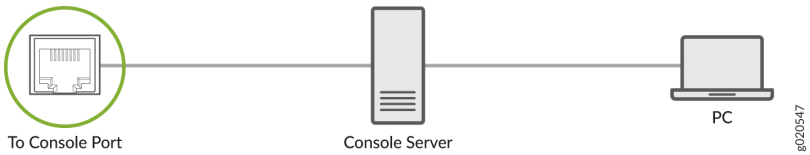


Figure 74: Connect Your Device Directly to a Management Console

Connect Your Device to a Management Console Using a Mini USB-B Connector

Ensure that you have a USB cable that has a mini USB-B connector at one end and a standard USB-A connector at the other. You will also need the appropriate adapter (not provided) depending upon your console server or management console.

Ensure that the USB-to-serial driver is installed on the host machine.

By default, the RJ-45 port is the active console port. You must configure the mini USB-B console port before using it. Set the HyperTerminal properties of the console server or management console as follows:

- Baud rate—9600
- Flow control—None
- Data—8
- Parity—None
- Stop bits—1
- DCD state—Disregard

To connect the device to a management console:

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.
2. Connect the mini USB-B connector of the USB cable to the console port on the device.
3. Connect the standard USB-A connector of the cable to the console server or management console.

Figure 75: Connect Your Device to a Management Console Through a Console Server

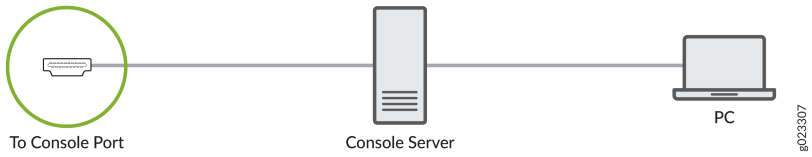


Figure 76: Connect Your Device Directly to a Management Console

4. Use the `set system ports auxiliary port-type mini-usb` command to enable logging in to the device by using the mini USB-B console port.
5. Reboot the device. The boot logs and the login prompt appear on the console connected to the mini USB-B port.

Connect Your Device to a Management Console Using a USB-C Connector

Ensure that you have a USB cable that has a USB-C connector at either end. You will also need the appropriate adapter (not provided) depending upon your console server or management console.

Ensure that the USB-to-serial driver is installed on the host machine.

By default, the RJ-45 port is the active console port. You must configure the USB-C console port before using it. Set the HyperTerminal properties of the console server or management console as follows:

- Baud rate—9600
- Flow control—None
- Data—8
- Parity—None
- Stop bits—1
- DCD state—Disregard

To connect the device to a management console:

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.
2. Connect one end of the USB cable to the console port on the device.
3. Connect the other end of the cable to the console server or management console.

Figure 77: Connect Your Device to a Management Console Through a Console Server

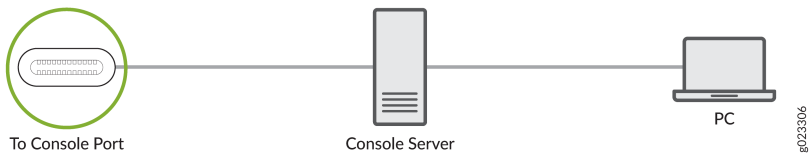


Figure 78: Connect Your Device Directly to a Management Console

4. Use the `set system ports auxiliary type ansi` command to enable logging in to the device by using the USB-C console port.
5. Use the `request system boot-console auxiliary` command to see the boot logs on the console connected to the USB-C port.

   Note that only the Junos OS boot logs will be visible on the console connected to the USB-C port.
6. Reboot the device. The boot logs and the login prompt appear on the console connected to the USB-C port.

Connect the MX301 to External Clocking and Timing Devices

IN THIS SECTION

Connect 1-PPS and 10-MHz Timing Devices

Your device has GPS clock ports that you can use to connect it to a 1-pulses per second (PPS) and 10-megahertz (MHz) timing device. These ports require 2x1 DIN 1.0/2.3 latching plug connectors.

You can configure your device as a timing primary device or a client device. As a timing primary device, the device receives inputs from the timing device through the input ports and sends outputs to a client device through the output ports. As a timing client device, the device receives inputs from the timing device through the input ports.

To connect your device to a 1-PPS and 10-MHz timing device:

1. If your device is a timing client device, connect one end of each 2x1 DIN 1.0/2.3 cable to each input port on your device.

   If your device is a timing primary device, connect it to a client device by using the output ports.

NOTE: Ensure that you use a cable of 3 meters or less.

Ensure that the timing device supports an input or output impedance of 50 ohms and input and output voltage levels that comply with ITU G.703. The timing device inputs must be 5-volt (V) tolerant.

2. Connect the other end of each cable to each 1-PPS and 10-MHz connector on the timing device.

Connect the MX301 to a Time-of-Day Device

You can use the time-of-day (TOD) port on your device to connect it to a TOD timing device.

To connect your device to a TOD timing device:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to one of the ESD points on the chassis.
2. Plug one end of an RJ-45 cable into the TOD port.

NOTE: Ensure that you use a cable of 6 meters or less in length.

3. Plug the other end of the RJ-45 cable into the TOD timing device.
4. Configure the port.

Connect the MX301 to Power

SUMMARY

Connect the MX301 to power by performing the following steps. Take safety precautions to prevent equipment damage and personal injury

IN THIS SECTION

Ground the MX301

To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the MX301 to an earth ground before you connect it to power.

NOTE: Before you connect an earth ground to the protective earthing terminal of the device, ensure that a licensed electrician attaches an appropriate grounding terminal to the grounding cable. Using a grounding cable with an incorrectly attached terminal can damage the device.

NOTE: You must install the router in a restricted-access location and ensure that the chassis is always properly grounded. The router has a two-hole protective grounding 73 terminal on the rear panel. Under all circumstances, use this grounding connection to ground the chassis. For AC and HVAC/HVDC-powered systems, you must also use the grounding wire in the power cord along with the two-hole protective grounding lug connection. This tested system meets or exceeds all applicable EMC regulatory requirements with the two-hole protective grounding terminal.

Before connecting the device to an earth ground, ensure that you have the following parts and tools:

- An electrostatic discharge (ESD) grounding strap (provided).
- Terminal lug (provided)—Panduit LCD6-14AF-L terminal lug or an equivalent lug are sized for 6 AWG (4.11 mm^2) power source cables. The 2-hole terminal lug connects to the grounding point located at the rear panel of the MX301.
- Grounding cable for your device (not provided)—The grounding cable must be 6 AWG (4.11 mm^2) stranded wire and rated 90 °C or according to local electrical code.
- A Phillips (+) screwdriver, number 2 to tighten the screw (not provided).

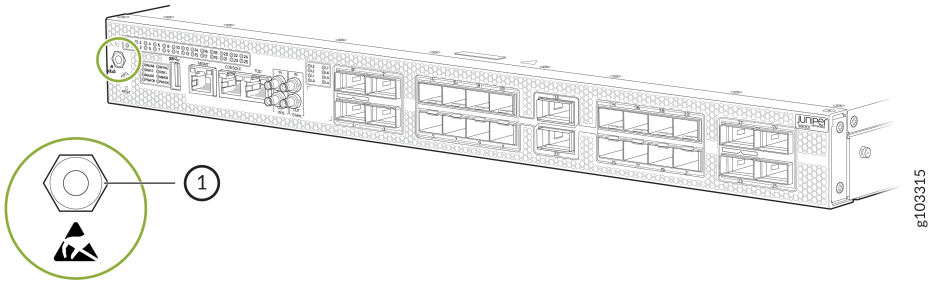
You must install heat-shrink tubing insulation around the crimped section of the power source cables and lugs.

Under all circumstances, use the chassis grounding point to ground the chassis to earth ground.

To ground the MX301:

1. Wrap and fasten one end of the ESD grounding strap around your wrist. Connect the other end to the ESD point on the chassis.

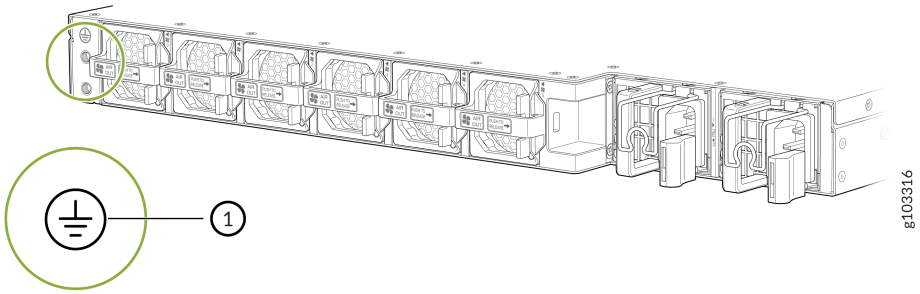
Figure 79: Chassis ESD Point



1– ESD point

2. Ensure that all grounding surfaces are clean and brought to a bright finish before making the grounding connections.
3. Connect the grounding cable to a proper earth ground, such as the rack in which you mount the device.
4. Using the Phillips screwdriver, remove the screws from the chassis grounding point.

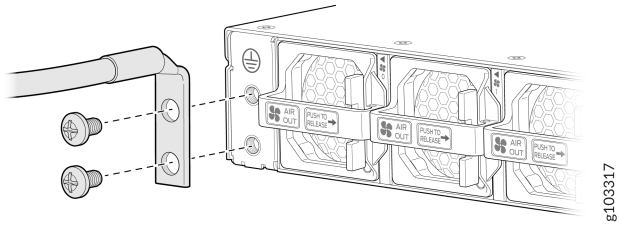
Figure 80: Grounding Point on the MX301



1– Grounding point

5. Secure the terminal lug attached to the other end of the ground cable to the chassis grounding point. Use the screws that you removed from the chassis grounding point in the earlier step.

Figure 81: Connect the Terminal Lugs to the MX301



6. Verify that the grounding cable does not touch or block access to the device components. Make sure that the cable does not trail across the floor where people could trip over it.

NOTE: Ensure that the device is permanently connected to ground during its operation.

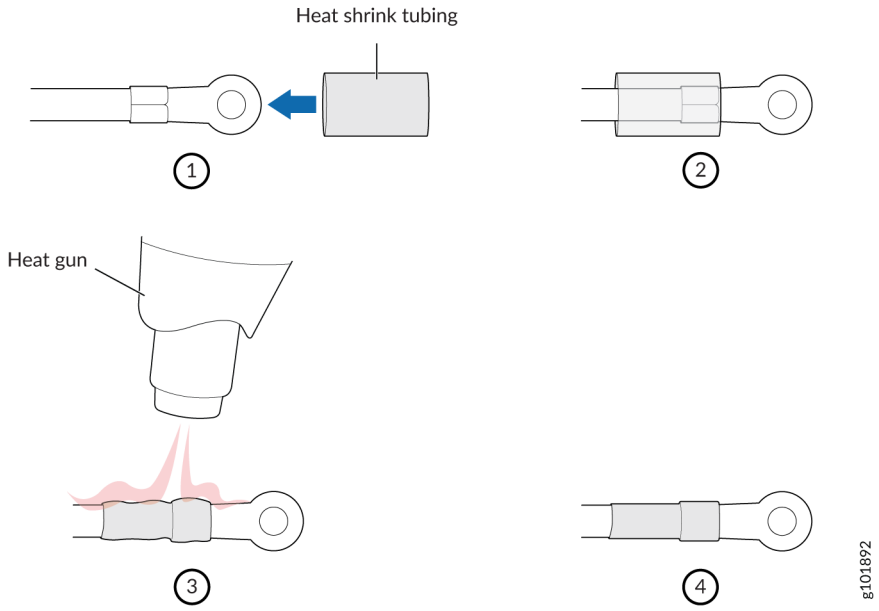
Install Heat-Shrink Tubing on a Power Cable

To install heat-shrink tubing insulation around the power cables:

1. 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.
2. 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.

CAUTION: Do not overheat the tubing.

Figure 82: Install Heat-Shrink Tubing



Connect AC Power to the MX301

IN THIS SECTION

Power supply units (PSUs) in the MX301 are hot-removable and hot-insertable field-replaceable units (FRUs) with support for 1+1 redundancy. You can remove and replace a redundant PSU without powering off the MX301 or disrupting the device functions.

CAUTION: Do not mix AC, DC, and HVAC/DC power supplies in the same chassis.

Before you begin to connect AC power to the device:

- Ensure that you have connected the chassis to an earth ground (see "Ground the MX301" on page 127).

- Ensure that you have a power cord appropriate for your geographical location available to connect AC power to the device.
- Ensure that you familiarize yourself with AC Power Electrical Safety Guidelines and Action to Take After an Electrical Accident.
- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage.
- Ensure that you have an ESD grounding strap.
- If not already installed, install the PSUs in the device (see "Replace an AC PSU on the MX301" on page 68).

Connect the JPSU-850W-AC-AFO to Power

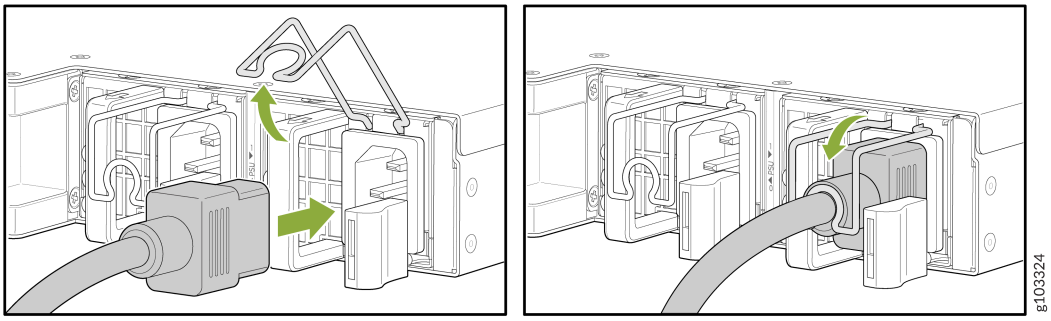
SUMMARY

This topic guides you through the steps to connect the JPSU-850W-AC-AFO AC PSU to power.

To connect the JPSU-850W-AC-AFO to power:

1. Wrap and fasten one end of the ESD cable grounding strap around your bare wrist. Connect the other end to a site ESD point.
2. Lift the power cord retainer on the PSU. See Figure 83 on page 132.
3. Locate the AC power cords shipped with the MX301. The cords have plugs appropriate for your geographical location. See "JPSU-850W-AC-AFO" on page 43.
4. Insert the coupler end of the power cord into the power inlet of the AC PSU.
5. Pull down the power cord retainer onto the power cord.

Figure 83: Connect power cord to the MX301 AC PSU



6. If the AC power source outlet has a power switch, set it to the off (O) position.
7. Insert the power cord plug into the AC power source outlet.

> **NOTE**: Connect each PSU to a dedicated AC power feed and a dedicated external circuit breaker. We recommend that you use a circuit breaker rated at a minimum of 16 A (250 VAC), or as permitted by the local code.

8. If the AC power source outlet has a power switch, set it to the on (|) position.

Connect DC Power to the MX301

IN THIS SECTION

Power supply units (PSUs) in the MX301 are hot-removable and hot-insertable field-replaceable units (FRUs) with support for 1+1 redundancy. You can remove and replace a redundant PSU without powering off the MX301 or disrupting the device functions.

> **CAUTION**: Do not mix AC, DC, and HVAC/DC power supplies in the same chassis.

Before you begin to connect DC power to the device:

- Ensure that you have connected the chassis to an earth ground (see "Ground the MX301" on page 127).

- Ensure that you familiarize yourself with DC Power Electrical Safety Guidelines and Action to Take After an Electrical Accident.
- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage.
- Ensure that you have an ESD grounding strap.
- If not already installed, install the PSUs in the device (see "Replace a DC PSU on the MX301" on page 70).

You connect DC power to MX301 by attaching power cables from the external DC power sources to the terminal studs on the power supply faceplates. The power cables for the DC PSUs are rated at 14 AWG or as permitted by the local code.

Connect the JPSU-850W-DC-AFO to Power

SUMMARY

This topic guides you through the steps to connect the JPSU-850W-DC-AFO DC PSU to power.

To connect the JPSU-850W-DC-AFO to power:

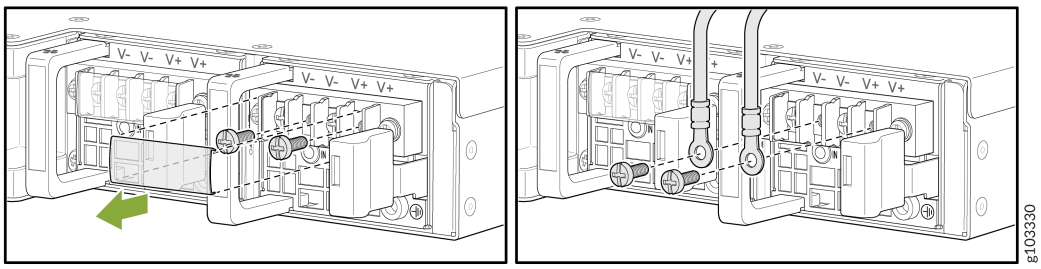
1. Wrap and fasten one end of the ESD cable grounding strap around your bare wrist. Connect the other end to a site ESD point.
2. Switch off the dedicated facility circuit breakers. Ensure that the voltage across the DC power source cable leads is 0 V. You must ensure that the cable leads do not become active during installation.
3. Install heat-shrink tubing insulation around the power cables (see "Install Heat-Shrink Tubing on a Power Cable" on page 129).
4. Remove the clear plastic cover that protects the terminal studs on the faceplate.
5. Verify that you have correctly labeled the DC power cables before making connections to the PSU.

   In a typical power distribution scheme where the return (RTN) cable is connected to chassis ground in a battery plant, you can use a multimeter to verify the ohm output of the -48 V and return (RTN) DC cables to chassis ground. The cable with very large resistance (indicating an open circuit) to chassis ground will be -48 V. The cable with very low resistance (indicating a closed circuit) to chassis ground will be RTN.

> **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 terminal studs on each PSU.

6. Remove the screws and square washers from the terminals using a Phillips (+) screwdriver, number 2. See Figure 84 on page 134.
7. Secure each power cable ring terminal to the terminals with the square washers and the screws. Apply between 23 in.-lb (2.6 Nm) and 25 in.-lb (2.8 Nm) of torque to each screw.

Figure 84: Connect Power Cable Ring Terminal to the MX301 DC PSU Terminal



- Secure each positive (+) DC source power cable lug to an RTN (return) terminal.
- Secure each negative (–) DC source power cable lug to a -48 V (input) terminal.

> **NOTE**: Connect each power cable to a dedicated external circuit breaker. We recommend that you use a circuit breaker rated at 20 A through 25 A for 80 VDC, or as permitted by the local code.

8. Replace the clear plastic cover over the terminal studs of the PSU faceplate.
9. Verify that the power cables are connected correctly. The cables must not touch or block access to the router components, and they must not cause a tripping hazard.
10. Switch the circuit breaker on the panel board that services the DC circuit to the ON (|) position.
11. Connect the power cables to the external DC power source. If the external DC power source has a switch, set it to the ON (|) position.

Connect HVAC/DC Power to the MX301

IN THIS SECTION

Power supply units (PSUs) in the MX301 are hot-removable and hot-insertable field-replaceable units (FRUs) with support for 1+1 redundancy. You can remove and replace a redundant PSU without powering off the MX301 or disrupting the device functions. The HVAC/DC PSU will automatically detect whether there is HVAC or HVDC input voltage and manage the power accordingly.

CAUTION: Do not mix AC, DC, and HVAC/DC power supplies in the same chassis.

Before you begin to connect HVAC or HVDC power to the device:

- Ensure that you have connected the chassis to an earth ground (see "Ground the MX301" on page 127).
- Ensure that you familiarize yourself with Action to Take After an Electrical Accident.
- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage.
- Ensure that you have an ESD grounding strap.
- If not already installed, install the PSUs in the device (see "Replace an HVAC/DC PSU on the MX301" on page 73).

Connect the JPSU-850W-HV-AFO to Power

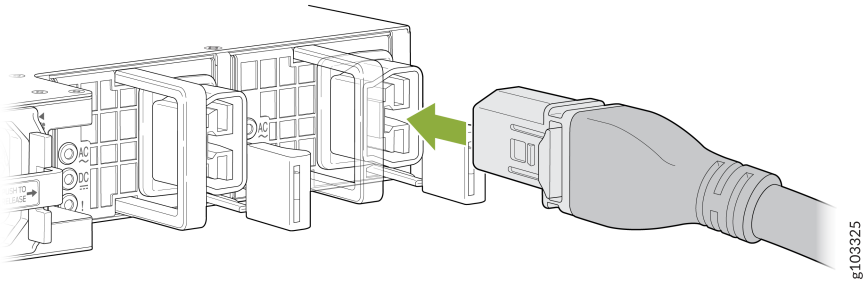
SUMMARY

This topic guides you through the steps to connect the JPSU-850W-HV-AFO HVAC or HVDC PSU to power.

To connect the JPSU-850W-DC-AFO to HVAC or HVDC power:

1. Wrap and fasten one end of the ESD cable grounding strap around your bare wrist. Connect the other end to a site ESD point.
2. Power off the AC/DC power source outlet.
3. Insert the HVAC/DC power cord firmly into the power inlet of the HVAC/DC PSU.

Figure 85: Connect Power Cord to the MX301 HVAC/DC PSU



4. Insert the power cord plug into the AC/DC power source outlet.

> **NOTE**: Each PSU must be connected to a dedicated HVAC/HVDC power feed and a dedicated external circuit breaker. We recommend that you use a circuit breaker rated at a minimum of 16 A (250 VAC), or as permitted by the local code.

5. Route 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. If the power source outlet has a power switch, power it on.

Register Products—Mandatory to Validate SLAs

Juniper Networks auto registers newly purchased products based on the end customer information provided at the point of sale. Registering products and changes to products activates your hardware replacement service-level agreements (SLAs).

> **CAUTION**: Update the installation base data if any installation base data is added or changed or if the installation base is moved. Juniper Networks is not responsible for customers not meeting the hardware replacement service-level agreement (SLA) for products that do not have registered serial numbers or accurate installation base data.

To know more about how to register your product and update your installation base, see Juniper Networks Product Registration and Install Base Management.

Configure Junos OS on the MX301

SUMMARY

This topic guides you through the initial configuration of your MX301 by using the Junos OS CLI.

IN THIS SECTION

The MX301 Router is shipped with the Junos OS preinstalled and ready to be configured when the router is powered on. Two Serial Peripheral Interface (SPI) flash memories store the boot image to provide redundancy. If the primary flash memory fails, the Junos OS boots from the secondary SPI flash memory.

A USB storage device can be inserted into the USB slot in the front panel of the chassis. The router also has two M.2-based solid-state drives (SSDs) that act as the primary boot devices (**nvme0n1** and **nvme1n1**). When the router boots, it first attempts to load the Junos OS image from the USB flash memory drive if it detects this drive. If the attempt fails because the USB flash drive is missing or for some other reason, the router tries the primary boot device and then the secondary boot device.

You can use the Junos OS command line interface (CLI) to perform the initial configuration.

Access the CLI on the MX301

To access the CLI on your device:

1. Verify that the device is powered on.
2. Connect the management device to the serial console port.
3. Start your asynchronous terminal emulation application (such as Microsoft Windows HyperTerminal) and select the appropriate COM port to use (for example, COM1).
4. Configure the serial port settings with the following values:
   - Baud rate—9600

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

5. Power on the device. You can start performing initial software configuration on the device after the device is up.

> **NOTE**: After you complete the initial configuration, you can connect your device to a network for out-of-band management.

Configure Root Authentication and Management Interface from the CLI

The MX301 Router ships with factory-default settings that enable zero-touch provisioning (ZTP). These settings load as soon as you power on the switch. In this case, as we configure the router manually, we disable ZTP during the initial configuration.

When you don't use ZTP, you must perform the initial configuration of an MX301 router through the console port (**CONSOLE**) using the Junos OS command-line interface (CLI).

Gather the following information before configuring the device:

- Router's host and domain name
- IP address and subnet mask for the management and loopback interfaces
- IP address of a default gateway for the management network
- IP address of a DNS server
- Root user's password

To configure root authentication and the management interface:

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

1. Start the CLI.

```
root@:~ # cli
root>
```

2. Enter configuration mode.

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

3. Set the root authentication password by entering either a plain text password, an encrypted password, or an SSH public key string (ECDSA, ED25519, or RSA).

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

or

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

or

```
[edit]
root# set system root-authentication (ssh-ecdsa | ssh-ed25519 | ssh-rsa) public-key
```

4. Remove factory default configuration statements that relate to ZTP. After you commit these initial changes, the ZTP process is stopped and the related console messages are no longer displayed.

```
[edit]
root@# delete system commit
root@# delete chassis auto-image-upgrade
root@# delete interfaces fxp0
```

5. Configure the IP address and prefix length for the router's management Ethernet interface (fxp0). You also configure an IPv4 address on the loopback interface in this step. Having a routable IP

address on the loopback interface is a best practice and is generally needed later, when you configure routing protocols.

```
[edit]
root# set interfaces fxp0 unit 0 family inet address address/prefix-length
root# set interfaces lo0 unit 0 family inet address address/32
```

6. Perform an initial commit to activate the modified configuration.

```
[edit]
root# commit
commit complete
[edit]
root#
```

7. Configure the router's host name. If the name includes spaces, enclose the name in quotation marks (“ ”).

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

8. Configure the router’s domain name.

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

9. Configure the IP address of a DNS server.

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

10. Configure one or more static routes to remote subnets that have access to the management subnet. Without static routing, access to the management port is limited to devices attached to the management subnet. For more information about static routes, see Configure Static Routes.

In our example, we define a single default static route to provide management network reachability to all possible remote destinations.

```
[edit]
root# set routing-options static route 0.0.0.0/0 next-hop destination-IP retain no-
readvertise
```

11. Configure the IP address of a backup router. The backup router is used only while the routing protocol is not running. The primary use of the backup router is to provide routing capability for the management port on the backup Routing Engine. This is because the backup Routing-Engine does not run the routing protocol daemon (rpd).

    In most cases, the IP address of the backup router is the same as the next-hop IP address used for the management network's static routes. We configure a default route to provide the backup Routing Engine with reachability to all possible remote destinations.

```
[edit]
root# set system backup-router address
root# set system backup-router destination 0.0.0.0/0
```

12. Configure remote access for the root user over SSH. By default the root user can log in only through the console port. The `root-login allow` statement permits remote login for the root user.

```
[edit]
root# set system services ssh root-login allow
```

13. (Optional) Verify if the configuration is correct.

```
[edit]
root# show
system {
    host-name host-name;
    root-authentication {
        authentication-method (encripted-password | public-key);
    }
     services {
        ssh {
            root-login allow;
        }
    }
    domain-name domain-name;
```

```
    backup-router address destination 0.0.0.0/0;

    name-server {
        address;
    }
}
interfaces {
    fxp0 {
        unit 0 {
            family inet {
                address address/prefix-length;
            }
        }
    }
lo0 {
        unit 0 {
            family inet {
                address address/32;
            }
        }
    }
}
routing-options {
    static {
        route 0.0.0.0/0 next-hop destination-IP;
    }
}
```

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

```
[edit]
root# commit
commit complete

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

15. When you've finished configuring the router, exit configuration mode.

```
[edit]
root@host-name# exit
Exiting configuration mode
```

```
root@host-name>
```

The initial configuration is now complete. At this point, you should be able to remotely access the device as the root user through SSH.

CHAPTER 8

Maintenance

IN THIS CHAPTER

Routine Maintenance Guidelines for the MX301

To maintain optimum performance of the device, you must regularly follow the preventive maintenance guidelines below:

- Inspect the installation site for moisture, loose wires or cables, and excessive dust.
- Ensure that the airflow in unobstructed around the device and into the air intake vents.
- Check status LEDs on the front panel of the device.

Maintain the MX301 Transceivers and Fiber-Optic Cables

IN THIS SECTION

Remove a Transceiver

Before you remove 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).

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

The transceivers for Juniper Networks devices are hot-removable and hot-insertable field-replaceable units (FRUs). You can remove and replace the transceivers 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.

Figure 86 on page 147 shows how to remove a quad small form-factor pluggable plus (QSFP+) transceiver. The procedure is the same for all types of transceivers except the QSFP28 and C form-factor pluggable (CFP) transceivers.

To remove a transceiver from a device:

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 rack.
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 protects your eyes from 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 (see Disconnect a Fiber-Optic Cable). 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. If there is a cable management system, 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.
6. To remove an SFP56-DD, SFP, SFP+, XFP, a QSFP+, or QSFP56-DD transceiver:

a. Using your fingers, pull open the ejector lever on the transceiver to unlock the transceiver.

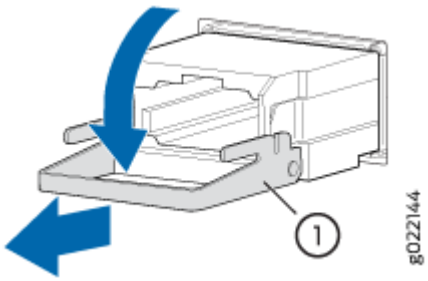
   Note that QSFP-DD and SFP-DD transceivers don't have ejector levers, instead they have a pull tab which can be used to unlock and remove the transceiver.

   > **CAUTION**: Before removing the transceiver, make sure that you open the ejector lever completely until you hear it click. This precaution prevents damage to the transceiver.

b. Grasp the transceiver ejector lever and gently slide the transceiver approximately 0.5 in. (1.3 cm) straight out of the port.

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

Figure 86: Remove a QSFP+ Transceiver



1– Ejector lever

To remove a CFP transceiver:

a. Using your fingers, loosen the screws on the transceiver.

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 ESD damage to the transceiver, do not touch the connector pins at the end of the transceiver.

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

Install a Transceiver

You can install a transceiver in an empty slot on the MX301. See "Install a QSFP28 Transceiver" on page 114 for instructions to install a QSFP28 transceiver or "Install a Transceiver" on page 113 for instructions to install other types of transceivers except a CFP transceiver.

Disconnect a Fiber-Optic Patch Cable

Before you disconnect a fiber-optic patch cable from an optical transceiver, ensure that you have taken the necessary precautions for safe handling of lasers. See Laser and LED Safety Guidelines and Warnings.

Ensure that you have the following parts and tools available:

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

Juniper Networks devices have optical transceivers to which you can connect fiber-optic patch cables.

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

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

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

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

2. Carefully unplug the fiber-optic patch 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 protects your eyes from accidental exposure to laser light.

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

Connect a Fiber-Optic Cable

You can connect fiber-optic cables to optical transceivers installed on the MX301. See "Connect a Fiber-Optic Cable" on page 115 for instructions to connect a fiber-optic cable to an optical transceiver.

How to Handle Fiber-Optic Patch Cables

Fiber-optic patch cables connect to optical transceivers that are installed in Juniper Networks devices.

Follow these guidelines when handling fiber-optic patch cables:

- When you unplug a fiber-optic patch cable from a transceiver, place rubber safety caps over the transceiver and on the end of the cable.
- Anchor fiber-optic patch cables to prevent stress on the connectors. When attaching a fiber-optic patch cable to a transceiver, secure the fiber-optic patch cable so that it does not support its own weight as it hangs to the floor. Never let a fiber-optic patch cable hang free from the connector.
- Avoid bending the fiber-optic patch cables beyond their minimum bend radius. Bending fiber-optic patch cables into arcs smaller than a few inches in diameter can damage the cables and cause problems that are difficult to diagnose.
- Frequent plugging and unplugging of fiber-optic patch cables in and out of optical instruments can damage the instruments, which are expensive to repair. To prevent damage from overuse, attach a short fiber extension to the optical equipment. The short fiber extension absorbs wear and tear due to frequent plugging and unplugging. It is easier and more cost-efficient to replace the short fiber extension than to replace the instruments.
- Keep fiber-optic patch 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 instructions in the cleaning kit you use.
  - After cleaning the transceiver, make sure that the connector tip of the fiber-optic patch cable is clean. Use only an approved alcohol-free fiber-optic cable cleaning kit such as the Opptex Cletop-S® Fiber Cleaner. Follow the instructions in the cleaning kit you use.

Replace Direct Attach Cables

SUMMARY

IN THIS SECTION

A direct attach cable has a transceiver preattached to each end.

Disconnect a Direct Attach Cable

Ensure that you have the following parts and tools available:

- An antistatic bag or an antistatic mat to store the cable, if you are disconnecting the cable from both the ports it is connected to
- Rubber safety caps to cover the ports on the device, or a replacement cable
- Rubber safety caps to cover the transceivers at the ends of the cable
- An electrostatic discharge (ESD) grounding strap—not provided

To disconnect a direct attach cable:

1. Disable the port to which the cable is connected by issuing the following command:

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

2. Place the antistatic bag or antistatic mat on a flat, stable surface if you are disconnecting the cable from both the ports it is connected to.
3. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to a site ESD point.
4. Label the cable so that you can reconnect it correctly.

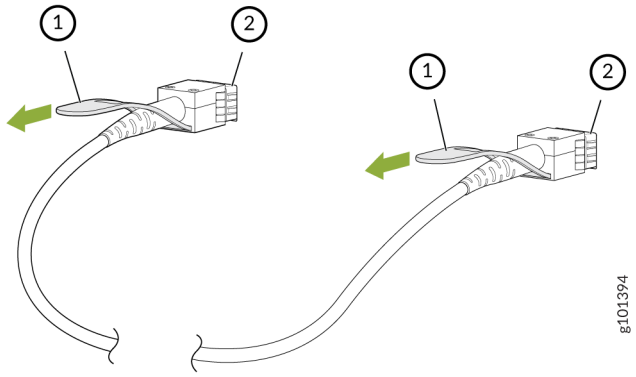
CAUTION: Do not leave the transceivers at the ends of the cable uncovered except when connecting or disconnecting the cable. The rubber safety cap keeps the transceivers clean and protected.

CAUTION: Do not bend the 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.

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

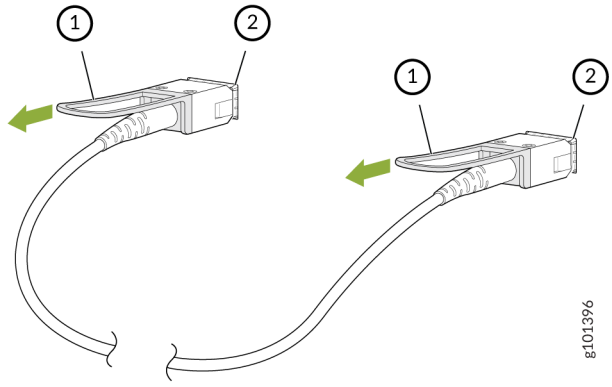
5. By using your fingers, pull the tab on the transceiver attached to the cable to disengage it.

Figure 87: Disconnect an SFP28 or SFP+ Direct Attach Cable



Callout	Item
1	Tab to pull the transceiver
2	Port on the device

Figure 88: Disconnect a QSFP-DD Direct Attach Cable



Callout	Item
1	Tab to pull the transceiver
2	Port on the device

6. Grasp the transceiver and gently slide it approximately 0.5 in. (1.3 cm) straight out of the port.

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

7. By using your fingers, grasp the body of the transceiver and pull it straight out of the port.
8. Cover the transceiver with a rubber safety cap.
9. If you are disconnecting the cable from both the ports it is connected to, place the cable in the antistatic bag or on the antistatic mat placed on a flat, stable surface.

The procedure to disconnect other types of direct attach cables, other than direct attach breakout cables, is the same as the procedure described in this topic.

Connect a Direct Attach Cable

CAUTION: To prevent ESD damage to the transceiver, do not touch the connector pins at the end of the transceiver.

Ensure that you have an ESD grounding strap (not provided).

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

We recommend that you use only cables 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 connect a direct attach cable:

1. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to a site ESD point.
2. Remove the cable from its bag.
3. If the transceiver attached to the cable is covered with a rubber safety cap, remove the cap. Save the cap.

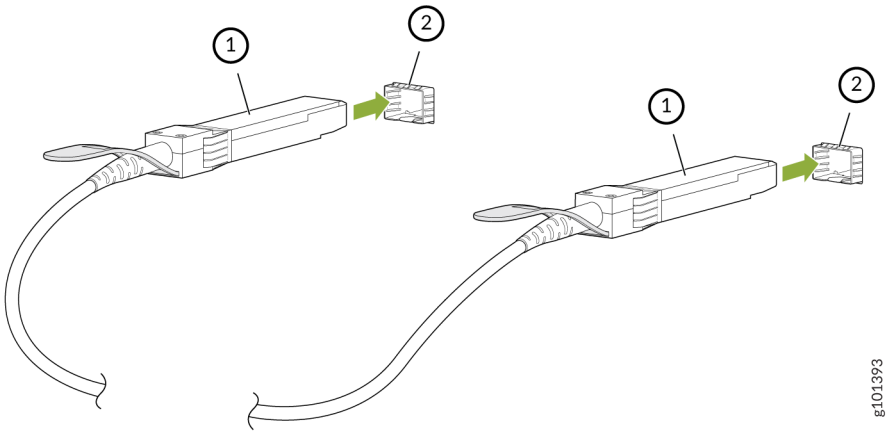
CAUTION: Do not leave the transceivers at the ends of the cable uncovered except when connecting or disconnecting the cable. The rubber safety cap keeps the transceivers clean and protected.

4. If the port on the device is covered with a rubber safety cap, remove the cap. Save the cap. If you are hot-swapping a cable, wait for at least 10 seconds after removing the cable from the port before installing a new cable.

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 cable unusable.

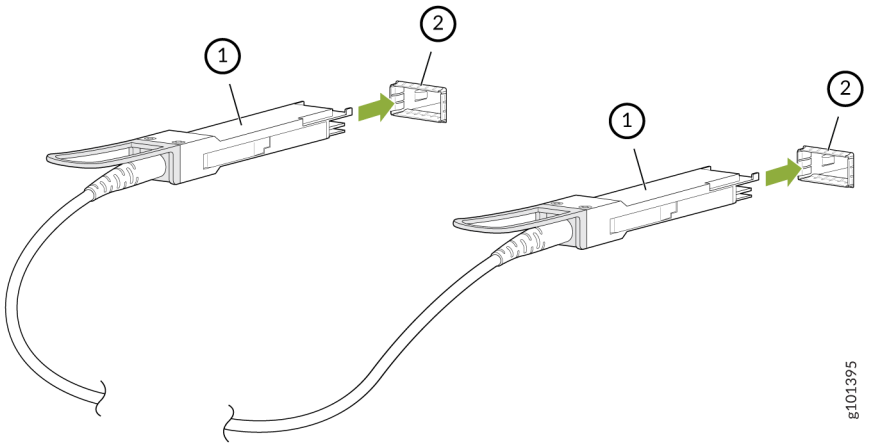
5. By using both hands, carefully insert the transceiver in the empty port. The connectors must face the chassis. Slide the transceiver in gently until it is fully seated.

Figure 89: Connect an SFP28 or SFP+ Direct Attach Cable



Callout	Item
1	Transceiver
2	Port on the device

Figure 90: Connect a QSFP-DD Direct Attach Cable



Callout	Item
1	Transceiver
2	Port on the device

6. Repeat Step 5 for the other port to which the cable must be connected.
7. Secure the cable so that it does not support its own weight as it hangs to the floor. If there is a cable management system, arrange the cable in the cable management system to prevent the cable from dislodging or developing stress points. 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 bend the 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.

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

The procedure to connect other types of direct attach cables, other than direct attach breakout cables, is the same as the procedure described in this topic.

Replace Breakout Cables

IN THIS SECTION

Breakout cables have one transceiver preattached to one end and two or more transceivers preattached to the other end. You can use the cables to channelize a port and increase the number of interfaces. For example, you can channelize the QSFP28 ports on the rear panel of EX4400 switches by connecting breakout cables and by using CLI configuration when those ports are configured as network ports.

Disconnect a Breakout Cable

Before you disconnect a breakout cable from a device, ensure that you have taken the necessary precautions for safe handling of laser (see Laser and LED Safety Guidelines and Warnings).

Ensure that you have the following parts and tools available:

- An antistatic bag or an antistatic mat to store the cable, if you are disconnecting the cable from all the ports it is connected to
- Rubber safety caps to cover the ports on the device, or a replacement cable
- Rubber safety caps to cover the transceivers at the ends of the cable
- An electrostatic discharge (ESD) grounding strap—not provided

To disconnect a breakout cable:

1. Disable the port to which the cable is connected by issuing the following command:

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

2. Place the antistatic bag or antistatic mat on a flat, stable surface if you are disconnecting the cable from all the devices it is connected to.

3. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to a site ESD point.
4. Label the cable so that you can reconnect it correctly.

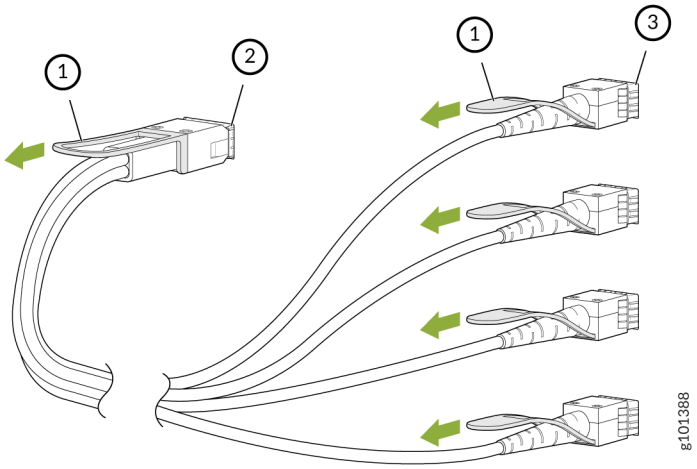
> **CAUTION**: Do not leave the transceivers at the ends of the cable uncovered except when connecting or disconnecting the cable. The rubber safety cap keeps the transceivers clean and protected.

> **CAUTION**: Do not bend the 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.

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

5. By using your fingers, pull the tab on the transceiver attached to the cable to disengage it.

Figure 91: Disconnect a Breakout Cable



Callout	Item
1	Tab to pull the transceiver

(Continued)

Callout	Item
2	Channelized port on a device
3	Port at the other end

6. Grasp the transceiver and gently slide it approximately 0.5 in. (1.3 cm) straight out of the port.

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

7. By using your fingers, grasp the body of the transceiver and pull it straight out of the port.
8. Cover the transceiver with a rubber safety cap.
9. Secure the cable so that it does not support its own weight as it hangs to the floor. If there is a cable management system, arrange the cable in the cable management system to prevent it from dislodging or developing stress points. 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.
10. If you are disconnecting the cable from all the devices it is connected to, place the cable in the antistatic bag or on the antistatic mat placed on a flat, stable surface.

The procedure to disconnect other types of breakout cables is the same as the procedure described in this topic.

Connect a Breakout Cable

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 connect a breakout cable to a device, ensure that you have taken the necessary precautions for safe handling of laser (see Laser and LED Safety Guidelines and Warnings).

CAUTION: To prevent ESD damage to the transceiver, do not touch the connector pins at the end of the transceiver.

Ensure that you have an electrostatic discharge (ESD) grounding strap (not provided).

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

To connect a breakout cable:

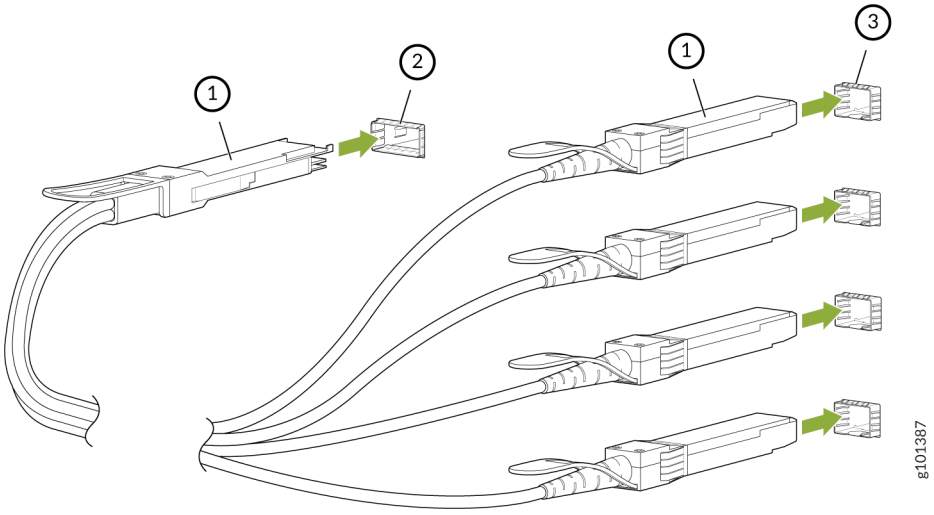
1. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to a site ESD point.
2. Remove the cable from its bag.

   CAUTION: Do not leave the transceivers at the ends of the cable uncovered except when connecting or disconnecting the cable. The rubber safety cap keeps the transceivers clean and protected.
3. If the transceiver attached to the cable is covered with a rubber safety cap, remove the cap. Save the cap.
4. If the port on the device is covered with a rubber safety cap, remove the cap. Save the cap. If you are hot-swapping a cable, wait for at least 10 seconds after removing the cable from the port before installing a new cable.

   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 cable unusable.

5. By using both hands, carefully insert the transceiver in the empty port. The connectors must face the chassis. Slide the transceiver in gently until it is fully seated.

Figure 92: Connect a Breakout Cable



Callout	Item
1	Tab to pull the transceiver
2	Channelized port on a device
3	Ports at the other end

6. Repeat Step 5 for all ports to which the cable must be connected.
7. Secure the cable so that it does not support its own weight as it hangs to the floor. If there is a cable management system, arrange the cable in the cable management system to prevent the cable from dislodging or developing stress points. 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 bend the cables beyond their minimum bend radius. An arc smaller than a few inches in diameter can damage the cables and cause problems that are difficult to diagnose.

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

The procedure to connect other types of breakout cables is the same as the procedure described in this topic.

Replace Active Optical Cables

SUMMARY

IN THIS SECTION

An active optical cable (AOC) is an optical fiber cable that has a transceiver preattached to each end.

Disconnect an Active Optical Cable

Before you disconnect an active optical cable (AOC) from a device, ensure that you have taken the necessary precautions for safe handling of laser (see Laser and LED Safety Guidelines and Warnings).

Ensure that you have the following parts and tools available:

- An antistatic bag or an antistatic mat to store the cable, if you are disconnecting the cable from all the ports it is connected to
- Rubber safety caps to cover the ports on the device, or a replacement cable
- Rubber safety caps to cover the transceivers at the ends of the cable
- An electrostatic discharge (ESD) grounding strap—not provided

To disconnect an active optical cable:

1. Disable the port to which the cable is connected by issuing the following command:

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

2. Place the antistatic bag or antistatic mat on a flat, stable surface if you are disconnecting the cable from both the ports it is connected to.
3. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to a site ESD point.
4. Label the cable so that you can reconnect it correctly.

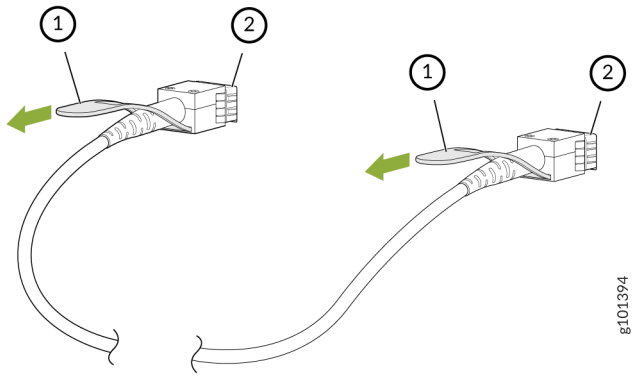
> **CAUTION**: Do not leave the transceivers at the ends of the cable uncovered except when connecting or disconnecting the cable. The rubber safety cap keeps the transceivers clean and protected.

> **CAUTION**: Do not bend the 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.

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

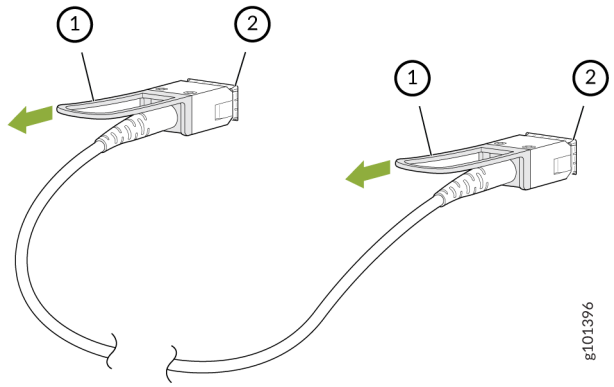
5. By using your fingers, pull the tab on the transceiver attached to the cable to disengage it.

Figure 93: Disconnect an SFP28 or SFP+ Active Optical Cable



Callout	Item
1	Tab to pull the transceiver
2	Port on the device

Figure 94: Disconnect a QSFP28 or QSFP+ Active Optical Cable



Callout	Item
1	Tab to pull the transceiver
2	Port on the device

6. Grasp the transceiver and gently slide it approximately 0.5 in. (1.3 cm) straight out of the port.

> ⚠ **CAUTION**: To prevent ESD damage to the transceiver, do not touch the connector pins at the end of the transceiver.

7. By using your fingers, grasp the body of the transceiver and pull it straight out of the port.
8. Cover the transceiver with a rubber safety cap.
9. If you are disconnecting the cable from both the ports it is connected to, place the cable in the antistatic bag or on the antistatic mat placed on a flat, stable surface.

The procedure to disconnect other types of AOCs, other than direct attach AOCs, is the same as the procedure described in this topic.

Connect an Active Optical Cable

Before you connect an AOC to a device, ensure that you have taken the necessary precautions for safe handling of lasers (see Laser and LED Safety Guidelines and Warnings).

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

Ensure that you have an ESD grounding strap (not provided).

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

We recommend that you use only cables 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 connect an active optical cable:

1. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to a site ESD point.
2. Remove the cable from its bag.

3. If the transceiver attached to the cable is covered with a rubber safety cap, remove the cap. Save the cap.

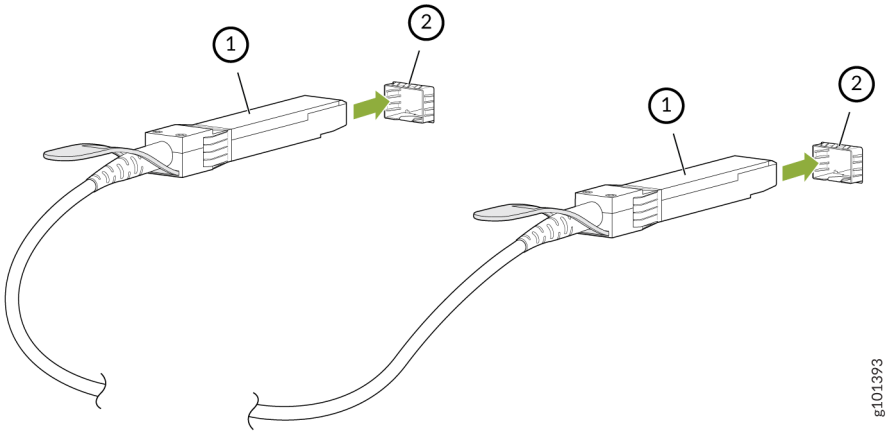
> **CAUTION**: Do not leave the transceivers at the ends of the cable uncovered except when connecting or disconnecting the cable. The rubber safety cap keeps the transceivers clean and protected.

4. If the port on the device is covered with a rubber safety cap, remove the cap. Save the cap. If you are hot-swapping a cable, wait for at least 10 seconds after removing the cable from the port before installing a new cable.

> **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 cable unusable.

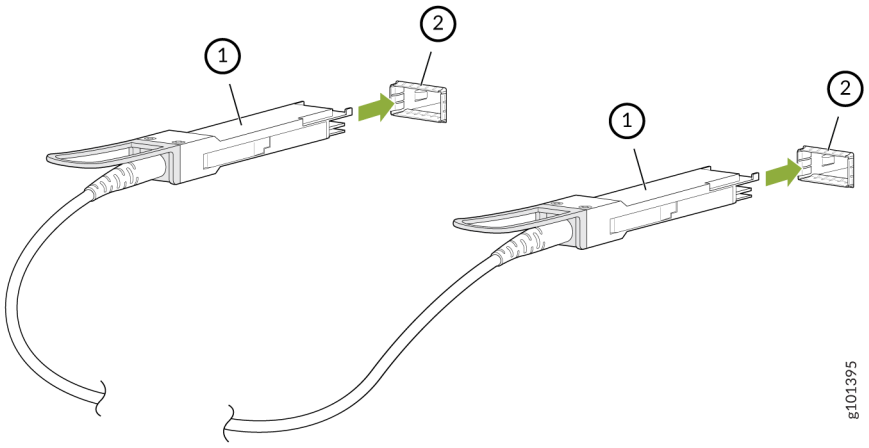
5. By using both hands, carefully insert the transceiver in the empty port. The connectors must face the chassis. Slide the transceiver in gently until it is fully seated.

Figure 95: Connect an SFP28 or SFP+ Active Optical Cable



Callout	Item
1	Transceiver
2	Port on the device

Figure 96: Connect a QSFP28 or QSFP+ Active Optical Cable



Callout	Item
1	Transceiver
2	Port on the device

6. Repeat Step 5 for the other port to which the cable must be connected.
7. Secure the cable so that it does not support its own weight as it hangs to the floor. If there is a cable management system, arrange the cable in the cable management system to prevent the cable from dislodging or developing stress points. 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 bend the 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.

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

The procedure to connect other types of AOCs, other than direct attach AOCs, is the same as the procedure described in this topic.

CHAPTER 9

Troubleshooting and Support

IN THIS CHAPTER

MX301 Hardware and CLI Terminology Mapping

Table 49: Junos OS CLI Equivalents of Terms Used in MX301 Documentation

Hardware Item (as displayed in the CLI)	Description	Value (as displayed in the CLI)	Item in Documentation	Additional Information
Chassis	–	–	Device chassis	"MX301 Chassis" on page 20
Routing Engine 0	–	–	Routing Engine (built-in)	–
CB 0	Abbreviated name for Control Board	–	Control board (built-in)	–
FPC 0	Abbreviated name for Flexible PIC Concentrator	–	MPC (built-in)	Understanding Interface Naming Conventions
PIC 0	Abbreviated name for Physical Interface Card	–	Linecard MIC (built-in)	–
Xcvr n	Abbreviated name for a transceiver	*n* is a value equivalent to the number of the port in which the transceiver is installed.	Optical transceiver	Hardware Compatibility Tool
PEM n	• JPSU-850W-AC-AFO • JPSU-850W-DC-AFO • JPSU-850W-HV-AFO	*n* is 0 or 1. The value corresponds to the power supply slot number.	AC, DC, or HVAC/DC power supply	"MX301 Power System" on page 42

Table 49: Junos OS CLI Equivalents of Terms Used in MX301 Documentation *(Continued)*

Hardware Item (as displayed in the CLI)	Description	Value (as displayed in the CLI)	Item in Documentation	Additional Information
Fan Tray n	JNP-FAN3-1RU	*n* is a value in the range of 0–5. The value corresponds to the fan module slot number.	Fan module	"MX301 Cooling System" on page 77

Troubleshoot the MX301

SUMMARY

This topic contains some common troubleshooting resources for the MX301 and a list of alarms and how to fix them.

IN THIS SECTION

Troubleshooting Resources for MX301

Use the messages on the status panel on the front panel and LEDs on the components to identify alarm conditions and the Junos OS CLI to troubleshoot the device. You can also contact the Juniper Networks® Technical Assistance Center (JTAC) for support.

- Status panel—When the device detects an alarm condition, it is displayed on the status panel.
- LEDs—When the device detects an alarm condition, the alarm LED on an interface glows red or yellow.
- CLI—The CLI is the primary tool for controlling and troubleshooting hardware, Junos OS, and network connectivity. CLI command outputs display information about network connectivity, which Junos OS derives from the ping and traceroute utilities. You can use the CLI to see more information about alarm conditions.

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

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

Alarm Types and Alarm Severity

IN THIS SECTION

Table 50: Alarm Terms

Term	Definition
Alarm	A signal alerting you to conditions that might prevent normal operation. On a device, the alarm signal is the red system LED that is lit on the front of the chassis.
Alarm condition	A failure event that triggers an alarm.
Alarm severity	The seriousness of the alarm. The level of severity can be either major or minor.

Alarm Types

Table 51: Alarm Types

Term	Definition
Chassis alarms	A predefined alarm triggered by a physical condition in the device such as a power supply failure or excessive component temperature.

Table 51: Alarm Types *(Continued)*

Term	Definition
Interface alarms	An alarm that you configure to alert you when an interface link is down. The alarm applies to Ethernet, Fibre Channel, and management Ethernet interfaces. You can set the alarm as major or minor for a specific link-down condition or have the condition ignored.
System alarms	A predefined alarm that might be triggered by a missing rescue configuration, failure to install a license for a licensed software feature, or high disk usage. You can configure system alarms to appear automatically in the J-Web interface display or CLI display.

Alarm Severity

Table 52: Alarm Severity

Term	Definition
Major (red)	Indicates a critical situation on the router that has resulted from one of the following conditions and that requires immediate action: • One or more hardware components have failed. • One or more hardware components have exceeded temperature thresholds. • An alarm condition configured on an interface has triggered a critical warning.
Minor (amber or blinking red)	Indicates a noncritical condition in the router that, if left unchecked, might cause an interruption in service or degradation in performance. A minor alarm condition requires monitoring or maintenance. For example, a missing rescue configuration generates a minor system alarm.

Use the RESET Button

If a configuration fails or you lose management access to the router because of a configuration change, you can use the **RESET** button to restore the device.

The RESET button on the MX301 is recessed to prevent it from being pressed accidentally. To press the RESET button, insert a small probe (such as a straightened paper clip) into the pinhole above the RESET label on the front panel.

- Press the RESET button momentarily to reboot the device.
- Press and hold the RESET button for approximately 10 seconds to reboot the device and enter the BIOS reset mode.

Contact Customer Support and Return the Chassis or Components

SUMMARY

If you need to return a hardware component to Juniper Networks, Inc., you need a Return Material Authorization (RMA) number and the equipment serial number. Contact the Juniper Networks Technical Assistance Center (JTAC) to generate an RMA number. You may also need to locate the chassis or component details using the CLI or by referring to equipment labels. You then pack and ship the component.

IN THIS SECTION

Contact Customer Support

You can contact JTAC 24 hours a day, seven days a week.

Chat	Use the **Ask me** icon at the bottom right of the Support page. Don't see the Chat icon? Read this.

Web	Juniper Support Portal Government Support Portal
Telephone	U.S. and Canada (Toll-free): 1-888-314-JTAC (5822) Outside the US or Canada, use the relevant country number listed on the regional tabs listed on the Contact Support page. Federal Government Support: 1-833-900-1454

NOTE: We do not support opening new cases through e-mail. Please use one of the above options to contact JTAC.

Return a Hardware Component to Juniper Networks

If a hardware component fails, contact Juniper Networks to obtain an RMA number. We use this number to track the returned material at the factory and to return the repaired or new components to you, as needed.

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

To return a defective hardware component:

1. Determine the part number and the serial number of the defective component. See "Locate the Serial Number of the MX301 or its Components" on page 174.
2. Obtain an RMA number from JTAC as described in "Request a Return Material Authorization" on page 180.
3. Pack the component for shipment. See "Guidelines for Packing and Shipping Hardware Components" on page 181.

For more information about return and repair policies, see the **Support** page at https://support.juniper.net/support/.

Locate the Serial Number of the MX301 or its Components

IN THIS SECTION

If the device is operational and you can access the CLI, you can list serial numbers for the device and for some components with a CLI command. If you don't have access to the CLI, or if the serial number for the component doesn't appear in the command output, you can physically locate the serial number ID label on the device or component.

NOTE: If you want to find the serial number ID label on a component, you need to remove the component from the device chassis.

List the MX301 Chassis and Component Details Using the CLI

To list the device and device components and their serial numbers, enter the `show chassis hardware` command on the CLI.

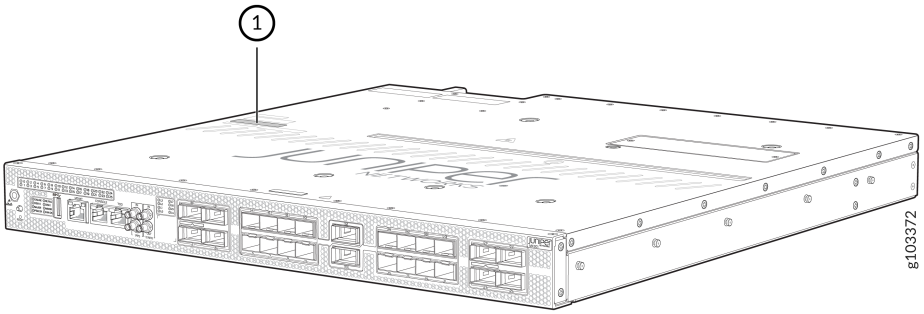
```
user@host> show chassis hardware
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                RF990             JNP301 [MX301]
Routing Engine 0          BUILTIN      BUILTIN           RE 3500 10C 128G
CB 0             REV 31   750-182793   EBBZ2132          Control Board
FPC 0                     BUILTIN      BUILTIN           FPC-BUILTIN
  PIC 0                   BUILTIN      BUILTIN           MRATE PIC 4x400G/14x100G/8x50G
    Xcvr 0       XXXX     NON-JNPR     AR5N000003        QSFP112-400GBASE-LR4
    Xcvr 12      XXXX     NON-JNPR     AR5P000004        QSFP112-400GBASE-FR4
    Xcvr 13      XXXX     NON-JNPR     AR5P000006        QSFP112-400GBASE-FR4
    Xcvr 22      XXXX     NON-JNPR     AR5P000003        QSFP112-400GBASE-FR4
  Mezz           REV 08   711-179260   EBBZ2559          JNP301 Wan Mezz Board
  PFE Board      REV 07   711-178583   EBBZ2068          JNP301-LC1600
  LED Board      REV 03   711-181531   EBBZ1667          JNP301 LED Board
```

```
PDB             REV 05   711-179324   EBBZ1950         JNP301 PD Board
PEM 0           REV 06   740-053352   1GD1E460897      JPSU-850W-AC-AFO
PEM 1           REV 06   740-053352   1GD1E460342      JPSU-850W-AC-AFO
Fan Tray 0      REV 08   750-184478   EBBY9901         JNP301 Fan Tray, Front to Back Airflow
Fan Tray 1      REV 08   750-184478   EBBZ0003         JNP301 Fan Tray, Front to Back Airflow
Fan Tray 2      REV 08   750-184478   EBBZ0200         JNP301 Fan Tray, Front to Back Airflow
Fan Tray 3      REV 08   750-184478   EBBZ0199         JNP301 Fan Tray, Front to Back Airflow
Fan Tray 4      REV 08   750-184478   EBBY9904         JNP301 Fan Tray, Front to Back Airflow
Fan Tray 5      REV 08   750-184478   EBBZ0120         JNP301 Fan Tray, Front to Back Airflow
```

Locate the Chassis Serial Number ID Label on MX301

You can find the chassis serial number for the MX301 on a label on the top panel.

Figure 97: Location of the Serial Number Label



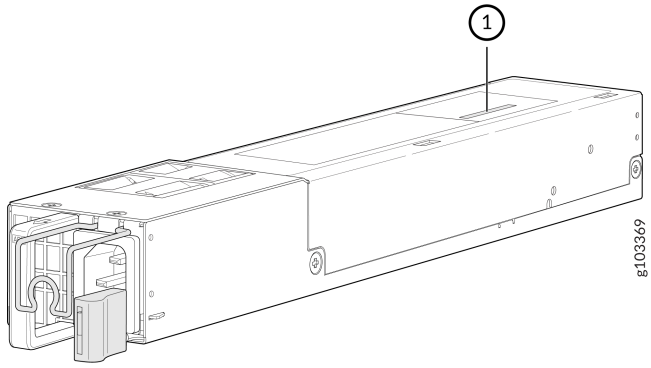
1– Serial number ID label

Locate the Serial Number ID Labels on FRUs

The power supplies and fan modules installed in the MX301 are field-replaceable units (FRUs). You must remove a FRU from the router chassis to see the FRU serial number ID label.

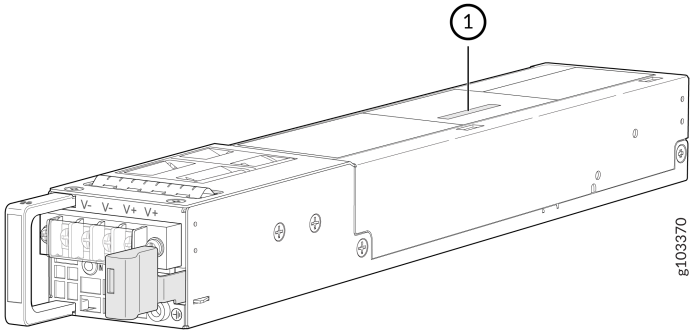
- Power supplies—The serial number ID label is located on top of the AC, DC, and HVAC/DC power supplies for the MX301.

Figure 98: Serial Number ID Label on MX301 AC PSU



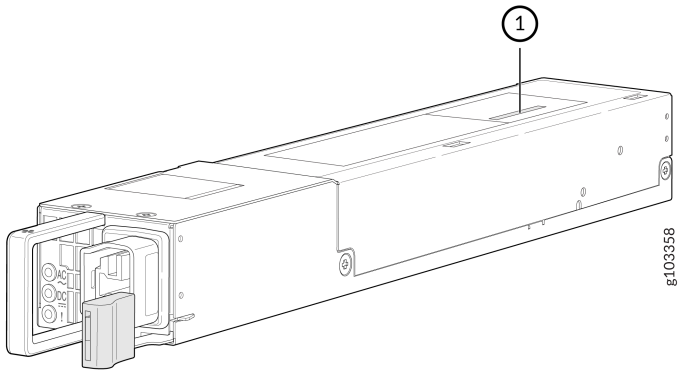
1– Serial number ID label

Figure 99: Serial Number ID Label on MX301 DC PSU



1– Serial number ID label

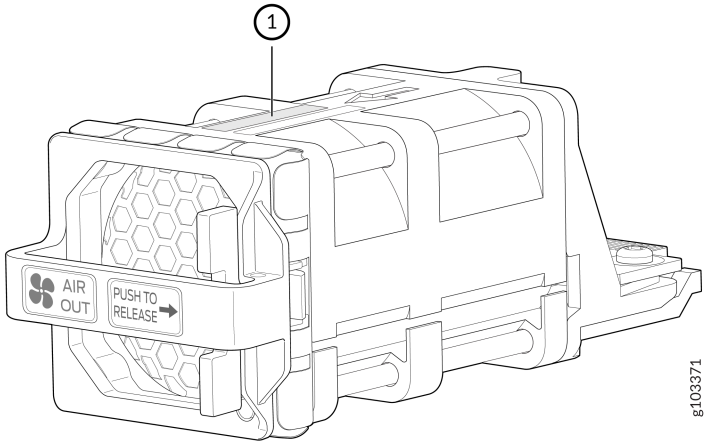
Figure 100: Serial Number ID Label on MX301 HVAC/DC PSU



1– Serial number ID label

- Fan module—The serial number ID label is located on top of the fan module for an MX301.

Figure 101: Serial Number ID Label on MX301 Fan Module



1– Serial number ID label

Remove the Solid State Drives for RMA on the MX301

The MX301 Router has two solid-state drives (SSDs) stacked on top of each other that store the software images, system logs, and the configuration files. Before returning a chassis to Juniper Networks

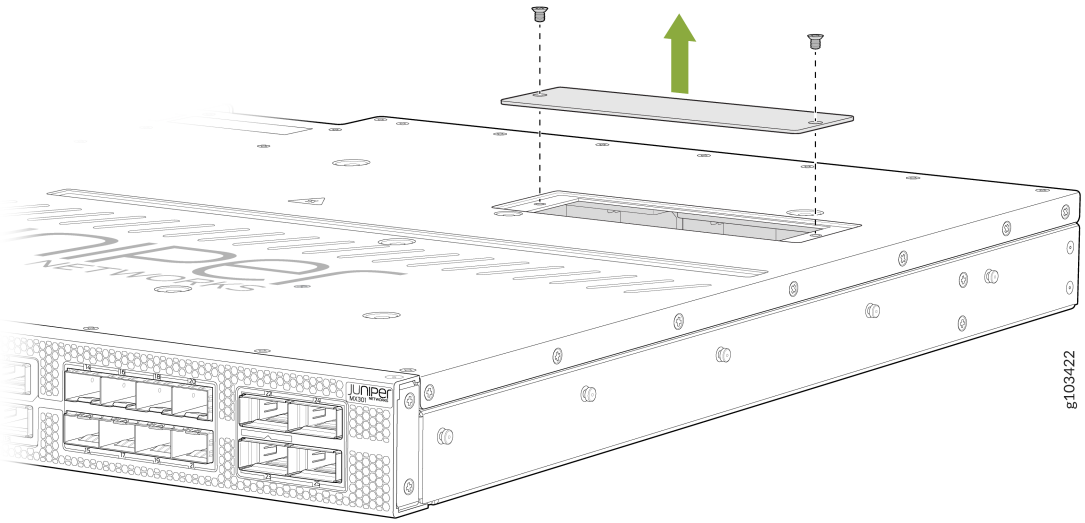
as part of a Return Material Authorization (RMA), you have the option to remove the SSDs and secure or dispose them according to your own company's security policies.

Before you begin this procedure, ensure you have a Philips (+) screwdriver, number 2.

Use this optional procedure to remove the SSDs from the MX301 Router after the device has shut down and you've removed it from the rack. The single SSD door is located on top of the device.

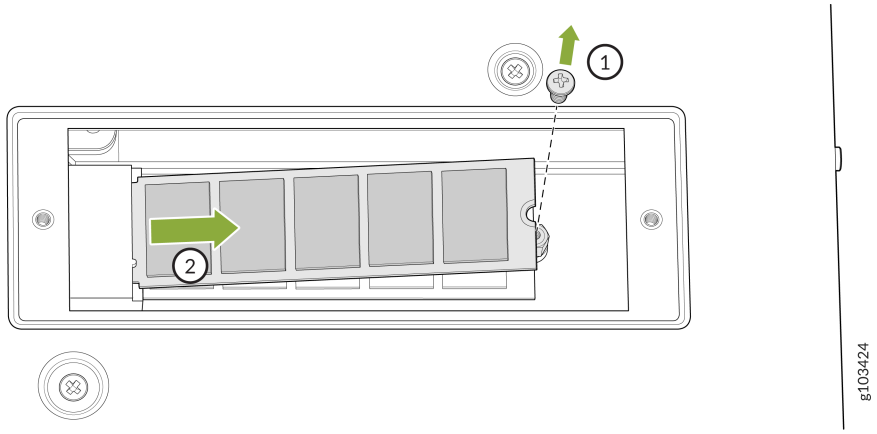
1. Ensure that the device is placed on a firm surface such as a workbench or a table with the SSD door facing up.
2. Use the Philips screwdriver to remove the two flat-head screws from the SSD door on top of the device. Set the screws aside in a safe place.

Figure 102: Remove Screws from SSD Door on MX301



3. Remove the top SSD using the following procedure:
   a. Use the Philips screwdriver to remove the screw on the top SSD. See Figure 103 on page 179. Set the screw aside in a safe place.
   b. Lift the top SSD at the end that is furthest from the connector and remove from the cavity.

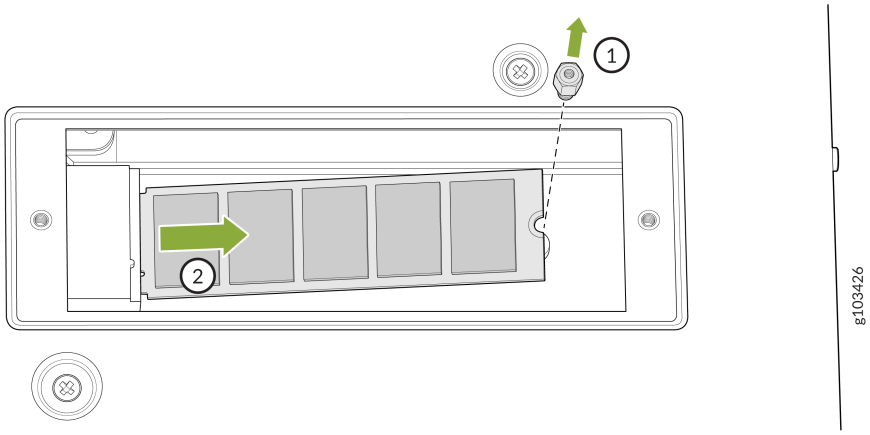
Figure 103: Remove the Screw and Lift the Top SSD Out of MX301



1– Remove the screw	2– Lift the top SSD

4. Remove the bottom SSD using the following procedure:
   a. Unscrew the standoff screw with your hands. See Figure 104 on page 179. Set the standoff screw aside in a safe place.
   b. Lift the bottom SSD at the end that is furthest from the connector and remove from the cavity.

Figure 104: Remove the Standoff Screw and Lift the Bottom SSD Out of MX301

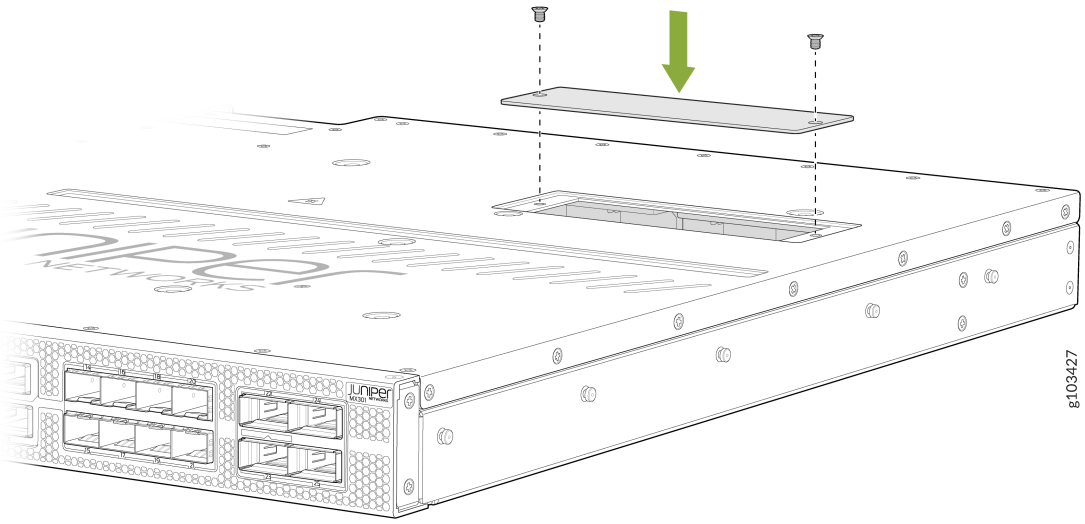


1– Remove the standoff screw	2– Lift the bottom SSD

5. Replace and tighten the standoff screw.
6. Replace the screw for the top SSD and tighten the screw using the Philips screwdriver.

7. Replace the SSD door and tighten the two flat-head screws using the Philips screwdriver to secure the SSD door to the chassis. See Figure 105 on page 180.
8. Tighten the two flat-head screws using the Philips screwdriver.

Figure 105: Replace the Screws on the SSD Door on MX301



9. Secure or dispose the SSDs according to your site's security policies.

Request a Return Material Authorization

If you are returning a device or hardware component to Juniper Networks for repair or replacement, obtain an RMA number from JTAC.

Before you request an RMA from JTAC, be prepared to provide the following information:

- Your existing service request number, if you have one
- Serial number of the device or component
- Your name, organization name, telephone number, fax number, and shipping address
- Details of the failure or problem
- Type of activity you were performing on the device when the problem occurred
- Configuration data displayed by one or more `show` commands

You can contact JTAC using the Support page or by telephone.
If you're contacting JTAC by telephone:

- To report a new incident, press the star (*) key to be routed to the next available support engineer.
- To enquire about an existing case, enter your 12-digit service request number followed by the pound (#) key.

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

Guidelines for Packing and Shipping Hardware Components

To pack and ship individual components:

- When you return the chassis or components, make sure to adequately protect them with packing materials. Pack them properly to prevent the pieces from moving around the carton.
- Use the original shipping materials, if they are available.
- Place the individual components in antistatic bags.
- Write the RMA number on the exterior of the box to ensure proper tracking.

10
CHAPTER

Safety and Compliance Information

IN THIS CHAPTER

MX301 Safety

IN THIS SECTION

Safety Information

The Juniper Networks Safety Guide provides general safety information and guidelines for all Juniper Networks products. Follow the guidelines provided in the guide to reduce the likelihood of personal injury, equipment damage, and damage to surrounding areas.

Along with the information provided in the Juniper Networks Safety Guide, you must read and understand the *MX301* specific safety information provided in this hardware guide.

Boot Time

The boot time for the MX301 is approximately 87 seconds. It takes approximately 357 seconds until all the FPCs and interfaces in the device are online.

Warning Statement for Shielded Intra-Building Criteria

WARNING: The intra-building port(s) of the equipment or subassembly must use shielded intra-building cabling or wiring that is grounded at both ends.

Warning Statement for Unshielded Intra-Building Criteria

WARNING: Certain ports of a device are designed for use as intra-building (within-the-building) interfaces only (Type 2 or Type 4 ports as described in *GR-1089-CORE*) and require isolation from the exposed outside plant (OSP) cabling. To comply with NEBS

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

Agency Approvals and Compliance Statements for MX301

IN THIS SECTION

Agency Approvals

IN THIS SECTION

The MX301 Router is designed to comply with the following standards:

Safety

Safety Requirements for Chassis

- IEC 62368-1:2014 (All country deviations): 2nd Edition: CB Scheme
- IEC 62368-1:2018 (All country deviations): 3rd Edition: CB Scheme
- IEC 62368-1:2023 (All country deviations): 4th Edition: CB Scheme
- EN 62368-1:2014+A11:2017, EN IEC 62368-1:2020+A11:2020
- EN 62368-1:2024/A11:2024
- BS EN 62368-1:2014+A11:2017, BS EN IEC 62368-1:2020+A11:2020
- BS EN 62368-1:2024/A11:2024
- UL 62368-1:2025 (4th Edition)
- CSA C22.2 No. 62368-1:2025 (4th Edition)
- UL 60950-1:2007
- CAN/CSA C22.2 No. 60950-1-07+ A1:2011+A2:2014

Safety Requirements for Optics

- CFR, Title 21, Chapter 1, Subchapter J, Part 1040
- REDR c 1370 OR CAN/CSA-E 60825-1 Part 1
- IEC 60825-1
- IEC 60825-2
- IEC/UL/CSA 62368-1

NEBS

- GR-3160-Core July 2013 (DC-NEBS)
- GR-1089-Core Issue 8 EMC and Electrical Safety for Network Telecommunications Equipment
- ETSI EN 300 019-2-1 – Storage, Class T1.2
- ETSI EN 300 019-2-2 – Transportation, Class T2.3

- ETSI EN 300 019-2-3 – Stationary Use at Weather-protected Locations, Class T3.2

Electromagnetic Compatibility (EMC)

EMC Requirements (Global)

- FCC 47 CFR Part 15
- ICES-003/ICES-GEN
- BS EN 55032
- BS EN 55035
- EN 300 386 V1.6.1
- EN 300 386 V2.2.1
- BS EN 300 386
- EN 55032
- CISPR 32
- EN 55035
- CISPR 35
- IEC/EN 61000 Series
- IEC/EN 61000-3-2
- IEC/EN 61000-3-3
- AS/NZS CISPR 32

  VCCI-CISPR 32
- BSMI CNS 15936
- KS C 9835 (Old KN 35)
- KS C 9832 (Old KN 32)
- KS C 9610
- BS EN 61000 Series

Customer-Specific EMC Requirements

- GR-1089-Core, Issue 8
- Juniper Inductive GND (IGS)

Energy Efficiency Requirements

- AT&T TEER (ATIS-06000015.03.2016)
- ECR 3.0.1
- ETSI ES 203 136 V1.2.1
- Verizon TEEER (VZ.TPR.9205 Issue 7)

Environmental

Environmental Requirements for Chassis

- Operating Temperature:
  - 0° C to 55° C @ 6000 ft (Telco NEBS environment short term GR 63) for optics up to 100G
  - 0° C to 40° C @ 6000 ft (DC NEBS environment) for 400G optics
- Storage Temperature: -40° to 70° C
- Relative Humidity (Operating): 5 to 90% non-condensing
- ETSI EN 300 019: Environmental Conditions & Environmental Tests for Telecommunications Equipment (Specific test requirements in Tables 7 & 8)
- ETSI EN 300 019-2-1 Storage (ETSI EN 300 019 -1-1 Class 1.2)
- ETSI EN 300 019-2-2 Transportation (ETSI EN 300 019-1-2 Class 2.3)
- ETSI EN 300 019-2-3 Stationary Use at Weather-protected Locations (ETSI EN 300 019-1-3 Class 3.2)

Environmental Product Regulations, Legislations, Directives and International Standards

Regulations:

- EC No. 1907/2006 – Regulation concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) 18 December 2006.

  - Annex XVII
  - SVHC
- EU 2019/1021 – Of the European Parliament and the council of 20 June 2019 on Persistent Organic Pollutants (EU POPs).
- Commission Regulation (EU) 2024/1834 of 3 July 2024 - Ecodesign requirements for the placing on the market or putting into service of fans with an electric input power between 125 W and 500 kW (≥ 125 W and ≤ 500 kW) at their best efficiency point, including where they are integrated into other products.

Legislations:

- TSCA – The Toxic Substance Control Act authorizes the EPA (Environmental Protection Agency) to regulate and screen all chemical producer or imported into the US to prevent unreasonable risks to health and the environment.
  - 6(h) PBT
  - 8(a)(7) PFAS
- PFAS Reporting Requirements in Canada Under the Section 71 of the Canadian Environmental Protection Act, 1999 (CEPA)
- California Prop 65 – The Safe Drinking Water and Toxic Enforcement Act of 1986.

Directives:

- The EU RoHS Directive 2011/65/EU amended by (EU) 2015/863.
- China RoHS - GB/T 26572-2011 – Must comply with the Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Products
  - China RoHS Certificates as per SJ/T 11364-2014 for all ordered AVL parts.
- Taiwan RoHS - CNS 15663 Guidance to reduction of the restricted chemical substances in electrical and electronic equipment (EEE) and its amendments.
- Korea RoHS - The Act for Resource Recycling of Electrical and Electronic Equipment and Vehicles and its amendments.
- UAE RoHS - Cabinet Decision No 10 of 2017 issued by The Emirates Authority for Standardization and Metrology ('ESMA') and its amendments.
- India RoHS -E-Waste (Management) Rules, 2022
- Directive 2002/96/EC of the European Parliament and of Council of 4 July 2012 on waste electrical and electronic equipment (WEEE).

- IATA DGR (Dangerous Good Regulation / Battery) – Guidelines and regulations to ensure the safe and standardized transportation of dangerous goods by air.

  Compliance to EU Battery Directive 2023/1542

  For all batteries used, the documents below must be collected.

  - Battery MSDS
  - EN IEC 60086
  - UL 1642
  - UN/DOT 38.3

International Standards:

- IEC 62474 DSL (Declarable Substance List)
- IEC 62474 RSL (Reference Substance List)
- IPC 1752 Class 6 or 1752A Class D required for all AVL parts ordered.

Compliance Statements

IN THIS SECTION

Compliance Statement for Argentina

EQUIPO DE USO IDÓNEO.

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

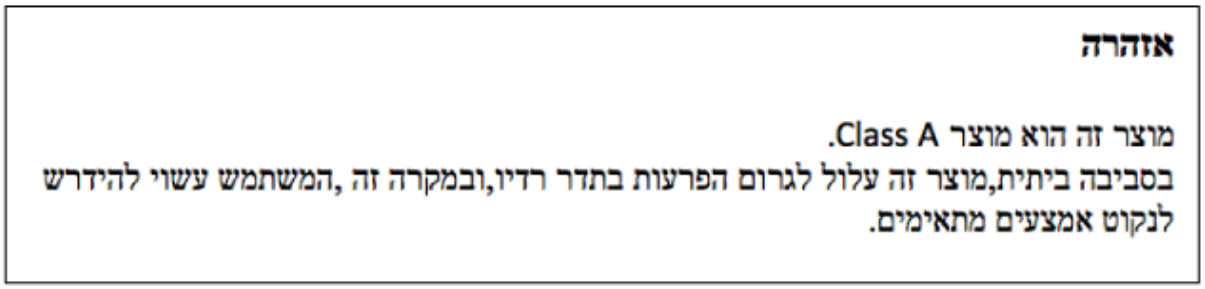
Canada

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

European Community

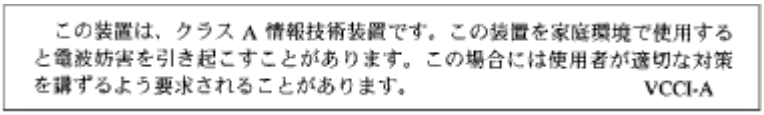
This is a Class A product. In a domestic environment, this product might cause radio interference in which case the user might be required to take adequate measures.

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.

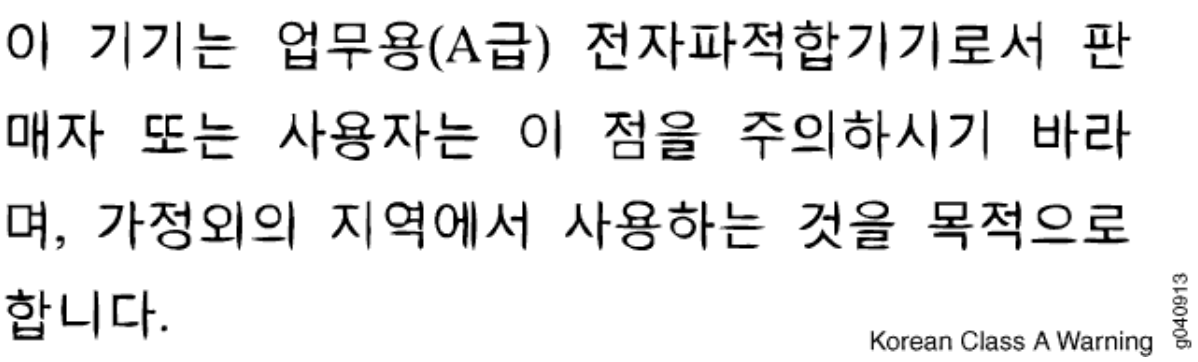
Japan



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.

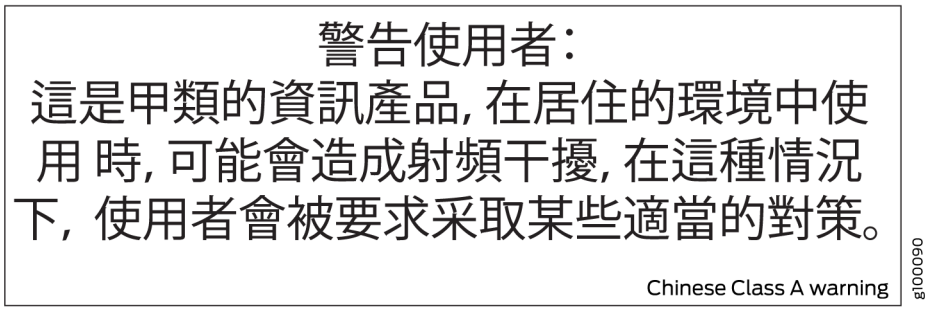
Korea



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



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 hardware equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This

equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, might cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Compliance Statements for Environmental Requirements

Batteries in this product are not based on mercury, lead, or cadmium substances. The batteries used in this product are in compliance with EU Directives 91/157/EEC, 93/86/EEC, and 98/101/EEC. The product documentation includes instructional information about the proper method of reclamation and recycling.