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PTX10001-36MR Packet Transport Router Hardware Guide

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PTX10001-36MR Packet Transport Router 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 plan, install, perform initial software configuration, perform routine maintenance, and to troubleshoot PTX10001-36MR Packet Transport Routers.

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

RELATED DOCUMENTATION

- PTX10001-36MR Quick Start

CHAPTER 1

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PTX10001-36MR System Overview

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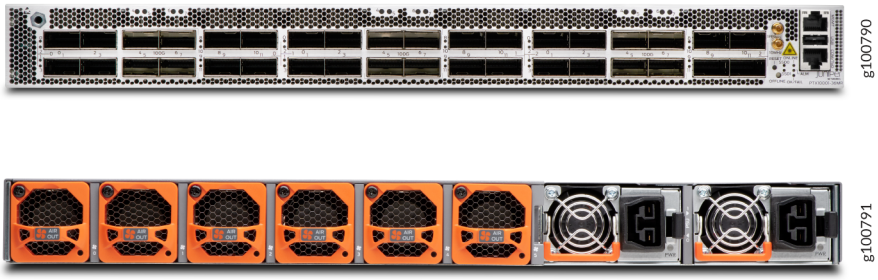
Juniper Networks PTX10001-36MR is a fixed-configuration router that features 36 network ports that provide high density and cost efficient 100-Gigabit and 400-Gigabit Ethernet (GbE) ports in a low-profile 1-U form factor. With 9.6 Tbps of throughput, the PTX10001-36MR is optimally designed for peering, core routing, and infrastructure edge routing roles in cloud provider, service provider and content provider networks.



TIP: For information about features supported on PTX Series routers, see Feature Explorer.

Benefits of the PTX10001-36MR

- Scalability—The PTX10001-36MR scales to 9.6 Tbps in a single chassis, supporting up to 120 10GbE interfaces, 30 40GbE, 96 100GbE interfaces (at line-rate), or 108 100GbE interfaces (oversubscribed), and 24 400GbE interfaces, giving cloud and service providers the performance and scalability needed as networks grow.
- Performance—The PTX10001-36MR uses the next-generation ASIC in the Junos Express silicon family, Juniper Triton silicon, to deliver inline MACsec on all 100-Gigabit and 400-Gigabit speed interfaces for dense 400-Gigabit architectures. The PTX10001-36MR's exceptional packet processing capabilities help alleviate the challenge of scaling the network as traffic levels increase.
- High availability hardware—The PTX10001-36MR is engineered with hardware redundancy for cooling, power supplies, and forwarding. With the PTX10001-36MR's high availability, service providers can maintain an always-on infrastructure base that helps meet stringent SLAs across the core.
- Space efficiency—The PTX10001-36MR's ultra-compact 1-U form factor efficiency is a critical requirement for space and power constrained internet exchange locations, remote central offices, and embedded peering points throughout the network. The PTX10001-36MR delivers a power efficiency of 0.2 watts/Gbps.

PTX10001-36MR System Architecture

The PTX10001-36MR is a fixed-configuration router that supports 10-Gbps, 25-Gbps, 40-Gbps, 100-Gbps, and 400-Gbps port speeds in a single 1-U stackable platform.

- Control operations are performed by the Routing Engine, which runs the Juniper Networks Junos OS Evolved operating system (Junos OS Evolved). The Routing Engine handles routing protocols, traffic engineering, policy, policing, monitoring, and configuration management. Junos OS Evolved is installed on the PTX10001-36MR router's two internal 200-gigabyte M.2 SATA solid-state drives (SSDs). The Routing Engine is enhanced by a 2.1-GHz 12 core Intel CPU and 64 GB of RAM.
- Forwarding operations are performed by the Packet Forwarding Engine, which uses Juniper Networks Triton silicon. The custom ASICs enable the PTX10001-36MR to provide up to 9.6 Tbps of bandwidth.

PTX10001-36MR System Software

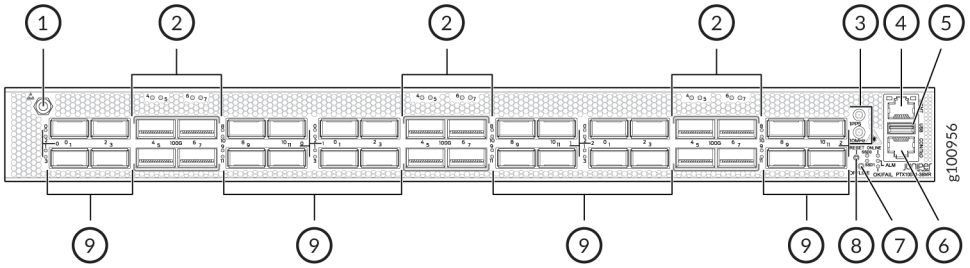
The PTX10001-36MR runs Junos OS Evolved, which provides Layer 2 and Layer 3 switching, routing, and security services. Junos OS Evolved runs natively on Linux, giving it direct access to all the Linux utilities and operations. It is designed to be modular, allowing for upgrades to be done on a component-by-component basis without a system reboot. Only those components changed are restarted. Junos OS Evolved is easily portable and minimal work is required to make it work on any platform. It has the same CLI user interface, the same code base for applications and features, and the same management and automation tools as Junos OS. However, the Junos OS Evolved infrastructure is entirely modernized, giving you the high availability, portability, faster innovation, and simplified upgrades you need.

For information about which features are supported on PTX Series devices, see Feature Explorer.

Port Panel and Management Panel

The front panel of the PTX10001-36MR contains 36 network ports, port LEDs, console and management ports, and system status LEDs. Figure 1 on page 4 shows the PTX10001-36MR front panel.

Figure 1: PTX10001-36MR Port Panel



1– ESD grounding point	6– RJ-45 console and time of day (TOD) port
2– 12 network ports—QSFP28 cages	7– Offline button. Pressing and holding this button for more than 4 seconds turns the device off. Pressing the button again turns the device back on.
3– Clock connectors (10 MHz and 1 PPS)	8– Reset button (do not use unless directed by JTAC)
4– RJ-45 management port (10 Mbps/100 Mbps/1000 Mbps)	9– 24 network ports—QSFP56-DD cages

5– USB port (USB 2.0 standard)	

You manage the PTX10001-36MR by using the Junos OS Evolved CLI, which is accessible through the console and out-of-band management ports on the front panel. In addition, the front panel has system status LEDs that alert you to minor or major alarms or other issues with the router, external clock synchronization ports, and a USB port to support software installation and recovery.

The network ports on the PTX10001-36MR consist of 24 QSFP56-DD ports that support data rates of 10-Gbps, 25-Gbps, 40-Gbps, 100-Gbps, and 400-Gbps and 12 QSFP28 ports that support data rates of 10-Gbps, 25-Gbps, 40-Gbps, and 100-Gbps.

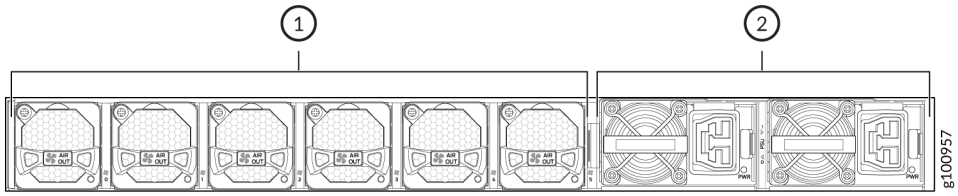
Cooling and Power

The cooling system in a PTX10001-36MR consists of six fan modules as well as fans housed in the power supplies. Each fan module has dual counter-rotating fans. These fan modules can be hot-swapped and hot-inserted, meaning that you do not need to power off the router or disrupt the routing function to replace a module.

In the PTX10001-36MR cooling system, cool air enters through the vents in the port panel and hot air exhausts through the field-replaceable unit (FRU) panel. This type of airflow is known as *airflow out* or *port-to-FRU airflow*.

The PTX10001-36MR has two AC/HDVC or DC 3000-W power supplies. Each power supply provides 12-VDC output with a standby voltage of 12-VDC. The AC/HDVC or DC power supplies in a PTX10001-36MR are hot-removable and hot-insertable FRUs. See Figure 2 on page 5 for an example of the PTX10001-36MR FRU panel.

Figure 2: PTX10001-36MR Back Panel (AC/HVDC Power Supplies Installed)



1– Fan modules (6)	2– Power supplies (2)

PTX10001-36MR Field-Replaceable Units

Field-replaceable units (FRUs) are components that you can replace at your site.

Table 1 on page 6 lists the model numbers and CLI output for PTX10001-36MR FRUs.

Table 1: PTX10001-36MR FRUs and Spares

Component	Spare Juniper Model Number	CLI Output
Chassis	JNP10001-36MR	`JNP10001-36MR [PTX10001-36MR]`
Fan module	JNP-FAN2-1RU	`JNP10001 Fan Tray, Front to Back Airflow - AFO`
Power supplies	JNP-3000W-AC-AFO	`AC AFO 3000W PSU`
	JNP-3000W-DC-AFO	`DC AFO 3000W PSU`

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

PTX10001-36MR Component Redundancy

The following hardware components provide redundancy on a PTX10001-36MR:

- Power supplies—The PTX10001-36MR has two power supplies. Each power supply provides power to all components in the device. The two power supplies provide full power redundancy to the device. If one power supply fails or is removed, the second power supply balances the electrical load without interruption. To provide power redundancy to the system, both power supplies must be installed. Connect power source feed A to one power supply and power source feed B to the second power supply.

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

- Cooling system—The PTX10001-36MR has six fan modules and within each fan module there are two counter-rotating fans. If a fan module fails and the remaining fan modules are unable to keep the PTX10001-36MR within the desired temperature thresholds, chassis alarms occur and the PTX10001-36MR can shut down.

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PTX10001-36MR Power System | 25

PTX10001-36MR Port Panel

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PTX10001-36MR Port Panel Description

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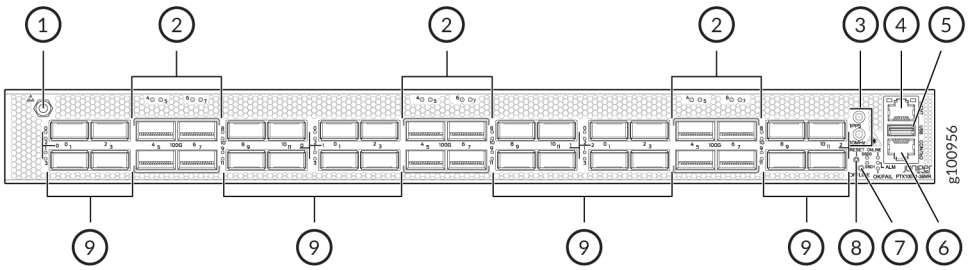
- How to Configure the QSFP28 Ports for 10-Gbps, 25-Gbps, and 40-Gbps Speeds | **13**

Operating in a fixed core router configuration, the PTX10001-36MR features flexible interface configuration options. The port panel has 24 double density quad small-form factor pluggable (QSFP56-DD) ports that support data rates of 10-Gbps, 25-Gbps, 40-Gbps, 100-Gbps, and 400-Gbps and 12 quad small form-factor pluggable (QSFP28) ports that support data rates of 10-Gbps, 25-Gbps, 40-Gbps, and 100-Gbps.

Figure 3 on page 8 shows the PTX10001-36MR port panel.

Figure 3: PTX10001-36MR Port Panel



1– ESD grounding point	6– RJ-45 console and time of day (TOD) port
2– 12 network ports—QSFP28 cages	7– Offline button. Pressing and holding this button for more than 4 seconds turns the device off. Pressing the button again turns the device back on.
3– Clock connectors (10 MHz and 1 PPS)	8– Reset button (do not use unless directed by JTAC)
4– RJ-45 management port (10 Mbps/100 Mbps/1000 Mbps)	9– 24 network ports—QSFP56-DD cages
5– USB port (USB 2.0 standard)	

QSFP56-DD Network Ports

The PTX10001-36MR has 24 double density quad small-form factor pluggable (QSFP56-DD) sockets that are configured as 400GbE ports by default.

The QSFP56-DD network ports support:

- QSFP56-DD transceivers
- QSFP28-DD transceivers
- QSFP28 transceivers
- QSFP+ transceivers
- Active optical cables (AOC)
- Direct attach copper (DAC) cables
- Direct attach copper break out (DACBO) cables
- QSA adapters

NOTE: Installing either the QDD-400G-LR8 or the QDD-400G-FR4 transceivers next to each other in ports 1, 3, 9, or 11 (on each logical PIC) is supported up to a maximum operating temperature of 35°C at an altitude of up to 6000 feet above sea level. For example, if you install either a QDD-400G-LR8 or a QDD-400G-FR4 transceiver in port 1 and port 3 of PIC 0, the maximum supported operating temperature and altitude combination is 35°C at 6000 feet above sea level. This restriction is due to thermal limitations.

Table 2 on page 9 describes the maximum number of ports for each interface type supported by the QSFP56-DD ports.

Table 2: QSFP56-DD Ports: Maximum Supported Ports at Each Interface Speed

Interface Type	Maximum Supported Ports **NOTE**: To achieve maximum ports, break out cables maybe required.
400GbE	24
100GbE	96
40GbE	24
25GbE	192
10GbE	96

NOTE: Port speeds are configured using the `set interfaces interface-name speed speed` command. You configure ports to operate at a particular speed by using the appropriate speed option. If you configure a port to operate at a certain speed, and you want to return the port to the default configuration, delete the `speed` statement from the configuration at the `[interfaces interface-name]` hierarchy level and commit the configuration. The network port is reset to the default Ethernet interface.

See Port Speed on PTX10001-36MR Router Overview to learn about multiple port speeds supported on PTX10001-36MR router, guidelines, and how to configure the port speed.

QSFP28 Network Ports

The PTX10001-36MR has 12 quad small-form factor pluggable (QSFP28) sockets that are configured as 100GbE ports by default.

The QSFP28 network ports support:

- QSFP28 transceivers
- QSFP+ transceivers
- Active optical cables (AOC)
- Direct attach copper (DAC) cables
- Direct attach copper break out (DACBO) cables
- QSA adapters

Table 3 on page 10 describes the maximum number of ports for each interface type supported by the QSFP28 ports.

Table 3: QSFP28 Ports: Maximum Supported Ports at Each Interface Speed

Interface Type	Maximum Supported Ports **NOTE**: To achieve maximum ports, break out cables might be required.
100GbE	12
40GbE	6

Table 3: QSFP28 Ports: Maximum Supported Ports at Each Interface Speed *(Continued)*

Interface Type	Maximum Supported Ports **NOTE**: To achieve maximum ports, break out cables might be required.
25GbE	24
10GbE	24

NOTE: Port speeds are configured using the `set interfaces` *`interface-name`* `speed` *`speed`* command. You configure ports to operate at a particular speed by using the appropriate speed option. If you configure a port to operate at a certain speed, and you want to return the port to the default configuration, delete the `speed` statement from the configuration at the `[interfaces` *`interface-name`*`]` hierarchy level and commit the configuration. The network port is reset to the default Ethernet interface.

See Port Speed on PTX10001-36MR Router Overview to learn about multiple port speeds supported on PTX10001-36MR router, guidelines, and how to configure the port speed.

Port Numbering

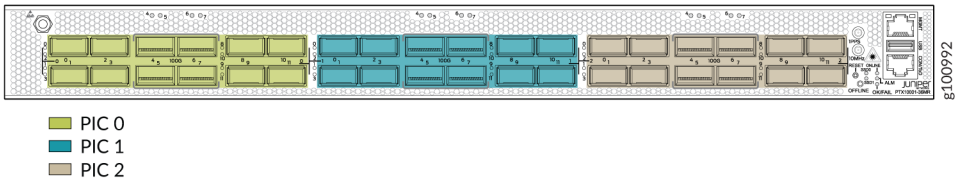
The interfaces for the PTX10001-36MR are divided into logical PICs and physical optical ports as follows:

- **PICs**: There are three logical PICs, numbered 0, 1, and 2 from left to right.
- **Ports**: Each PIC controls 8 QSFP56-DD ports, numbered 0 through 3 and 8 through 11 from left to right. Each PIC also controls 4 QSFP28 ports numbered 4 through 7 from left to right.

Each PIC uses the same port numbering.

Figure 4 on page 12 shows how the PTX10001-36MR network ports are divided into the 3 PICs.

Figure 4: PTX10001-36MR PIC Locations



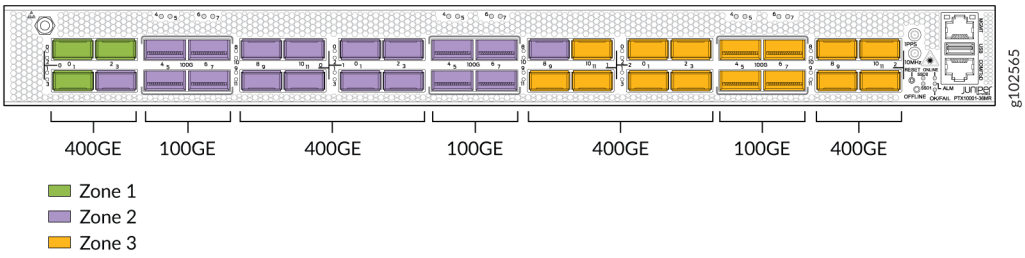
PTX10001-36MR Power Zone Restrictions

The ports on the PTX10001-36MR are organized in three power zones based on the power available to the ports in each zone. Table 4 on page 12 describes the power zones, ports assigned to each zone, and the maximum power available to each zone. Figure 5 on page 12 shows which ports belong to each power zone.

Table 4: Port Power Zone Restrictions

Power Zone	Ports assigned to the Power Zone	Zone Maximum Power Limit
1	0 through 2 (on PIC 0)	50 Watts
2	3 through 11 (on PIC 0) and 0 through 8 (on PIC 1)	220 Watts
3	9 through 11 (on PIC 1) and 0 through 11 (on PIC 2)	220 Watts

Figure 5: Power Zone Port Locations



The total amount of power consumed by the optics inserted in the ports in each zone must not exceed the maximum power available to the power zone.

For information regarding using optic hardware with the PTX10001-36MR, see the Hardware Compatibility Tool.

How to Configure the QSFP28 Ports for 10-Gbps, 25-Gbps, and 40-Gbps Speeds

The QSFP28 ports support 10-Gbps, 25-Gbps, 40-Gbps, and 100-Gbps speeds. 100-Gbps is supported on all QSFP28 ports. 10-Gbps, 25-Gbps, and 40-Gbps speeds are not supported on all QSFP28 ports.

Further, when these supported QSFP28 ports are configuring for 10-Gbps, 25-Gbps, or 40-Gbps speeds, there are corresponding QSFP28 ports that must be configured as unused.

Table 5 on page 13 lists the ports that support 10-Gbps, 25-Gbps, or 40-Gbps speeds and which must be configured as unused .

You must configure these ports as unused through the CLI. The PTX10001-36MR does not automatically power off the ports.

NOTE: The list of ports supported in Table 5 on page 13 correspond to 3 logical PICs. For example, for port number 4 listed in the table, there are actually three ports numbered 4 on the PTX10001-36MR (one on each logical PIC) and all three ports support the same speeds.

Table 5: QSFP28 Ports that Support 10-Gbps, 25-Gbps, or 40-Gbps Port Speeds

Port Speed	Supported Port Number	Corresponding Port Number that Must Be Configured as unused
40 Gbps	4	5
	6	7
25 Gbps	4	5
	6	7
10 Gbps	4	5

Table 5: QSFP28 Ports that Support 10-Gbps, 25-Gbps, or 40-Gbps Port Speeds *(Continued)*

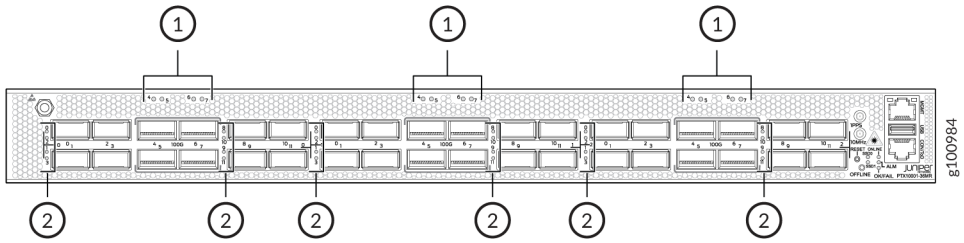
Port Speed	Supported Port Number	Corresponding Port Number that Must Be Configured as unused
NOTE: You can configure one of the ports (odd or even) for 1x10-Gbps and the other port (odd or even) for 1x100-Gbps at the same time. In this scenario, you do not need to configure any ports as unused.	6	7

NOTE:
Port Speed on PTX10001-36MR Router Overview

PTX10001-36MR Network Port LEDs

Each PTX10001-36MR network port uses a single bicolored LED to indicate link status, activity on the link, or a fault condition. The LEDs for the QSFP28 ports are located above the ports. The LEDs for the QSFP56-DD ports are located to the left of the ports. Figure 6 on page 14 shows the location of the LEDs.

Figure 6: Network Port LEDs on a PTX10001-36MR



1– 12 network ports—QSFP28 cages

2– 24 network ports—QSFP56-DD cages

The number next to the LED indicates the port number that the LED belongs to. All 36 network port LEDs behave the same.

Table 6 on page 15 describes the network port LEDs.

Table 6: PTX10001-36MR Network Port LEDs

LED Color	LED State	Description
Unlit	Off	The port is administratively disabled, there is no power, the link is down, or a transceiver is not present.
Green	On steadily	A link is established and all channels are up.
	Blinking	The beacon function is enabled on the port.
Amber	On steadily	One or more channels are up. At least one channel has activity, but not all connections are active.
	Blinking	The beacon function is enabled on the port.
Red	On steadily	All channels are down.
	Blinking	The beacon function is enabled on the port.

RELATED DOCUMENTATION

PTX10001-36MR System Overview | **2**

PTX10001-36MR Management Panel | **15**

show chassis alarms

PTX10001-36MR Management Panel

IN THIS SECTION

PTX10001-36MR Management Panel Description | **16**

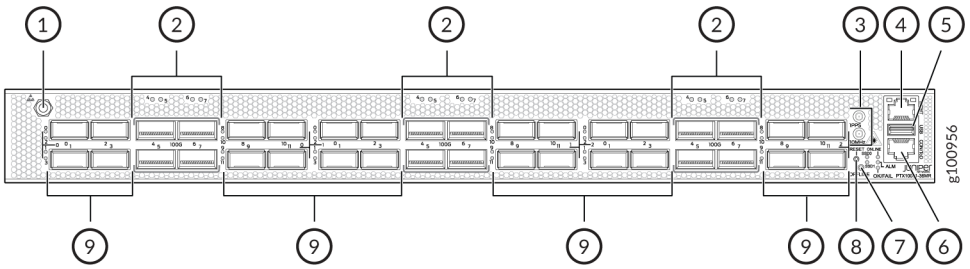
The management panel allows you to have a management channel into the device that is separate from production traffic.

PTX10001-36MR Management Panel Description

The PTX10001-36MR management panel is located to the right of the network ports. Figure 7 on page 16 shows the connections and components of the management panel and the network ports.

You manage the PTX10001-36MR by using the Junos OS Evolved CLI, which is accessible through the console and out-of-band management ports on the management panel. In addition, the management panel has system status LEDs that alert you to minor or major alarms or other issues with the router, SSD status LEDs, external clock synchronization ports, and a USB port to support software installation and recovery.

Figure 7: PTX10001-36MR Port and Management Panel



1– ESD grounding point	6– RJ-45 console and time of day (TOD) port
2– 12 network ports—QSFP28 cages	7– Offline button. Pressing and holding this button for more than 4 seconds turns the device off. Pressing the button again turns the device back on.
3– Clock connectors (10 MHz and 1 PPS)	8– Reset button (do not use unless directed by JTAC)
4– RJ-45 management port (10 Mbps/100 Mbps/1000 Mbps)	9– 24 network ports—QSFP56-DD cages
5– USB port (USB 2.0 standard)	

PTX10001-36MR Management Panel LEDs

IN THIS SECTION

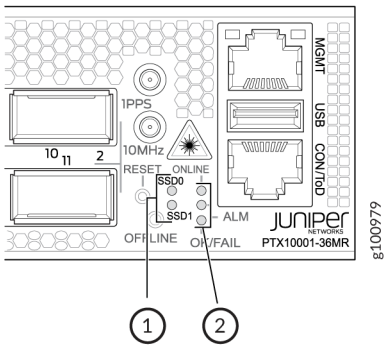
- PTX10001-36MR SSD Port LEDs | 18
- PTX10001-36MR Chassis Status LEDs | 18
- PTX10001-36MR Management Port LEDs | 19

The following status LEDs ae located on the management panel:

- SSD Port LEDs
- Chassis status LEDs
- Management Port LEDs

Figure 8 on page 17 shows the locations of the SSD and status LEDs.

Figure 8: PTX10001-36MR SSD Port LEDs and Status LEDs



1– SSD port LEDs	2– Status LEDs

The following sections explain how to interpret these LEDs.

PTX10001-36MR SSD Port LEDs

The PTX10001-36MR has two 200-GB Serial Advanced Technology Attachment (SATA) solid-state drives (SSD). Each SSD has its own status LED. The LEDs are located on the management panel next to the chassis status LEDs. The LEDs are labeled **SSD0** and **SSD1**.

Table 7 on page 18 describes the SSD status LEDs.

Table 7: PTX10001-36MR SSD LEDs

LED	Color	State	Description
SSD0 and **SSD1**	Unlit	Off	The SSD is not being accessed.
	Green	Blinking	The SSD is active and being accessed.

PTX10001-36MR Chassis Status LEDs

The PTX10001-36MR has three LEDs that indicate system status. They are located in the middle of the management panel (see Figure 8 on page 17).

Table 8 on page 18 describes the chassis status LEDs on a PTX10001-36MR, their colors and states, and the status that they indicate.

Table 8: Chassis Status LEDs on a PTX10001-36MR Device

Name	Color	State	Description
ONLINE	Unlit	Off	The device is powered off.
	Green	On steadily	Junos OS Evolved is loaded on the device.
	Green	Blinking	Junos OS Evolved is being loaded on the device.
ALM (Alarm)	Unlit	Off	The device is halted or there is no alarm.

Table 8: Chassis Status LEDs on a PTX10001-36MR Device *(Continued)*

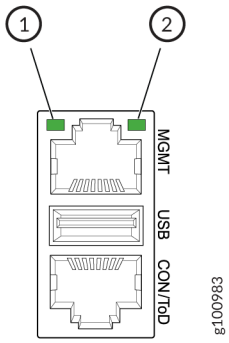
Name	Color	State	Description
	Red	On steadily	A major hardware fault has occurred, such as a temperature alarm or power failure, and the device has halted. Power off the device by setting the AC power source outlet to the OFF (O) position, or unplugging the AC power cords. Correct any voltage or site temperature issues, and allow the device to cool down. Power on the device and monitor the power supply and fan LEDs to help determine where the error is occurring.
	Yellow	On steadily	A minor alarm has occurred, such as a software error. Power off the device by setting the AC power source outlet to the OFF (O) position, or unplugging the AC power cords. Power on the device and monitor the status LEDs to ensure that Junos OS Evolved boots properly.
	Yellow	Blinking	Both a major and a minor alarm is occurring on the device.
OK/FAIL	Green	On steadily	There are no fault conditions on the device.
	Red	Blinking	A fault has occurred on the device.

PTX10001-36MR Management Port LEDs

There is one management port on the PTX10001-36MR that has LEDs that indicate link status and link activity. The port is located on the management panel above the USB port and is labeled **MGMT**. The

management port has separate LEDs for status and activity. Figure 9 on page 20 shows the location of the LEDs.

Figure 9: Management Port LEDs



1– Status LED (RJ-45)	2– Link activity LED (RJ-45)

Table 9 on page 20 describes the RJ-45 management port LEDs.

Table 9: PTX10001-36MR RJ-45 Management Port LEDs

LED	Color	State	Description
Status	Unlit	Off	No link is established or the port speed is 10 Mbps.
	Yellow	On steadily	The port speed is 100 Mbps.
	Green	On steadily	The port speed is 1 Gbps.
Link activity	Green	Blinking	A link is established and there is link activity.

RELATED DOCUMENTATION

PTX10001-36MR System Overview | 2

PTX10001-36MR Port Panel | 7

PTX10001-36MR Cooling System

IN THIS SECTION

- PTX10001-36MR Cooling System Description | 21
- PTX10001-36MR Fan Module LEDs | 24

PTX10001-36MR Cooling System Description

IN THIS SECTION

- Fan Modules | 21
- Airflow Through the Chassis | 23

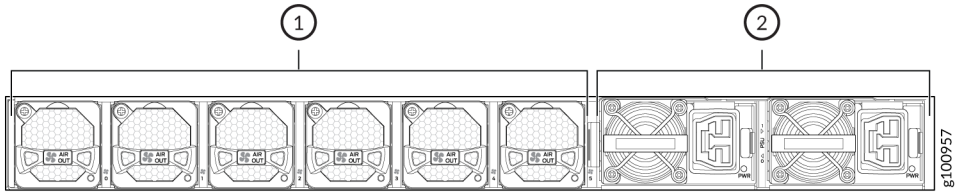
Fan Modules

The cooling system in a PTX10001-36MR device consists of fan modules and a single fan in each power supply. There are six fan modules in the PTX10001-36MR. The airflow direction on the PTX10001-36MR is airflow out; air comes into the device through the vents in the front (port) panel.

The fan modules in the PTX10001-36MR are hot-insertable and hot-removable field-replaceable units (FRUs). These fan modules are designed for the airflow out direction. The fan modules are installed in the fan module slots on the back panel (FRU) side of the device next to the power supplies. The PTX10001-36MR has six fan modules numbered 0 through 5 from left to right. Each fan module slot has a fan icon next to it.

Figure 10 on page 22 shows the location of the fan modules on the device. Figure 11 on page 22 shows an example of the fan module.

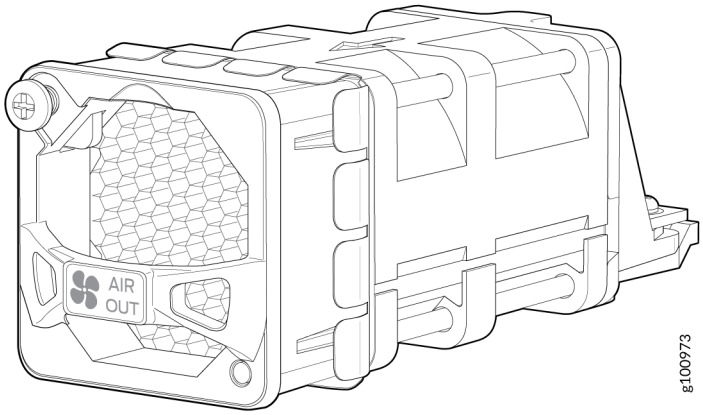
Figure 10: PTX10001-36MR Back Panel



1– Fan modules (6)	2– Power supplies (2)

Figure 11 on page 22 shows the fan module for the PTX10001-36MR.

Figure 11: PTX10001-36MR Fan Module



You remove and replace a fan module from the back end of the chassis. During replacement, the device continues to operate for four minutes if one fan module is removed. If two fans are removed, the chassis will shut down immediately.

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

Table 10 on page 23 lists the fan module product SKU.

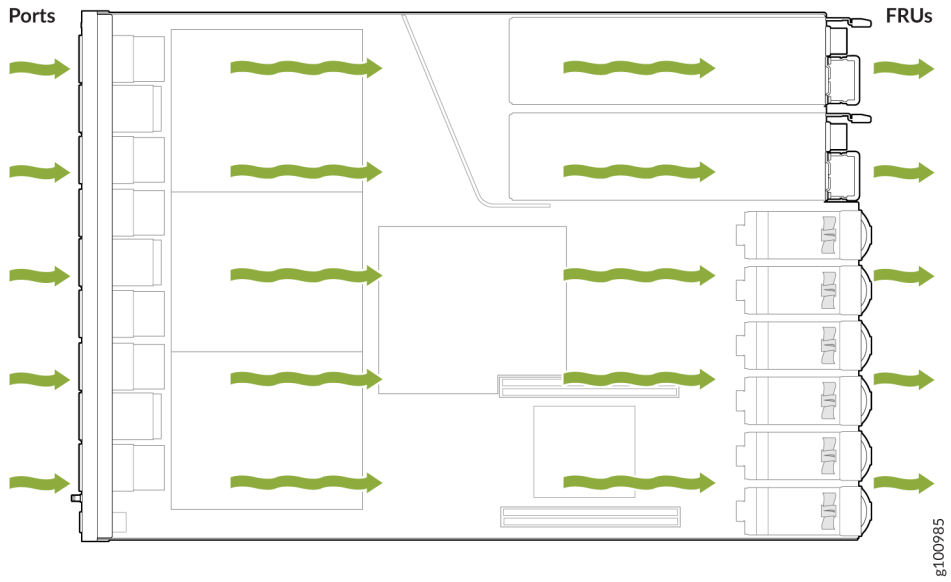
Table 10: PTX10001-36MR Fan Modules

Fan Module	Label on the Fan Module	Direction of Airflow in the Fan Module	Power Supplies
JNP-FAN2-1RU	**AIR OUT**	Front-to-back, that is, air comes in through vents on the end with the network ports; air exhausts out the end with the fans.	You must install only power supplies that have **AIR OUT** labels in devices in which the fan modules have **AIR OUT** labels.

Airflow Through the Chassis

In the PTX10001-36MR cooling system, cool air enters through the vents in the port panel and hot air exhausts through the FRU panel. This type of airflow is known as *airflow out* or *port-to-FRU* airflow. When the chassis is installed, it must be positioned so that the FRUs are next to the *hot aisle*. Figure 12 on page 23 shows the airflow through the chassis.

Figure 12: Airflow Through the PTX10001-36MR Chassis (Port-to-FRU)



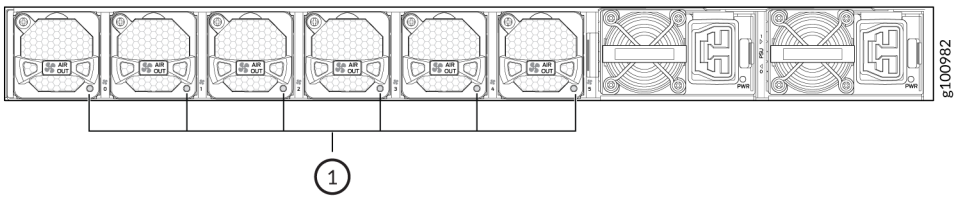
NOTE: Under normal operating conditions, the fan modules operate at a moderate speed. Temperature sensors in the chassis monitor the temperature within the chassis. The system raises an alarm if a fan module fails or if the ambient temperature inside the chassis rises above the acceptable range. If the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

PTX10001-36MR Fan Module LEDs

You can check the status of fan modules through the `show system alarms` command or by looking at the LEDs next to each fan module.

Figure 13 on page 24 shows the location of the LED on the fan module.

Figure 13: Fan Module LEDs



1– Fan LED

Table 11 on page 24 describes the function of the fan module LED.

Table 11: PTX10001-36MR Fan Module LED

LED Color	LED State	Description
Green	On steadily	The fan module is operating normally. The system has verified that the module is engaged, that the airflow is in the correct direction, and that the fan is operating correctly.
	Blinking	The fan module is in the verification process.

Table 11: PTX10001-36MR Fan Module LED *(Continued)*

LED Color	LED State	Description
Red	On steadily	An error has been detected in the fan module. Replace the fan module as soon as possible. Either the fan has failed or it is seated incorrectly. To maintain proper airflow through the chassis, leave the fan module installed in the chassis until you are ready to replace it.

RELATED DOCUMENTATION

PTX10001-36MR System Overview | 2

PTX10001-36MR Power System | 25

PTX10001-36MR Power System

IN THIS SECTION

PTX10001-36MR AC/HVDC Power Supply Description | 26

PTX10001-36MR DC Power Supply Description | 38

The PTX10001-36MR is powered by 3000-W redundant AC/HDVC or DC power supplies that are preinstalled at the factory. The PTX10001-36MR is powered by two power supplies for 1 + 1 redundancy. The power supplies are hot-removable and hot-insertable. If one power supply fails, you can replace it without powering off or disrupting the routing function. The other power supply balances the electrical load without interruption. Each power supply has two outputs: 12 V and 12 V standby. Two counter-rotating fans in each power supply provide front to back cooling. The input voltages are as follows:

- AC input voltage range: 200-277 VAC
- HDVC input voltage range: 204-380 VDC
- DC input voltage range: -40 VDC Minimum, -72 VDC maximum

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

PTX10001-36MR AC/HVDC Power Supply Description

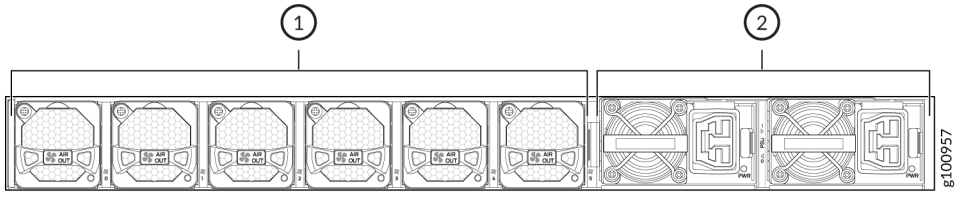
IN THIS SECTION

- PTX10001-36MR AC Power Supply LED | **27**
- PTX10001-36MR AC/HVDC Power Specifications | **29**
- PTX10001-36MR AC Power Cord Specifications | **30**

The input power to the AC/HVDC power supplies can be AC power or HVDC power. The power supplies automatically detect whether there is AC or HVDC input voltage and manage the power accordingly. AC power can be 180-305 VAC input voltage and HVDC power can be 190-400 VDC input voltage. Each 3000-W AC/HVDC power supply module has a single AC or HVDC input and provides 12 V of power to the system.

Figure 14 on page 26 shows the location of the power supplies on the back panel.

Figure 14: PTX10001-36MR Back Panel (AC/HVDC Power Supplies Installed)

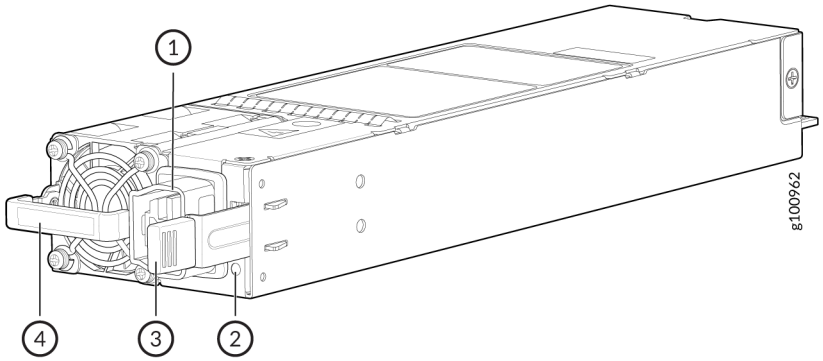


1– Fan modules (6)

2– Power supplies (2)

Figure 15 on page 27 shows an example of the AC/HVDC power supply module components.

Figure 15: PTX10001-36MR AC/HVDC Power Supply



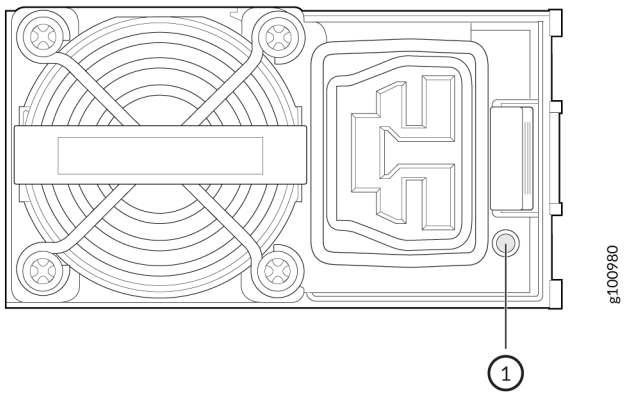
1– Plug power connector	3– Ejector lever
2– Status LED	4– Orange handle

CAUTION: To avoid electrical injury, carefully follow instructions in "Connect the PTX10001-36MR to Power" on page 95 .

PTX10001-36MR AC Power Supply LED

Each PTX10001-36MR AC/HVDC power supply module has a status LED on the power supply module faceplate. Refer to Figure 16 on page 27 .

Figure 16: PTX10001-36MR AC/HVDC Power Supply Status LED Location



1– Power supply LED	

The PTX10001-36MR AC/HVDC power supply module uses an amber and green bicolor LED to indicate the operating state (see Table 12 on page 28).

Table 12: PTX10001-36MR AC/HVDC Power Supply Status LED Description

LED Color	LED State	Description
Unlit	off	One or both power supplies do not have AC power.
Green	On steadily	The power supply module is on and operating properly.
	Blinking	There is no input power, but the power supply module from another slot in the same system is on with 12 VSB active.
Amber	On steadily	• The power supply module shut down due to a critical event. Possible causes: high temperature, high power, high current, or fan failure. • The AC power cord is unplugged.
	Blinking	The power supply module is operating but there are warning events. Possible conditions: high temperature (inlet temperature is greater than 53° F [11° C] or a hot spot temperature is greater than 95° F [35° C]), high power, high current, or slow fan (less than 1200 rpm).

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

PTX10001-36MR with Two AC/HVDC Power Supplies

```
user@device> show chassis power
Chassis Power        Voltage(V)    Power(W)

Total Input Power                   1020
```

```
  PSM 0
    Input 1             230          603
    Output            12.02       525.93
  PSM 1
    Input 1             232          417
    Output            11.99       346.21

user@device> show chassis power detail
Chassis Power        Voltage(V)    Power(W)

Total Input Power                   1023
  PSM 0
    Input 1             229          604
    Output            12.02       533.45
    Capacity           3000 W (maximum 3000 W)
  PSM 1
    Input 1             232          419
    Output            11.99       334.33
    Capacity           3000 W (maximum 3000 W)

Item                 Used(W)
  Routing Engine 0       26
  CB 0                    5

System:
  Zone 0:
      Capacity:          6000 W (maximum 6000 W)
      Actual usage:      1023 W
  Total system capacity: 6000 W (maximum 6000 W)
```

PTX10001-36MR AC/HVDC Power Specifications

The PTX10001-36MR operates within the AC/HVDC input voltage range listed in Table 13 on page 29 . The PTX10001-36MR power consumption is listed in Table 14 on page 30 .

Table 13: PTX10001-36MR AC/HVDC Power Specifications

Parameter	Minimum	Rated	Maximum
Input voltage (AC)	180 VAC	200-277 VAC	305 VAC

Table 13: PTX10001-36MR AC/HVDC Power Specifications *(Continued)*

Parameter	Minimum	Rated	Maximum
Input voltage (HVDC)	204 VDC	240-380 VDC	400 VDC
AC input line frequency	47 Hz	50-60 Hz	63 Hz

Table 14: PTX10001-36MR AC/HVDC Power Consumption

Item	Specification
Typical power consumption	1538 W
Maximum power consumption	2164 W

PTX10001-36MR AC Power Cord Specifications

Detachable AC power cords are shipped with the AC power supplies. Table 16 on page 33 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.

NOTE: In North America, AC power cords must not exceed 14.75 feet (approximately 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 that can be ordered for the PTX10001-36MR are in compliance.

Table 15 on page 31 lists AC power cord specifications provided for each country or region.

Table 15: PTX10001-36MR Power Cord Specifications

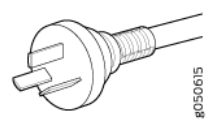
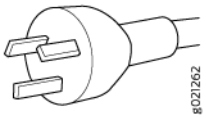
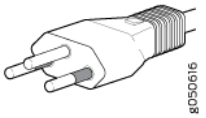
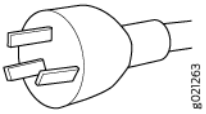
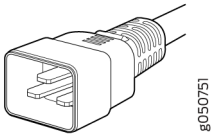
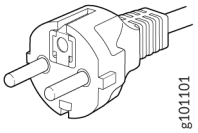
Locale	Cord Set Rating	Plug Standards	Spare Juniper Model Number	Graphic
Argentina	16 A, 250 VAC	IRAM 2073 Type RA/3	CBL-JNP-SG4-AR	
Australia and New Zealand	15 A, 250 VAC	AS/NZS 4417	CBL-JNP-SG4-AU	
Brazil	16 A, 250 VAC	NBR 14136 Type BR/3	CBL-JNP-SG4-BR	
China	16 A, 250 VAC	GB2099	CBL-JNP-SG4-CH	
China, Japan, and Europe	16 A, 250 VAC	C20 to Anderson 3-5958p4	CBL-JNP-SG4-C20-CH	
Europe (except Italy, Switzerland, and United Kingdom)	20 A, 250 VAC	CEE 7/7 STRAIGHT	CBL-JNP-SG4-EU	
Great Britain	13 A, 250 VAC,	BS1363	CBL-JNP-SG4-UK	

Table 15: PTX10001-36MR Power Cord Specifications *(Continued)*

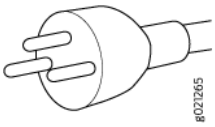
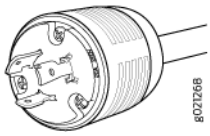
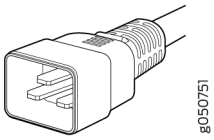
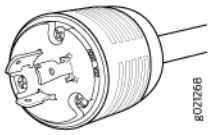
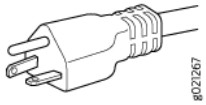
Locale	Cord Set Rating	Plug Standards	Spare Juniper Model Number	Graphic
India	16 A, 250 VAC	SANS 164/1	CBL-JNP-SG4-SA	
Israel	16 A, RA, 250 VAC	SI 32/1971 Type IL/3G	CBL-JNP-SG4-IL	
Italy	16 A, 250 VAC	CEI 23-16	CBL-JNP-SG4-IT	
Japan	20 A, 250 VAC	Nema L-20	CBL-JNP-SG4-JPL	
North America	20 A, 250 VAC	C20 to Anderson 3-5958p4	CBL-JNP-SG4-C20	
North America	16 A, 250 VAC	Locking NEMA L6-20P	CBL-JNP-SG4-US-L	
North America	16 A, 250 VAC	NEMA 6-20P	CBL-JNP-SG4-US	

Table 15: PTX10001-36MR Power Cord Specifications *(Continued)*

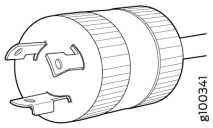
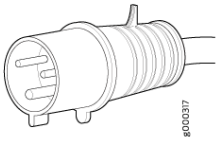
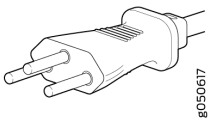
Locale	Cord Set Rating	Plug Standards	Spare Juniper Model Number	Graphic
North America	15 A, 277 V	NEMA I7-20P	CBL-JNP-SG4-HVAC	
North America	20 A, 250 V	IEC 320P6W	CG_CBL-APP-400-02	
South Africa	16 A, 250 VAC	SANS 164/1	CBL-JNP-SG4-SA	
Switzerland	16 A, 250 VAC	CEI 23-50	CBL-JNP-SG4-SZ	

Table 16: PTX10001-36MR Default Power Cords Supplied

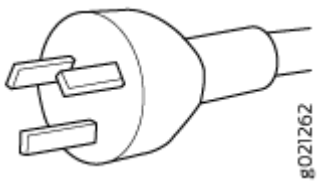
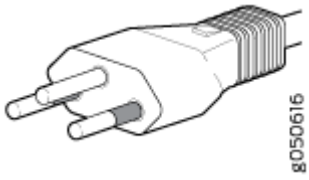
Locale	Spare Juniper Model Number	Graphic
Australia, Cook Islands, Fiji, Kiribati, Nauru, New Zealand, Papua New Guinea, Samoa, Tonga, and Vanuatu	CBL-JNP-SG4-AU	
Brazil	CBL-JNP-SG4-BR	

Table 16: PTX10001-36MR Default Power Cords Supplied *(Continued)*

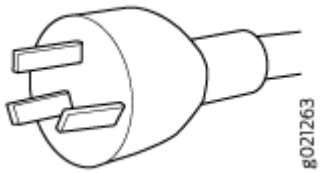
Locale	Spare Juniper Model Number	Graphic
China	CBL-JNP-SG4-CH	

Table 16: PTX10001-36MR Default Power Cords Supplied *(Continued)*

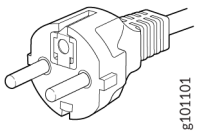
Locale	Spare Juniper Model Number	Graphic
Afghanistan, Albania, Algeria, Andorra, Angola, Argentina, Armenia, Austria, Azerbaijan, Bangladesh, Belarus, Belgium, Benin, Bhutan, Bolivia, Bosnia and Herzegovina, Bulgaria, Burundi, Burkina Faso, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Cocos Islands, Comoros, Croatia, Czech Republic, Democratic Republic of the Congo, Denmark, Djibouti, Dominica, East Timor, Egypt, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Faroe Islands, Finland, France, French Guiana, Gabon, Georgia, Germany, Ghana, Gibraltar, Greece, Greenland, Guinea, Guinea-Bissau, Hungary, Iceland, Indonesia, Iran, Iraq, Isle of Man, Ivory Coast, Jordan, Kuwait, Kazakhstan, Latvia, Libya, Lithuania, Luxembourg, Macau, Macedonia, Madagascar, Mali, Martinique, Mauritania, Mauritius, Moldova, Monaco, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, New Caledonia, Netherlands, Nepal, Nigeria, Norway, Pakistan, Paraguay, Poland, Portugal, Qatar, Republic of the Congo, Romania, Russia, Rwanda, Saint Barthelemy, Saint Kitts and Nevis, Saint Vincent and the Grenadines, Senegal, Serbia, Serbia and Montenegro, Sierra Leone, Slovakia, Slovenia, Somalia, Spain, Sri Lanka, Sudan, Suriname, Sweden, Syria, Tajikistan, Tanzania, Togo, Tunisia, Turkey, Turkmenistan, Ukraine, Uruguay, Uzbekistan, Vietnam, and Yemen	CBL-JNP-SG4-EU	

Table 16: PTX10001-36MR Default Power Cords Supplied *(Continued)*

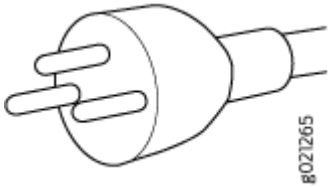
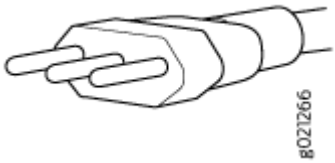
Locale	Spare Juniper Model Number	Graphic
Israel	CBL-JNP-SG4-IL	
Chile, Italy, and San Marino	CBL-JNP-SG4-IT	
South Africa	CBL-JNP-SG4-SA	
Maldives and United Kingdom	CBL-JNP-SG4-UK	

Table 16: PTX10001-36MR Default Power Cords Supplied *(Continued)*

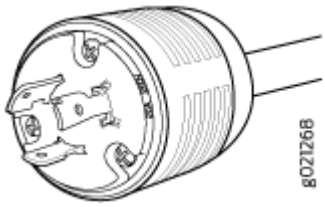
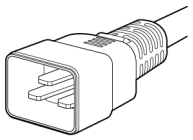
Locale	Spare Juniper Model Number	Graphic
American Samoa, Anguilla, Antigua and Barbuda, Aruba, Barbados, Bahamas, Belize, Bermuda, British Virgin Islands, Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guam, Guatemala, Guyana, Haiti, Honduras, Jamaica, Japan, Laos, Lebanon, Liberia, Mexico, Montserrat, Micronesia, Netherlands Antilles, Niger, Panama, Peru, Philippines, Puerto Rico, Saudi Arabia, Taiwan, Thailand, Trinidad and Tobago, U.S. Virgin Islands, and Venezuela	CBL-JNP-SG4-US-L	
United States	CBL-JNP-SG4-C20	

Table 17: PTX10001-36MR HVDC Cable Specifications (Bare Wire)

Locale	Cord Set Rating	Spare Juniper Model Number
HVDC power cord	16 A, 400 VAC	CBL-PWR2-BARE

NOTE: The insulation for the wires in the HVDC cables is color coded. Green is ground, black is line, and white is neutral. For HVDC, the black and white wires are not polarity-sensitive. The black wire can be positive (+) or neutral (–) and the white wire can be positive (+) or negative (–).

PTX10001-36MR DC Power Supply Description

IN THIS SECTION

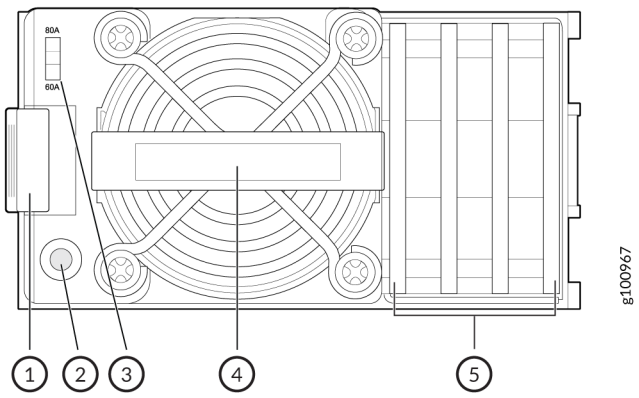
- PTX10001-36MR DC Power Supply LED | 39
- PTX10001-36MR DC Input Current Selector (DIP Switch) | 40
- PTX10001-36MR Input DC Voltage Specification | 41
- 60-A Input Feed Power Management | 42
- PTX10001-36MR DC Power Cables | 42
- PTX10001-36MR DC Power Lugs | 43
- View Power Statistics | 44

The PTX10001-36MR DC power supplies are hot-removable and hot-insertable FRUs. Each 3000-W power supply module has a single DC input and provides 12-VDC output with a standby voltage of 12-VDC.

Figure 17 on page 38 shows the DC power supply module components.

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

Figure 17: PTX10001-36MR DC Power Supply



1– Ejector lever	4– Handle

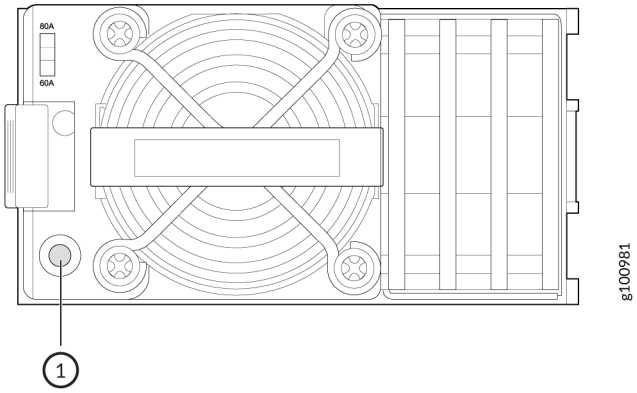
2– Status LED	5– Terminal block cover
3– DC input current selector (DIP switch)	

CAUTION: To avoid electrical injury, carefully follow instructions in "Connect the PTX10001-36MR to Power" on page 95 .

PTX10001-36MR DC Power Supply LED

Each PTX10001-36MR DC power supply module has a status LED on the power supply module faceplate (see Figure 18 on page 39).

Figure 18: PTX10001-36MR DC Power Supply Status LED Location



1– Power supply status LED	

Table 18 on page 39 describes the DC power supply module status LED.

Table 18: PTX10001-36MR DC Power Supply Status LED Description

LED Color	LED State	Description
Unlit	Off	The power supplies do not have DC power.
Green	On steadily	The power supply module is on and operating properly.

Table 18: PTX10001-36MR DC Power Supply Status LED Description *(Continued)*

LED Color	LED State	Description
	Blinking	• The power supply module is uploading firmware. • The power supply module is in the cold redundant state.
Amber	On steadily	• The power supply module shut down due to a critical event. Possible causes: high temperature, high power, high current, or slow fan. • The DC power cord is unplugged, but the second power supply module still has DC power.
	Blinking	The power supply module is operating, but there are warning events. Possible causes: high temperature, high power, high current, or slow fan.

PTX10001-36MR DC Input Current Selector (DIP Switch)

The PTX10001-36MR DC power supply module can operate with an input current of 80 A or 60 A. You select the input rating by moving the DC input current selector (DIP switch) to the desired setting. Refer to Figure 17 on page 38 for the location of the DIP switch. If you select 60 A, the power supply module limits the output power so that the input current does not exceed 60 A under normal steady-state operation. If you select 80 A, the power supply module limits the output power so that the input current does not exceed 80 A.

For example:

Input Current	Description
60 A	The power supply module limits the output power to 2200 W when the input voltage is between 40 V and 48 V. It linearly increases the output power if the input voltage increases. The power supply module provides 2700 W output power when the input voltage is between 48 V and 72 V.

(Continued)

Input Current	Description
80 A	The power supply module provides 3000-W output power throughout the input voltage range from 40 VDC through 72 VDC.

PTX10001-36MR Input DC Voltage Specification

The PTX10001-36MR DC power supply modules operate within the DC input voltage range listed in Table 19 on page 41 . The PTX10001-36MR DC power consumption is listed in Table 20 on page 41 .

NOTE: Depending on the available input source, we recommend that the 48-VDC facility DC source be equipped with a circuit breaker rated at a minimum of 60 A (48 VDC) or 80 A (48 VDC), or as required by local code.

Table 19: PTX10001-36MR DC Power Specifications

Input Switch Setting	Minimum Input DC Voltage	Rated Input DC Voltage	Maximum Input DC Voltage	Maximum Input DC Current	Maximum Output Power
60 A	40 VDC	48 VDC to 60 VDC	72 VDC	60 ADC	2700 W
80 A	40 VDC	48 VDC to 60 VDC	72 VDC	90 ADC	3000 W

Table 20: PTX10001-36MR DC Power Consumption

Item	Specification
Typical power consumption	1538 W
Maximum power consumption	2164 W

60-A Input Feed Power Management

The 60-A DC power supply module capacity changes when the input voltage is below or above the under voltage limit as follows:

- When the 60-A DC power supply module input voltage is above the input under voltage warning limit, its capacity is 2700 W.
- When the input voltage is below the input under voltage warning limit, the power supply module capacity is reduced to 2200 W.

When the input voltage is above the input under voltage warning limit, the software adjusts the system capacity and reallocates power to the FRUs based on the new system capacity. Table 21 on page 42 shows system behavior in different scenarios with 60 A DC power supply modules.

Table 21: System Behavior in Different Scenarios with 60-A DC power supply modules

	Input voltage: < 40 V	Input voltage: 40 V to 72 V
60 A DC mode	The power supply module is powered off and won't turn on when the system is powering up.	Normal operation.
PTX10001-36MR with two power supply modules	The power supply modules are offline and the system is powered down.	Normal operation.
PTX10001-36MR with one power supply modules	The power supply modules are offline and the system is powered down.	Normal operation, but there's no power supply module redundancy.

In all these scenarios, power management actions can be different but deterministic based on the total system capacity and total system power required. Use the `show chassis power detail` command to determine the behavior.

PTX10001-36MR DC Power Cables

You must supply the DC power cables that meet the specifications required by the local code, laws, and standards. The insulation for the wires in the cables is color coded. Green is ground, black is line, and white is neutral. The wires are labeled **(+)** and **(–)** to indicate their polarity.

CAUTION: You must ensure that power connections maintain the proper polarity.

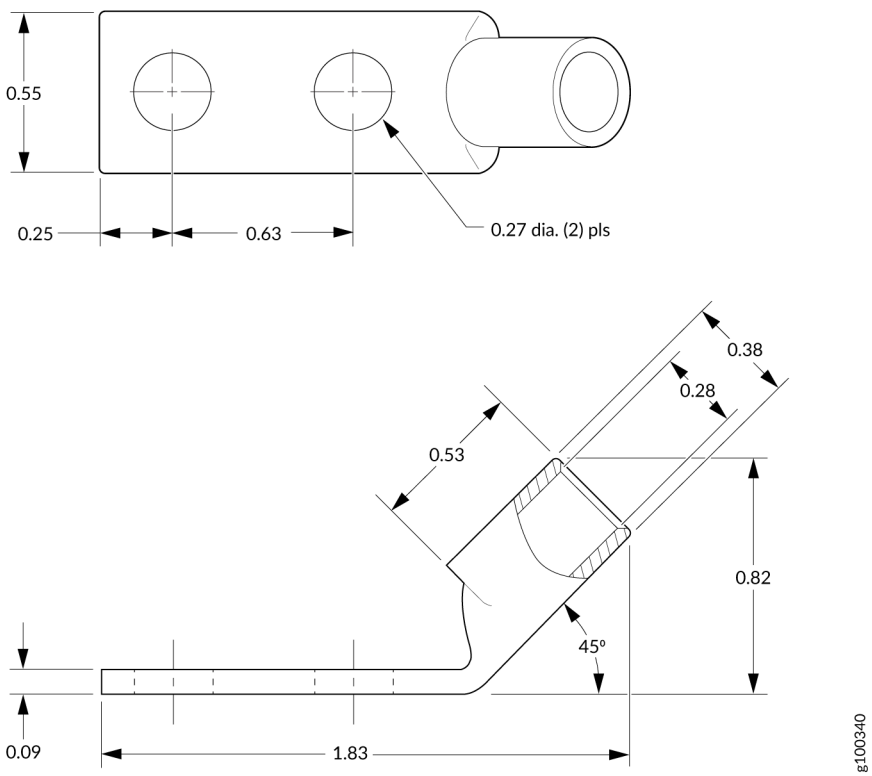
WARNING: For field-wiring connections, use copper conductors only.

WARNING: DC power cables must not block access to PTX10001-36MR components or drape where people could trip on them.

PTX10001-36MR DC Power Lugs

The accessory box shipped with the PTX10001-36MR includes the cable lugs that attach to the terminal studs of each power supply module. (The cable lug shown in Figure 19 on page 44 is also used for grounding the chassis.) The cable lugs are dual hole and sized to fit 1/4-20 UNC terminal studs at 15.86-mm (0.625-in.) center line.

Figure 19: DC Power Cable Lugs



CAUTION: Before you begin to install the PTX10001-36MR, a licensed electrician must attach a cable lug to the power cables that you supply. A cable with an incorrectly attached lug can damage the PTX10001-36MR.

View Power Statistics

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

PTX10001-36MR with Two DC Power Supplies

```
user@device> show chassis power
Chassis Power        Voltage(V)    Power(W)

Total Input Power                  1225
  PSM 0
```

```
    Input 1              53          581
    Output            12.07        580.88
  PSM 1
    Input 1              53          644
    Output            12.07        615.98

user@device> show chassis power detail
Chassis Power        Voltage(V)    Power(W)

Total Input Power                   1230
  PSM 0
    Input 1              53          584
    Output            12.07        531.43
    Capacity           3000 W (maximum 3000 W)
  PSM 1
    Input 1              53          646
    Output            12.07        626.14
    Capacity           3000 W (maximum 3000 W)

Item                 Used(W)
  Routing Engine 0       26
  CB 0                    6

System:
  Zone 0:
      Capacity:          6000 W (maximum 6000 W)
      Actual usage:      1230 W
  Total system capacity: 6000 W (maximum 6000 W)
```

RELATED DOCUMENTATION

PTX10001-36MR System Overview | 2

Maintain the PTX10001-36MR Power Supplies | 119

CHAPTER 2

Site Planning, Preparation, and Specifications

PTX10001-36MR Site Preparation Checklist | 47

PTX10001-36MR Site Guidelines and Requirements | 48

PTX10001-36MR Network Cable and Transceiver Planning | 58

PTX10001-36MR Management Cable Specifications and Pinouts | 70

PTX10001-36MR Site Preparation Checklist

The checklist in Table 22 on page 47 summarizes the tasks you need to perform when preparing a site for a PTX10001-36MR installation.

Table 22: Site Preparation Checklist

Item or Task	For More Information	Performed by	Date
Environment			
Verify that environmental factors such as temperature and humidity do not exceed router tolerances.	"PTX10001-36MR Environmental Requirements and Specifications" on page 49		
Power			
Measure the distance between external power sources and the router installation site.			
Calculate the power consumption and requirements.	• Table 13 on page 29 • Table 15 on page 31		
Rack or Cabinet			
Verify that your rack or cabinet meets the minimum requirements for the installation of the router.	"PTX10001-36MR Rack Requirements" on page 54		
Plan rack or cabinet location, including required space clearances.	"PTX10001-36MR Clearance Requirements for Airflow and Hardware Maintenance" on page 51		
Secure the rack or cabinet to the floor and building structure.			

Table 22: Site Preparation Checklist *(Continued)*

Item or Task	For More Information	Performed by	Date
Cables			
Acquire cables and connectors: • Determine the number of cables needed based on your planned configuration. • Review the maximum distance allowed for each cable. Choose the length of cable based on the distance between the hardware components being connected.	• "Determine Transceiver Support for the PTX10001-36MR" on page 58 • "Cable and Connector Specifications for MX and PTX Series Devices" on page 59		
Plan the cable routing and management.			

RELATED DOCUMENTATION

PTX10001-36MR Installation Safety Guidelines | **77**

Installation Instructions Warning | **163**

Chassis and Component Lifting Guidelines | **164**

Restricted Access Warning | **164**

Ramp Warning | **166**

Rack-Mounting and Cabinet-Mounting Warnings | **166**

Grounded Equipment Warning | **170**

PTX10001-36MR Site Guidelines and Requirements

IN THIS SECTION

PTX10001-36MR Environmental Requirements and Specifications | **49**

- General Site Guidelines | **50**
- PTX10001-36MR Chassis Grounding Cable and Lug Specifications | **51**
- PTX10001-36MR Clearance Requirements for Airflow and Hardware Maintenance | **51**
- PTX10001-36MR Physical Specifications | **52**
- Site Electrical Wiring Guidelines | **53**
- PTX10001-36MR Rack Requirements | **54**
- PTX10001-36MR Cabinet Requirements | **56**

PTX10001-36MR Environmental Requirements and Specifications

The PTX10001-36MR must be installed in a rack or cabinet. It must be housed in a dry, clean, well-ventilated, and temperature-controlled environment.

Follow these environmental guidelines:

- The site must be as dust-free as possible, because dust can clog air intake vents and filters, reducing the efficiency of the PTX10001-36MR cooling system.
- Maintain ambient airflow for normal PTX10001-36MR operation. If the airflow is blocked or restricted, or if the intake air is too warm, the chassis might overheat, leading to the PTX10001-36MR temperature monitor shutting down the router to protect the hardware components.

Table 23 on page 49 provides the required environmental conditions for normal PTX10001-36MR operation.

Table 23: PTX10001-36MR Environmental Tolerances

Description	Tolerance
Altitude	No performance degradation up to 6,562 feet (2000 meters).

Table 23: PTX10001-36MR Environmental Tolerances *(Continued)*

Description	Tolerance
Relative humidity	• Normal operation ensured in relative humidity range of 5% through 90%, noncondensing. • Short-term operation ensured in relative humidity range of 5% through 93%, noncondensing. **NOTE**: As defined in NEBS GR-63-CORE, Issue 3, short-term events can be up to 96 hours in duration but not more than 15 days per year.
Temperature	• Normal operation ensured in temperature range of 32° F through 104° F (0° C through 40° C). • Nonoperating storage temperature in shipping container: –40° F through 158° F (–40° C through 70° C).
Seismic	Designed to comply with Zone 4 earthquake requirements per NEBS GR-63-CORE, Issue 3.

NOTE: Install the PTX10001-36MR only in restricted areas, such as dedicated equipment rooms and equipment closets, in accordance with Articles 110-16, 110-17, and 110-18 of the National Electrical Code, ANSI/NFPA 70.

General Site Guidelines

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

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

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

- Install the device in a secure area, so that only authorized personnel can access the device.

PTX10001-36MR Chassis Grounding Cable and Lug Specifications

For installations that require a separate grounding conductor to the chassis, the PTX10001-36MR must be adequately grounded before power is connected to ensure proper operation and to meet safety and electromagnetic interference (EMI) requirements. To ground a PTX10001-36MR, connect a grounding cable to earth ground and then attach it to the chassis grounding points.

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

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

CAUTION: Before device installation begins, a licensed electrician must attach a cable lug to the grounding cables that you supply. See "Connect the PTX10001-36MR to Ground" on page 96 . A cable with an incorrectly attached lug can damage the PTX10001-36MR.

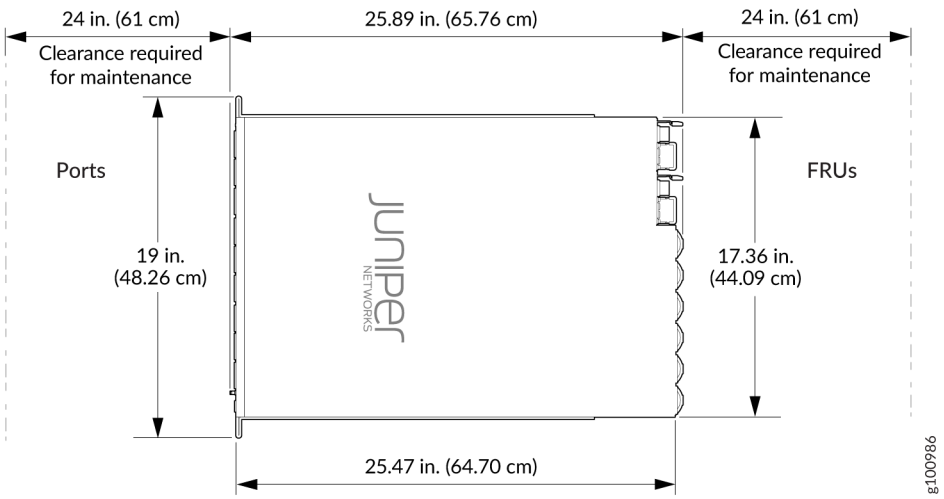
Before connecting the PTX10001-36MR to earth ground, review the following information:

- The grounding lug required is a Panduit LCD6-14AH-L or equivalent (not provided).
- The grounding cable that you provide for a PTX10001-36MR must be the same size or heavier than the input wire of each power supply. Minimum recommendations are 8 AWG (8.4 mm^2) stranded wire, 90° C wire, or as permitted by local code.

PTX10001-36MR Clearance Requirements for Airflow and Hardware Maintenance

When planning the site for a PTX10001-36MR installation, you must allow sufficient clearance around the installed chassis (see Figure 20 on page 52).

Figure 20: Clearance Requirements for Airflow and Hardware Maintenance for a PTX10001-36MR



Follow these guidelines:

- For the cooling system to function properly, the airflow around the chassis must be unrestricted. See "PTX10001-36MR Cooling System" on page 21 for more information about the airflow through the chassis.
- If you are mounting a PTX10001-36MR in a rack with other equipment, ensure that the exhaust from other equipment does not blow into the intake vents of the chassis.
- You must leave at least 24 in. (61 cm) both in front of and behind the PTX10001-36MR for service personnel to remove and install hardware components. You must leave adequate space at the front and back of the PTX10001-36MR. NEBS GR-63 recommends that you allow at least 30 in. (76.2 cm) in front of the rack or cabinet and 24 in. (61 cm) behind the rack.

PTX10001-36MR Physical Specifications

Table 24 on page 53 lists the physical specifications for the PTX10001-36MR chassis.

Table 24: Physical Specifications for the PTX10001-36MR

Product SKU	Weight	Height	Width	Depth
PTX10001-36MR	With all power supplies and fans installed: 39.7 lb (18.0 kg)	1.72 in. (4.3 cm)	17.36 in. (44.09 cm)	25.89 in. (65.76 cm)

Site Electrical Wiring Guidelines

Table 25 on page 53 describes the factors you must consider while planning the electrical wiring at your site.

WARNING: You must provide a properly grounded and shielded environment and use electrical surge-suppression devices.

Avertissement Vous devez établir un environnement protégé et convenablement mis à la terre et utiliser des dispositifs de parasurtension.

Table 25: Site Electrical Wiring Guidelines

Site Wiring Factor	Guidelines
Signaling limitations	If your site experiences any of the following problems, consult experts in electrical surge suppression and shielding: • Improperly installed wires cause radio frequency interference (RFI). • Damage from lightning strikes occurs when wires exceed recommended distances or pass between buildings. • Electromagnetic pulses (EMPs) caused by lightning damage unshielded conductors and electronic devices.

Table 25: Site Electrical Wiring Guidelines *(Continued)*

Site Wiring Factor	Guidelines
Radio frequency interference	To reduce or eliminate RFI from your site wiring, do the following: • Use a twisted-pair cable with a good distribution of grounding conductors. • If you must exceed the recommended distances, use a high-quality twisted-pair cable with one ground conductor for each data signal, when applicable.
Electromagnetic compatibility	If your site is susceptible to problems with electromagnetic compatibility (EMC), particularly from lightning or radio transmitters, seek expert advice. Strong sources of electromagnetic interference (EMI) can cause: • Destruction of the signal drivers and receivers in the device, • Electrical hazards as a result of power surges conducted over the lines into the equipment.

PTX10001-36MR Rack Requirements

The PTX10001-36MR chassis is designed to be installed in two-post or four-post racks.

Rack requirements consist of:

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

Table 26 on page 55 provides the rack requirements and specifications for the PTX10001-36MR.

Table 26: Rack Requirements for the PTX10001-36MR

Rack Requirement	Guidelines
Rack type	Use a two-post or a four-post rack. You can mount the device on any two-post or four-post rack that provides bracket holes or hole patterns spaced at 1-U (1.75 in. or 4.45 cm) increments and that meets the size and strength requirements to support the weight. A U is the standard rack unit defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310–D) published by the Electronics Components Industry Association (http://www.ecianow.org/).
Mounting bracket hole spacing	The holes in the mounting brackets are spaced at 1-U (1.75 in. or 4.45 cm) increments, so that the PTX10001-36MR can be mounted in any rack that provides holes spaced at that distance.
Rack size and strength	• Ensure that the rack complies with the standards for a 19-in. rack as defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310–D) published by the Electronics Components Industry Association (http://www.ecianow.org/). • Use a 600-mm rack as defined in the four-part *Equipment Engineering (EE); European telecommunications standard for equipment practice* (document numbers ETS 300 119-1 through 119-4) published by the European Telecommunications Standards Institute (http://www.etsi.org). The horizontal spacing between the rails in a rack that complies with this standard is usually wider than the router's mounting brackets, which measure 19 in. (48.26 cm) from outer edge to outer edge. Use approved wing devices to narrow the opening between the rails as required. • Ensure that the rack rails are spaced widely enough to accommodate the PTX10001-36MR chassis' external dimensions. The outer edges of the front mounting rails extend the width to 19 in. (48.26 cm). • Ensure that the front and rear rack rails are spaced between 23.6 in. (60 cm) and 31.5 in. (80 cm) front-to-back. • Ensure that the rack is strong enough to support the weight of the device. • Ensure that the spacing of rails and adjacent racks allows for proper clearance around the PTX10001-36MR and rack.

Table 26: Rack Requirements for the PTX10001-36MR *(Continued)*

Rack Requirement	Guidelines
Rack connection to building structure	• Secure the rack to the building structure. • If earthquakes are a possibility in your geographical area, secure the rack to the floor. • Secure the rack to the ceiling brackets as well as wall or floor brackets for maximum stability.

PTX10001-36MR Cabinet Requirements

You can mount the PTX10001-36MR in an enclosure or cabinet that contains a four-post 19-in. open rack as defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310-D) published by the Electronics Industry Association.

Cabinet requirements consist of:

- Cabinet size and clearance
- Cabinet airflow requirements

Table 27 on page 56 provides the cabinet requirements and specifications for the PTX10001-36MR.

Table 27: Cabinet Requirements for the PTX10001-36MR

Cabinet Requirement	Guidelines
Cabinet size and clearance	The minimum cabinet size for accommodating a PTX10001-36MR device is 36 in. (91.4 cm) deep. Large cabinets improve airflow and reduce the chance of overheating.

Table 27: Cabinet Requirements for the PTX10001-36MR *(Continued)*

Cabinet Requirement	Guidelines
Cabinet airflow requirements	When you mount the device in a cabinet, ensure that ventilation through the cabinet is sufficient to prevent overheating. • Ensure that the cool air supply you provide through the cabinet adequately dissipates the thermal output of the device. • Ensure that the cabinet allows the chassis hot exhaust air to exit the cabinet without recirculating into the device. An open cabinet (without a top or doors) that employs hot air exhaust extraction from the top allows the best airflow through the chassis. If the cabinet contains a top or doors, perforations in these elements assist with removing the hot air exhaust. • The PTX10001-36MR fans exhaust hot air through the vents on the fans and power supplies. Install the device in the cabinet in a way that maximizes the open space on the FRU side of the chassis. This maximizes the clearance for critical airflow. • Route and dress all cables to minimize the blockage of airflow to and from the chassis. • Ensure that the spacing of rails and adjacent cabinets allows for the proper clearance around the device and cabinet.

RELATED DOCUMENTATION

PTX10001-36MR Site Preparation Checklist | **47**

General Safety Guidelines and Warnings | **158**

General Electrical Safety Guidelines and Warnings | **181**

Prevention of Electrostatic Discharge Damage | **183**

PTX10001-36MR Network Cable and Transceiver Planning

IN THIS SECTION

- Determine Transceiver Support for the PTX10001-36MR | 58
- Cable and Connector Specifications for MX and PTX Series Devices | 59
- Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion | 66
- Calculating Power Budget and Power Margin for Fiber-Optic Cables | 68

Determine Transceiver Support for the PTX10001-36MR

The PTX10001-36MR has 36 network ports. The 12 QSFP28 network ports on the port panel support QSFP+ and QSFP28 transceivers, direct-attach copper (DAC) cables, active optical cables (AOC) , and DAC breakout cables (DACBO).

The 24 QSFP56-DD network ports on the port panel support QSFP+, QSFP28, QSFP28-DD, and QSFP56-DD transceivers, direct-attach copper (DAC) cables, active optical cables (AOC), and DAC breakout cables (DACBO).

See "PTX10001-36MR Port Panel" on page 7 for more information about the network ports.

You can find information about the pluggable transceivers supported on your Juniper Networks device by using the Hardware Compatibility Tool. In addition to transceiver and connector type, the optical and cable characteristics—where applicable—are documented for each transceiver. The Hardware Compatibility Tool enables you to search by product, displaying all the transceivers supported on that device, or category, by interface speed or type. The list of supported transceivers for the PTX10001-36MR is located at https://apps.juniper.net/hct/product/?prd=PTX10001-36MR.

CAUTION: The Juniper Networks Technical Assistance Center (JTAC) provides complete support for Juniper-supplied optical modules and cables. However, JTAC does not provide support for third-party optical modules and cables that are not qualified or

supplied by Juniper Networks. If you face a problem running a Juniper device that uses third-party optical modules or cables, JTAC may help you diagnose host-related issues if the observed issue is not, in the opinion of JTAC, related to the use of the third-party optical modules or cables. Your JTAC engineer will likely request that you check the third-party optical module or cable and, if required, replace it with an equivalent Juniper-qualified component.

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

Cable and Connector Specifications for MX and PTX Series Devices

IN THIS SECTION

- 12-Fiber MPO Connectors | 60
- 24-Fiber MPO Connectors | 65
- LC Duplex Connectors | 66

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

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

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

NOTE: The terms multifiber push-on (MPO) and multifiber termination push-on (MTP) describe the same connector type. The rest of this topic uses MPO to mean MPO or MTP.

12-Fiber MPO Connectors

There are two types of cables used with 12-fiber MPO connectors on Juniper Networks devices—patch cables with MPO connectors on both ends, and breakout cables with an MPO connector on one end and four LC duplex connectors on the opposite end. Depending on the application, the cables might use single-mode fiber (SMF) or multimode fiber (MMF). Juniper Networks sells cables that meet the supported transceiver requirements, but it is not required to purchase cables from Juniper Networks.

Ensure that you order cables with the correct polarity. Vendors refer to these crossover cables as *key up to key up*, *latch up to latch up*, *Type B*, or *Method B*. If you are using patch panels between two transceivers, ensure that the proper polarity is maintained through the cable plant.

Also, ensure that the fiber end in the connector is finished correctly. Physical contact (PC) refers to fiber that has been polished flat. Angled physical contact (APC) refers to fiber that has been polished at an angle. Ultra physical contact (UPC) refers to fiber that has been polished flat, to a finer finish. The required fiber end is listed with the connector type in the Hardware Compatibility Tool.

12-Fiber Ribbon Patch Cables with MPO Connectors

You can use 12-fiber ribbon patch cables with socket MPO connectors to connect two transceivers of the same type—for example, 40GBASE-SR4-to-40GBASESR4 or 100GBASE-SR4-to-100GBASE-SR4. You can also connect 4x10GBASE-LR or 4x10GBASE-SR transceivers by using patch cables—for example, 4x10GBASE-LR-to-4x10GBASE-LR or 4x10GBASE-SR-to-4x10GBASE-SR—instead of breaking the signal out into four separate signals.

Table 28 on page 60 describes the signals on each fiber. Table 29 on page 61 shows the pin-to-pin connections for proper polarity.

Table 28: Cable Signals for 12-Fiber Ribbon Patch Cables

Fiber	Signal
1	Tx0 (Transmit)
2	Tx1 (Transmit)
3	Tx2 (Transmit)
4	Tx3 (Transmit)

Table 28: Cable Signals for 12-Fiber Ribbon Patch Cables *(Continued)*

Fiber	Signal
5	Unused
6	Unused
7	Unused
8	Unused
9	Rx3 (Receive)
10	Rx2 (Receive)
11	Rx1 (Receive)
12	Rx0 (Receive)

Table 29: Cable Pinouts for 12-Fiber Ribbon Patch Cables

MPO Pin	MPO Pin
1	12
2	11
3	10
4	9
5	8

Table 29: Cable Pinouts for 12-Fiber Ribbon Patch Cables *(Continued)*

MPO Pin	MPO Pin
6	7
7	6
8	5
9	4
10	3
11	2
12	1

12-Fiber Ribbon Breakout Cables with MPO-to-LC Duplex Connectors

You can use 12-ribbon breakout cables with MPO-to-LC duplex connectors to connect a QSFP+ transceiver to four separate SFP+ transceivers—for example, 4x10GBASE-LR-to-10GBASE-LR or 4x10GBASE-SR-to-10GBASE-SR SFP+ transceivers. The breakout cable is constructed out of a 12-fiber ribbon fiber-optic cable. The ribbon cable splits from a single cable with a socket MPO connector on one end, into four cable pairs with four LC duplex connectors on the opposite end.

Figure 21 on page 62 shows an example of a typical 12-ribbon breakout cable with MPO-to-LC duplex connectors (depending on the manufacture, your cable may look different).

Figure 21: 12-Ribbon Breakout Cable

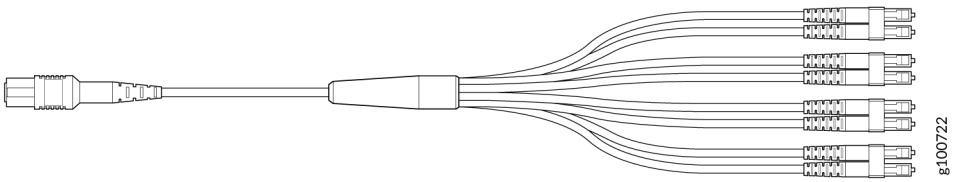


Table 30 on page 63 describes the way the fibers are connected between the MPO and LC duplex connectors. The cable signals are the same as those described in Table 28 on page 60 .

Table 30: Cable Pinouts for 12-Fiber Ribbon Breakout Cables

MPO Connector Pin	LC Duplex Connector Pin
1	Tx on LC Duplex 1
2	Tx on LC Duplex 2
3	Tx on LC Duplex 3
4	Tx on LC Duplex 4
5	Unused
6	Unused
7	Unused
8	Unused
9	Rx on LC Duplex 4
10	Rx on LC Duplex 3
11	Rx on LC Duplex 2
12	Rx on LC Duplex 1

12-Ribbon Patch and Breakout Cables Available from Juniper Networks

Juniper Networks sells 12-ribbon patch and breakout cables with MPO connectors that meet the requirements described above. It is not required to purchase cables from Juniper Networks. Table 31 on page 64 describes the available cables.

Table 31: 12-Ribbon Patch and Breakout Cables Available from Juniper Networks

Cable Type	Connector Type	Fiber Type	Cable Length	Juniper Model Number
12-ribbon patch	Socket MPO/PC to socket MPO/PC, key up to key up	MMF (OM3)	1 m	MTP12-FF-M1M
			3 m	MTP12-FF-M3M
			5 m	MTP12-FF-M5M
			10 m	MTP12-FF-M10M
	Socket MPO/APC to socket MPO/APC, key up to key up	SMF	1 m	MTP12-FF-S1M
			3 m	MTP12-FF-S3M
			5 m	MTP12-FF-S5M
			10 m	MTP12-FF-S10M
12-ribbon breakout	Socket MPO/PC, key up, to four LC/UPC duplex	MMF (OM3)	1 m	MTP-4LC-M1M
			3 m	MTP-4LC-M3M
			5 m	MTP-4LC-M5M
			10 m	MTP-4LC-M10M
	Socket MPO/APC, key up, to four LC/UPC duplex	SMF	1 m	MTP-4LC-S1M
			3 m	MTP-4LC-S3M
			5 m	MTP-4LC-S5M

Table 31: 12-Ribbon Patch and Breakout Cables Available from Juniper Networks *(Continued)*

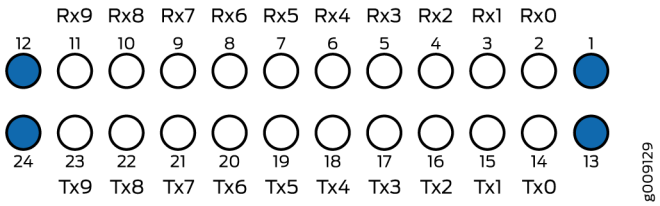
Cable Type	Connector Type	Fiber Type	Cable Length	Juniper Model Number
			10 m	MTP-4LC-S10M

24-Fiber MPO Connectors

You can use patch cables with 24-fiber MPO connectors to connect two supported transceivers of the same type—for example, 100GBASE-SR10-to-100GBASE-SR10.

Figure 22 on page 65 shows the 24-fiber MPO optical lane assignments.

Figure 22: 24-Fiber MPO Optical Lane Assignments



NOTE: Ensure that you order cables with the correct polarity. Vendors refer to these crossover cables as *key up to key up*, *latch up to latch up*, *Type B*, or *Method B*. If you are using patch panels between two transceivers, ensure that the proper polarity is maintained through the cable plant.

The MPO optical connector for the CFP2-100G-SR10-D3 is defined in *Section 5.6 of the CFP2 Hardware Specification and Section 88.10.3 of IEEE STD 802.3-2012*. These specifications include the following requirements:

- Recommended Option A in IEEE STD 802.3-2012.
- The transceiver receptacle is a plug. A patch cable with a socket connector is required to mate with the module.
- Ferrule finish shall be flat polished interface that is compliant with IEC 61754-7.
- Alignment key is key up.

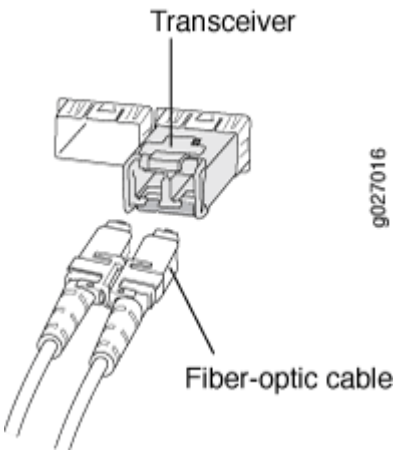
The optical interface must meet the requirement FT-1435-CORE in *Generic Requirements for Multi-Fiber Optical Connectors*. The module must pass the wiggle test defined by IEC 62150-3.

LC Duplex Connectors

You can use patch cables with LC duplex connectors to connect two supported transceivers of the same type—for example, 40GBASE-LR4-to-40GBASE-LR4 or 100GBASE-LR4-to100GBASE-LR4. The patch cable is one fiber pair with two LC duplex connectors at opposite ends. LC duplex connectors are also used with 12-fiber ribbon breakout cables, as described in "12-Fiber Ribbon Breakout Cables with MPO-to-LC Duplex Connectors" on page 62 .

Figure 23 on page 66 shows an LC duplex connector being installed in a transceiver.

Figure 23: LC Duplex Connector



Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion

IN THIS SECTION

- Signal Loss in Multimode and Single-Mode Fiber-Optic Cable | **67**
- Attenuation and Dispersion in Fiber-Optic Cable | **67**

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

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

Single-mode fiber is so small in diameter that rays of light can reflect internally through one layer only. Interfaces with single-mode optics use lasers as light sources. Lasers generate a single wavelength of light, which travels in a straight line through the single-mode fiber. Compared with multimode fiber, single-mode fiber has higher bandwidth and can carry signals for longer distances.

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

Attenuation and Dispersion in Fiber-Optic Cable

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

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

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

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

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

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

Calculating Power Budget and Power Margin for Fiber-Optic Cables

IN THIS SECTION

- How to Calculate Power Budget for Fiber-Optic Cables | **68**
- How to Calculate Power Margin for Fiber-Optic Cables | **69**

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

TIP: You can use the Hardware Compatibility Tool to find information about the pluggable transceivers supported on your Juniper Networks device.

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

How to Calculate Power Budget for Fiber-Optic Cables

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

$P_B = P_T - P_R$

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

$P_B = P_T - P_R$

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

$P_B = 13\ dB$

How to Calculate Power Margin for Fiber-Optic Cables

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

$P_M = P_B - LL$

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

Factors that can cause link loss include higher-order mode losses, modal and chromatic dispersion, connectors, splices, and fiber attenuation. Table 32 on page 69 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 32: Estimated Values for Factors Causing Link Loss

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

The following sample calculation for a 2-km-long multimode link with a power budget (P_B) of 13 dB uses the estimated values from Table 32 on page 69 . This example calculates link loss (LL) as the sum of fiber attenuation (2 km @ 1 dB/km, or 2 dB) and loss for five connectors (0.5 dB per connector, or 2.5 dB) and two splices (0.5 dB per splice, or 1 dB) as well as higher-order mode losses (0.5 dB). The power margin (P_M) is calculated as follows:

$P_M = P_B - LL$

P_M = 13 dB – 2 km (1 dB/km) – 5 (0.5 dB) – 2 (0.5 dB) – 0.5 dB

P_M = 13 dB – 2 dB – 2.5 dB – 1 dB – 0.5 dB

P_M = 7 dB

The following sample calculation for an 8-km-long single-mode link with a power budget (P_B) of 13 dB uses the estimated values from Table 32 on page 69 . This example calculates link loss (LL) as the sum of fiber attenuation (8 km @ 0.5 dB/km, or 4 dB) and loss for seven connectors (0.5 dB per connector, or 3.5 dB). The power margin (P_M) is calculated as follows:

$P_M = P_B - LL$

P_M = 13 dB – 8 km (0.5 dB/km) – 7(0.5 dB)

P_M = 13 dB – 4 dB – 3.5 dB

P_M = 5.5 dB

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

RELATED DOCUMENTATION

Determining Transceiver Support and Specifications

PTX10001-36MR Port Panel | 7

PTX10001-36MR System Overview | 2

PTX10001-36MR Management Cable Specifications and Pinouts

IN THIS SECTION

- Cable Specifications for Console and Management Connections for the PTX10001-36MR | 71
- Management Port Connector Pinouts for the PTX10001-36MR | 71
- Console and ToD Port Connector Pinouts for the PTX10001-36MR | 72

- USB Port Specifications the PTX10001-36MR | 73

Cable Specifications for Console and Management Connections for the PTX10001-36MR

Table 33 on page 71 lists the specifications for the cables that connect the PTX10001-36MR to a management device.

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

Table 33: Cable Specifications for Console and Management Connections for the PTX10001-36MR

Port on PTX10001-36MR	Cable Specification	Cable Supplied	Maximum Length	Device Receptacle
Console (**CON/ToD**) port	RS-232 (EIA-232) serial cable	One 7-foot (2.13-meter)-long RJ-45 patch cable and RJ-45 to DB-9 adapter	7 feet (2.13 meters)	RJ-45
Management (**MGMT**) port	Category 5 cable or equivalent suitable for 1000BASE-T operation	One 7-foot (2.13-meter)-long RJ-45 patch cable	328 feet (100 meters)	RJ-45

Management Port Connector Pinouts for the PTX10001-36MR

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

Table 34 on page 72 provides the pinout information of the RJ-45 management port connector. An RJ-45 cable is supplied with the PTX10001-36MR.

Table 34: RJ-45 Management Port Connector Pinouts for the PTX10001-36MR

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

Console and ToD Port Connector Pinouts for the PTX10001-36MR

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

Table 35 on page 73 provides the pinout information for the RJ-45 console connector. An RJ-45 cable and an RJ-45 to DB-9 adapter are supplied with the PTX10001-36MR.

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 a PTX10001-36MR, use a combination of the RJ-45 cable and

RJ-45 to DB-9 adapter supplied with the router and a USB to DB-9 plug adapter. You must provide the USB to DB-9 plug adapter.

Table 35: Console Port and ToD Connector Pinouts for the PTX10001-36MR

Pin	Signal	Description
1	CTS Input	Clear to send
2	DSR Output ToD Output	Data set ready Time of Day (ToD) for Precision Time Protocol (PTP) applications. You can use DSR pins as a ToD universal asynchronous receiver/transmitter (UART) by using breakout cables.
3	RxD Input	Receive data
4	Signal Ground	Signal ground
5	Signal Ground	Signal ground
6	TxD Output	Transmit data
7	DTR Input ToD Output	Data terminal ready Time of Day (ToD) for Precision Time Protocol (PTP) applications. You can use DTR pins as a ToD universal asynchronous receiver/transmitter (UART) by using breakout cables.
8	RTS Output	Request to send

USB Port Specifications the PTX10001-36MR

USB flash drives used with the PTX10001-36MR must support USB 2.0 or later.

CAUTION: Remove the USB flash drive before upgrading Junos OS Evolved or rebooting a PTX10001-36MR. Failure to do so could expose your router to unpredictable behavior.

RELATED DOCUMENTATION

PTX10001-36MR Management Panel | **15**

CHAPTER 3

Initial Installation and Configuration

PTX10001-36MR Installation Overview | 76

Unpack and Mount the PTX10001-36MR | 78

Connect the PTX10001-36MR to Power | 95

Connect the PTX10001-36MR to External Devices | 106

Perform the Initial Software Configuration for the PTX10001-36MR | 108

Power Off the PTX10001-36MR | 111

PTX10001-36MR Installation Overview

IN THIS SECTION

- Overview of Installing the PTX10001-36MR | 76
- PTX10001-36MR Installation Safety Guidelines | 77

Overview of Installing the PTX10001-36MR

Before you begin to install and connect a PTX10001-36MR, ensure that you have reviewed the information in "PTX10001-36MR Installation Safety Guidelines" on page 77 .

You can mount a PTX10001-36MR:

- Flush with the front of a 19-in. four-post rack. Use the standard mounting brackets provided with the PTX10001-36MR for this configuration.
- Recessed 2 in. (5 cm) from the front of a 19-in. four-post rack. Use the extension bracket provided in the standard mounting kit for this configuration. Recessed mounting is primarily used in enclosed cabinets to allow room for cabling.

To install and connect a PTX10001-36MR:

1. Unpack the PTX10001-36MR and verify the components received. See "Unpack the PTX10001-36MR" on page 78 .
2. Determine how the device is to be mounted.

   Mount the PTX10001-36MR in a rack or cabinet. See "Mount the PTX10001-36MR in a Rack or Cabinet" on page 79 .
3. For installations that require a separate grounding conductor to the chassis, follow the instructions in "Connect the PTX10001-36MR to Ground" on page 96 .
4. Connect the PTX10001-36MR to power. Depending on your configuration, follow the instructions in "Connect AC/HVDC Power to the PTX10001-36MR" on page 98 or "Connect DC Power to the PTX10001-36MR" on page 100 .
5. Connect the PTX10001-36MR to a management console for initial configuration. See "Connect the PTX10001-36MR to a Management Console" on page 107 .

6. Initially configure Junos OS Evolved following the instructions in "Perform the Initial Software Configuration for the PTX10001-36MR" on page 108 .

PTX10001-36MR Installation Safety Guidelines

IN THIS SECTION

- General Installation Safety Guidelines | 77
- PTX10001-36MR Chassis Lifting Guidelines | 77

Observe the following guidelines before and during PTX10001-36MR installation:

General Installation Safety Guidelines

Before installing or moving the PTX10001-36MR, verify that the intended site meets the specified power, environmental, and clearance requirements. See the following documentation:

- "PTX10001-36MR Site Preparation Checklist" on page 47
- "PTX10001-36MR Clearance Requirements for Airflow and Hardware Maintenance" on page 51
- "PTX10001-36MR Rack Requirements" on page 54
- "PTX10001-36MR Cabinet Requirements" on page 56
- "PTX10001-36MR Environmental Requirements and Specifications" on page 49
- Table 13 on page 29 or Table 19 on page 41

PTX10001-36MR Chassis Lifting Guidelines

The weight of a fully loaded PTX10001-36MR is approximately 39.7 lb (18.0 kg). Observe the following guidelines for lifting and moving a PTX10001-36MR:

CAUTION: If you are installing the PTX10001-36MR above 60 in. (152.4 cm) from the floor, remove the power supplies and fan modules before attempting to install the device, or ask someone to assist you during the installation.

- Before installing thw PTX10001-36MR, read the guidelines in "PTX10001-36MR Site Preparation Checklist" on page 47 to verify that the intended site meets the specified power, environmental, and clearance requirements.
- Before lifting or moving the PTX10001-36MR, disconnect all external cables.
- As when lifting any heavy object, lift most of the weight with your legs rather than your back. Keep your knees bent and your back relatively straight and avoid twisting your body as you lift. Balance the load evenly and be sure that your footing is solid.

RELATED DOCUMENTATION

Unpack and Mount the PTX10001-36MR | 78

Unpack and Mount the PTX10001-36MR

IN THIS SECTION

- Unpack the PTX10001-36MR | 78
- Mount the PTX10001-36MR in a Rack or Cabinet | 79

Unpack the PTX10001-36MR

The PTX10001-36MR chassis is a rigid sheet-metal structure that houses the hardware components. The PTX10001-36MR is shipped in a cardboard carton, secured with foam packing material. The carton also contains an accessory kit and a pointer card with links to the quick start instructions.

CAUTION: PTX10001-36MR routers are maximally protected inside the shipping carton. Do not unpack the PTX10001-36MR until you are ready to begin installation.

To unpack a PTX10001-36MR:

1. Move the shipping carton to a staging area as close to the installation site as possible, but where you have enough room to remove the system components.

2. Position the carton so that the arrows point up.
3. Open the top flaps on the shipping carton.
4. Remove the accessory kit.
5. Pull out the packing material holding the device in place.
6. Verify that the following components are in the box:
   - The chassis with six fan modules and two power supplies installed
   - 4-post rack mounting kit

     NOTE: If you are installing the PTX10001-36MR on a two-post rack, you must order the 2-post rack mount kit separately.

   - For AC/HVDC installations, two power cords with plugs that are appropriate for your geographical location.

     NOTE: Power cords are not provided for DC installations.

   - For DC installations, four DC power cable lugs
   - RJ-45 cable and RJ-45 to DB-9 serial port adapter
   - RJ-45 Y-splitter cable
   - End User License Agreement
   - Road Map card
7. Save the shipping carton and packing materials in case you need to move or ship the chassis later.

Mount the PTX10001-36MR in a Rack or Cabinet

IN THIS SECTION

- Before You Begin Rack Installation | **80**
- Mount the PTX10001-36MR by Using the PTX-4PST-RMK-1U-E Rack Mount Kit (In a Square Slotted 4-Post Rack) | **81**

- Mount the PTX10001-36MR by Using the PTX-4PST-RMK-1U-E Rack Mount Kit (In a Threaded Hole 4-Post Rack) | **85**
- Mount the PTX10001-36MR by Using the JNP10001-4PST-RMK Rack Mount Kit | **91**
- Mount the PTX10001-36MR on Two Posts in a Rack | **93**

You can mount a PTX10001-36MR:

- On four posts of a 19-in. rack or a 19-in. cabinet by using the mounting brackets provided with the device.
- On two posts of a 19-in. rack or a 19-in. cabinet. A two-post rack mounting kit must be ordered separately.

For four-post rack installation, there are two front brackets and two rear brackets. This configuration allows either end of the device to be mounted flush with the rack and still be adjustable for racks with different depths. The minimum distance the front and rear rack rails can be spaced apart is 23.6 in. (60 cm) front to back. The maximum distance the front and rear rack rails can be spaced apart is 31.5 in. (80 cm) front to back. (The remainder of this topic uses rack to mean rack or cabinet.)

Before You Begin Rack Installation

Before you begin mounting a PTX10001-36MR in the rack:

1. Ensure that you understand how to prevent electrostatic discharge (ESD) damage. See "Prevention of Electrostatic Discharge Damage" on page 183 .
2. Verify that the site meets the requirements described in "PTX10001-36MR Site Preparation Checklist" on page 47 .
3. Place the rack in its permanent location, allowing adequate clearance for airflow and maintenance, and secure it to the building structure.
4. Read "General Safety Guidelines and Warnings" on page 158 and "PTX10001-36MR Installation Safety Guidelines" on page 77 .
5. Remove the PTX10001-36MR from the shipping carton (see "Unpack the PTX10001-36MR" on page 78).
6. Ensure that you have all the parts and tools available to mount the PTX10001-36MR in a rack. See the instructions for the rack installation kit that you are using.
   - "Mount the PTX10001-36MR by Using the PTX-4PST-RMK-1U-E Rack Mount Kit (In a Square Slotted 4-Post Rack)" on page 81
   - "Mount the PTX10001-36MR by Using the PTX-4PST-RMK-1U-E Rack Mount Kit (In a Threaded Hole 4-Post Rack)" on page 85

- "Mount the PTX10001-36MR by Using the JNP10001-4PST-RMK Rack Mount Kit" on page 91
- "Mount the PTX10001-36MR on Two Posts in a Rack" on page 93

CAUTION: PTX10001-36MR routers require two people for installation, one person to lift the device into place and another person to attach the device to the rack. If you are installing the PTX10001-36MR 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 PTX10001-36MR.

CAUTION: If you are mounting multiple devices in a rack, mount the heaviest device at the bottom and mount the rest bottom to top in order of decreasing weight.

Mount the PTX10001-36MR by Using the PTX-4PST-RMK-1U-E Rack Mount Kit (In a Square Slotted 4-Post Rack)

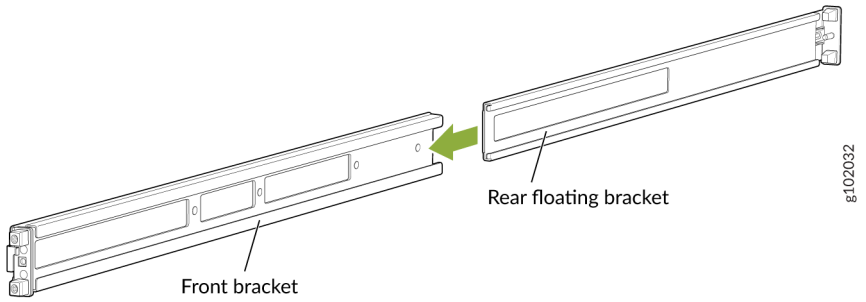
Ensure that you have the following parts and tools available:

- ESD grounding strap (not provided).
- A pair of two piece mounting brackets. These mounting brackets attach to the front and rear rack posts.
- A pair of mounting rails. These mounting rails are preinstalled on the PTX10001-36MR chassis with 16 Phillips M4 x 5 mm flathead screws.
- Screwdriver appropriate for the mounting screws (not provided). A screwdriver is required, only if the mounting rails are not already installed.

To mount the PTX10001-36MR on four posts in a rack (square slotted 4-post rack) by using the PTX-4PST-RMK-1U-E rack mount kit:

1. Wrap and fasten the ESD grounding strap to your bare wrist and an connect the other end of the strap to the ESD point on the device.
2. Position the PTX10001-36MR in such a manner that the **AIR OUT** labels on components are next to the hot aisle.
3. Assemble the mounting brackets. Slide the two brackets together. See Figure 24 on page 82 .

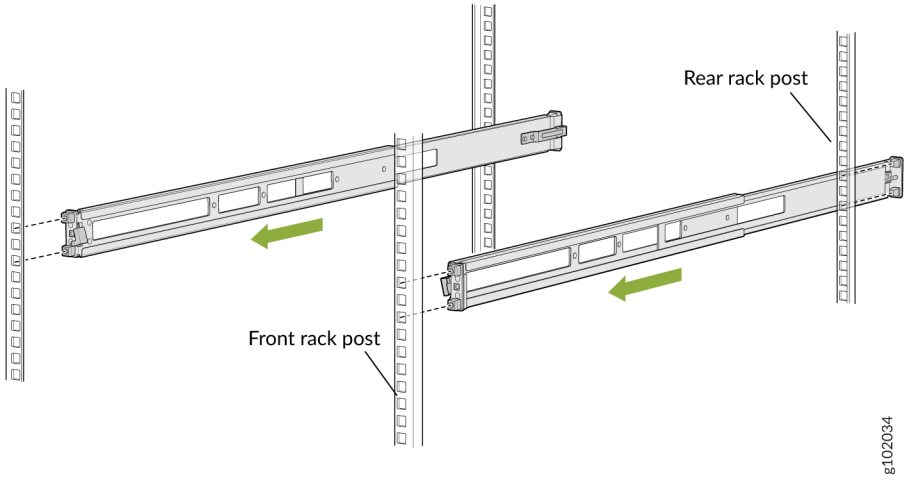
Figure 24: Assemble the Mounting Brackets



4. Attach the mounting brackets to the rack.

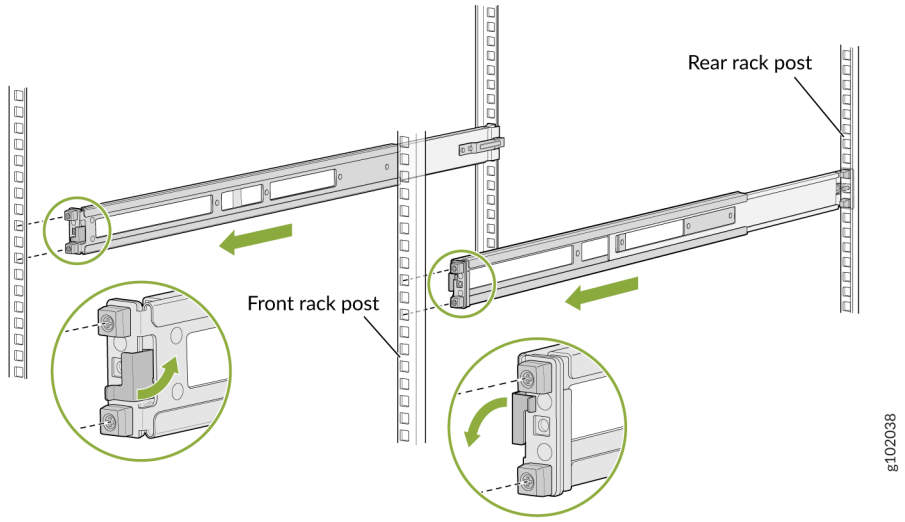
   a. Standing in front of the rack, insert the rear floating bracket's guide block into the rear rack post and slightly pull on the rear floating bracket. You will hear a click sound, indicating that the rear floating bracket is locked. See Figure 25 on page 82 .

Figure 25: Install the Rear Floating Brackets



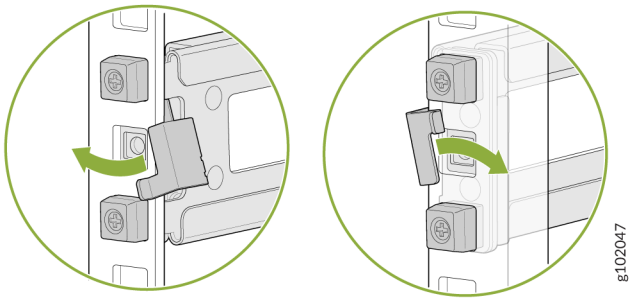
   b. Move the latch lock on the front mounting bracket to the open position, then insert the front mounting bracket's guide block into the front rack post. See Figure 26 on page 83

Figure 26: Install the Front Mounting Brackets



c. Push the lock latch over to the locked position. See Figure 27 on page 83 .

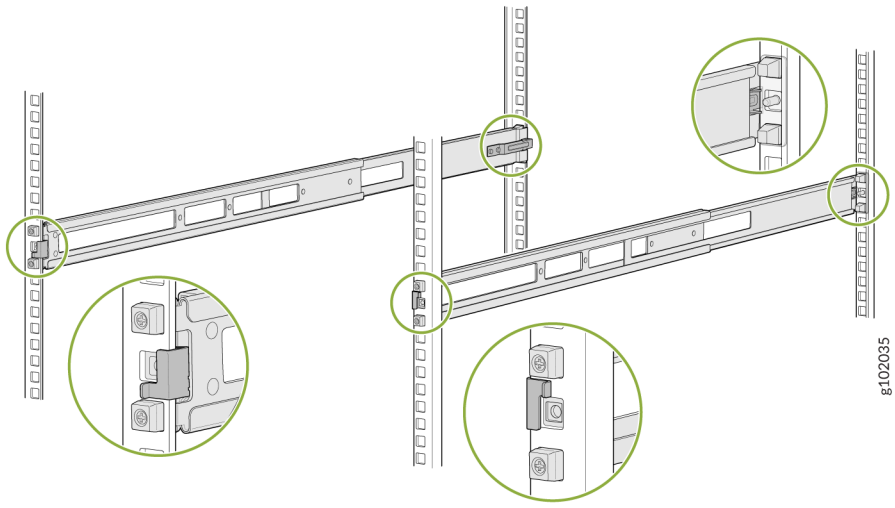
Figure 27: Front Mounting Bracket's Lock Latch



d. Repeat the above steps for the second mounting bracket.

e. Visually ensure that the front and rear latches are locked into place. See Figure 28 on page 84

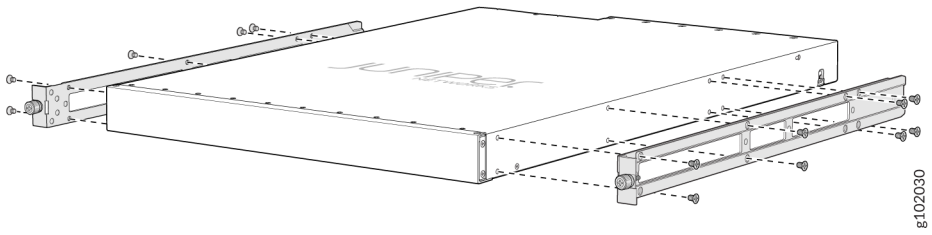
Figure 28: Mounting Brackets Locked



5. If the mounting rails are already installed, skip to Step 6. If the mounting rails are not installed, perform the following steps:

   a. Align the holes in the mounting rail with the screw holes on the side of the chassis. See Figure 29 on page 84 to see the proper alignment for the PTX10001-36MR.

Figure 29: Attach the Mounting Rails to the PTX10001-36MR

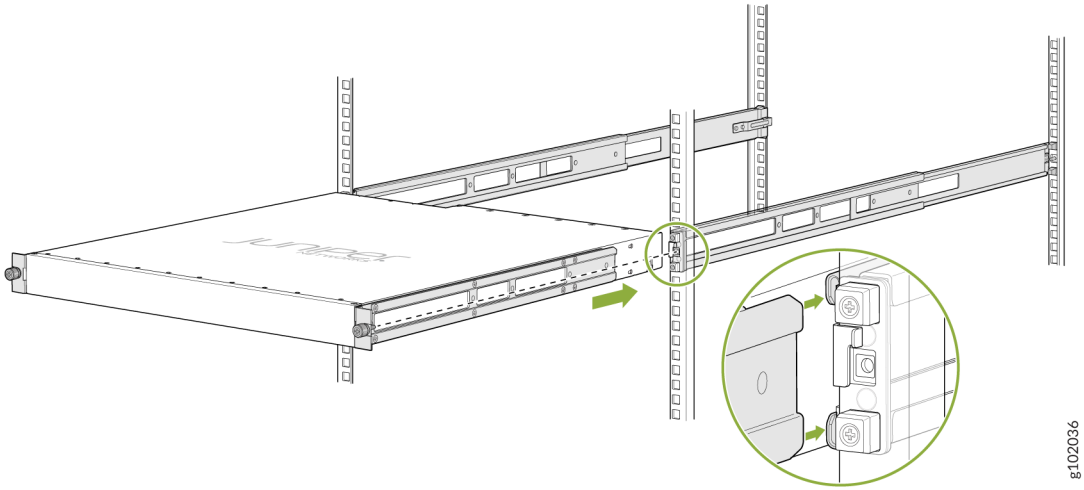


   b. Attach the mounting rail to the device using the mounting screws. Tighten the screws.

   c. Repeat the above steps for the second mounting rail.

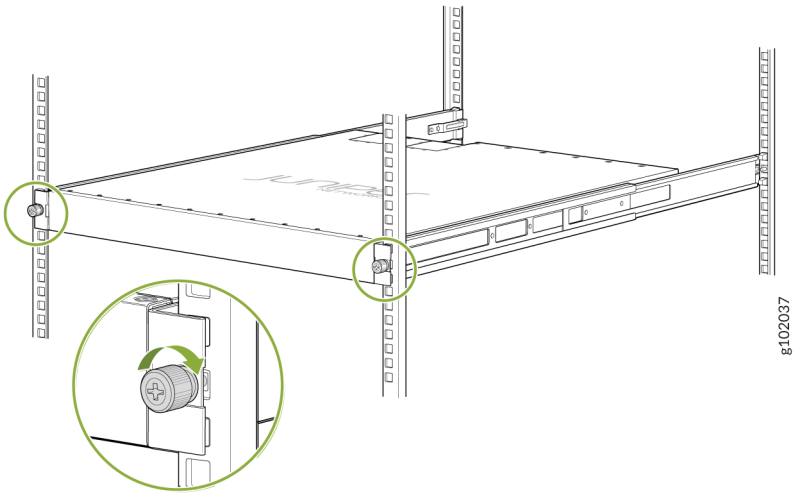
6. Grasp both sides of the device, lift it, and position the device so that the mounting rails slide into the channel of the front mounting brackets. See Figure 30 on page 85 .

Figure 30: Sliding the PTX10001-36MR into the Rack



7. Tighten the thumb screws on the front of the mounting rials. See Figure 31 on page 85 .

Figure 31: Tighten Thumb Screws



8. Ensure that the PTX10001-36MR chassis is level by verifying that all the screws on the front of the rack are aligned with the screws at the back of the rack.

Mount the PTX10001-36MR by Using the PTX-4PST-RMK-1U-E Rack Mount Kit (In a Threaded Hole 4-Post Rack)

Ensure that you have the following parts and tools available:

- ESD grounding strap (not provided).

- A pair of two piece mounting brackets. These mounting brackets attach to the front and rear rack posts.
- A pair of mounting rails. These mounting rails are preinstalled on the PTX10001-36MR chassis with 16 Phillips M4 x 5 mm flathead screws.
- Four rack mount screws appropriate for your rack, to secure the mounting brackets to the rack (not provided).
- Screwdriver appropriate for the mounting screws (not provided).

To mount the PTX10001-36MR on four posts in a rack (threaded hole 4-post rack) by using the PTX-4PST-RMK-1U-E rack mount kit:

1. Wrap and fasten the ESD grounding strap to your bare wrist and an connect the other end of the strap to the ESD point on the device.
2. Position the PTX10001-36MR in such a manner that the **AIR OUT** labels on components are next to the hot aisle.
3. Remove the guide blocks from both mounting brackets by loosening the screws. Place the guide blocks, screws, and washers to the side. See Figure 32 on page 86 and Figure 33 on page 87 .

Figure 32: Remove the Front Bracket's Guide Blocks

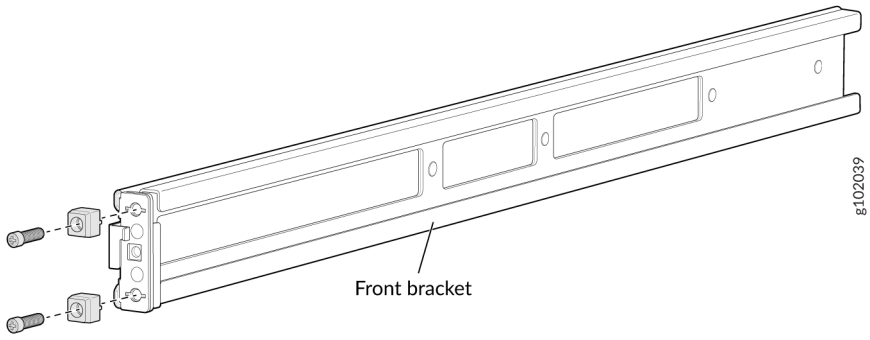
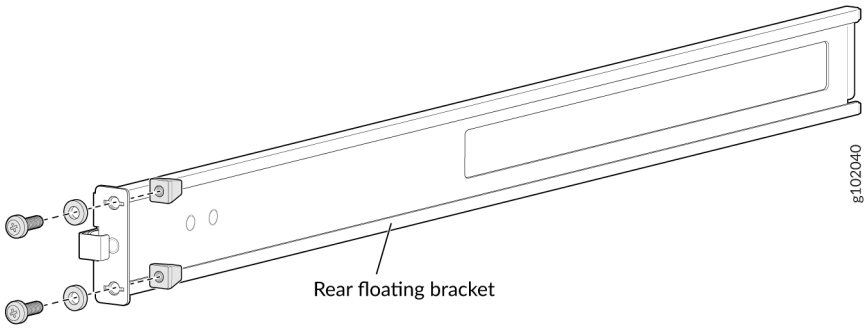
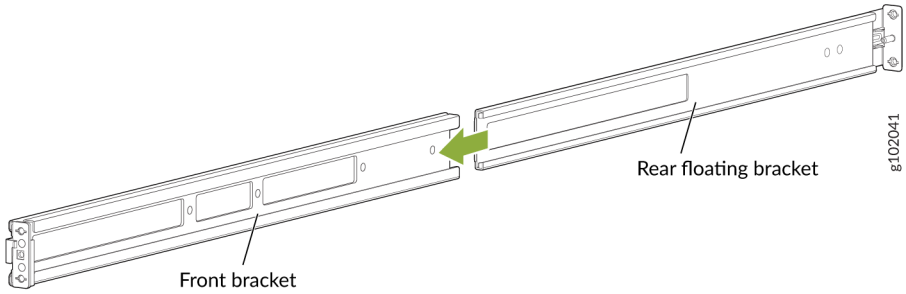


Figure 33: Remove the Rear Floating Bracket's Guide Blocks



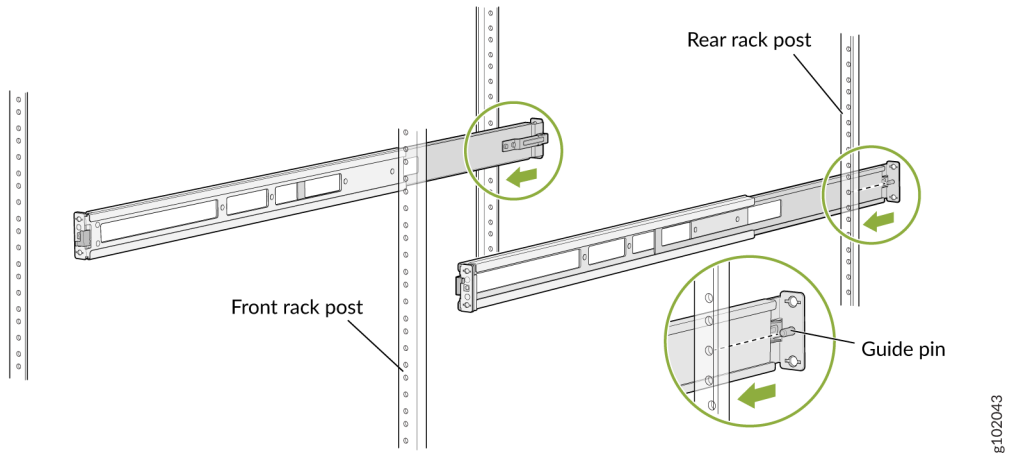
4. Assemble the mounting brackets. Slide the two brackets together. See Figure 34 on page 87 .

Figure 34: Assemble the Mounting Brackets



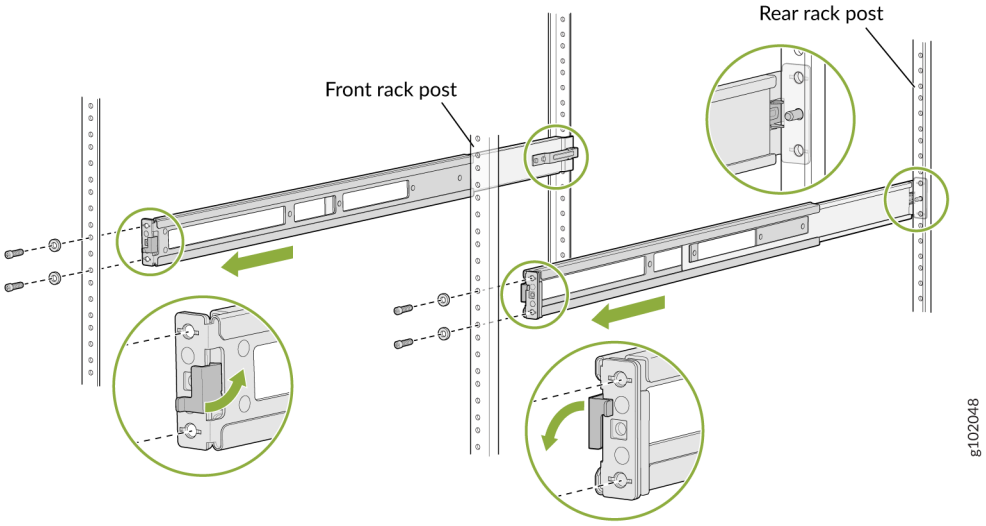
5. Attach the mounting brackets to the rack.
   a. Standing in front of the rack, insert the rear floating bracket into the rear rack post. Using the guide pin to align the floating bracket, slightly pull on the rear floating bracket. You will hear a click sound, indicating that the rear floating bracket is locked. See Figure 35 on page 88

Figure 35: Insert Rear Bracket



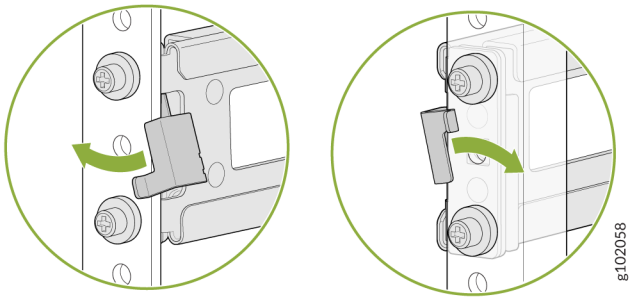
b. Move the latch lock on the front mounting bracket to the open position. Align the holes of the front mounting bracket with the holes of the front rack post. Using the screws removed from the front brackets and the washers removed from the rear brackets in Step 3, secure the front mounting bracket to the front rack post. See Figure 36 on page 88 .

Figure 36: Install Front Bracket



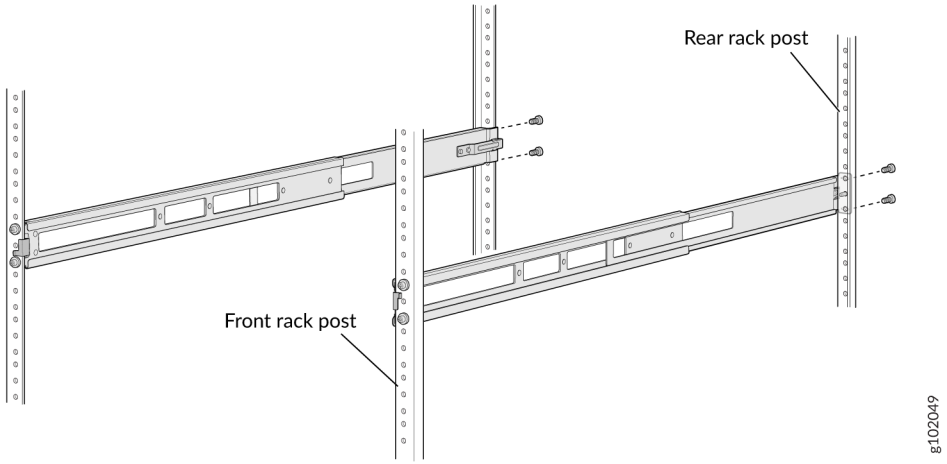
c. Push the lock latch over to the locked position. See Figure 37 on page 89 .

Figure 37: Front Mounting Bracket's Lock Latch



d. Using screws that are appropriate for your rack post, secure the rear bracket to the rack post. See Figure 38 on page 89 .

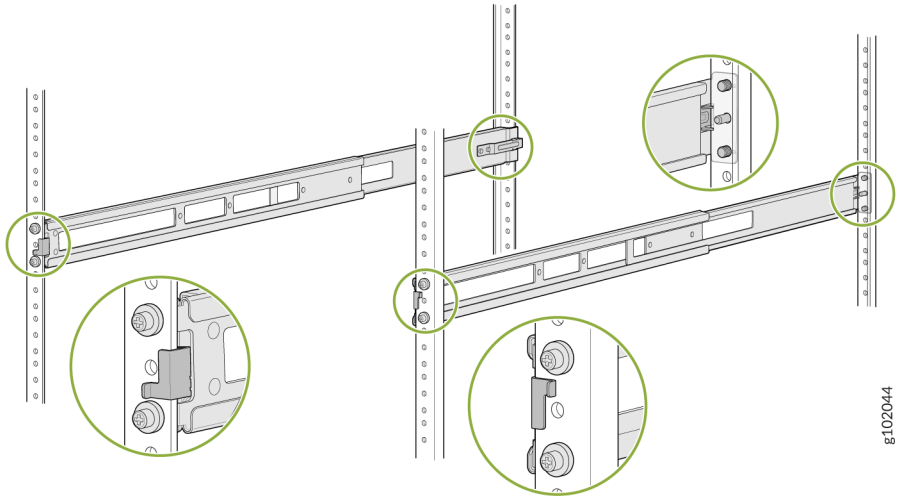
Figure 38: Secure the Rear Floating Brackets



e. Repeat the above steps for the second mounting bracket.

f. Visually ensure that the front and rear latches and screws are secure. See Figure 39 on page 90

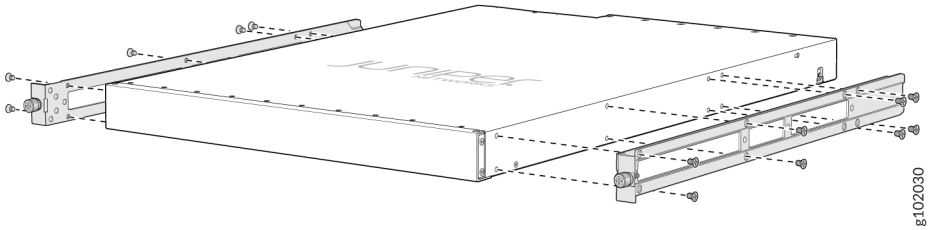
Figure 39: Mounting Brackets Secured



6. If the mounting rails are already installed, skip to Step 7. If the mounting rails are not installed, perform the following steps:

   a. Align the holes in the mounting rail with the screw holes on the side of the chassis. See Figure 40 on page 90 to see the proper alignment for the PTX10001-36MR.

Figure 40: Attach the Mounting Rails to the PTX10001-36MR

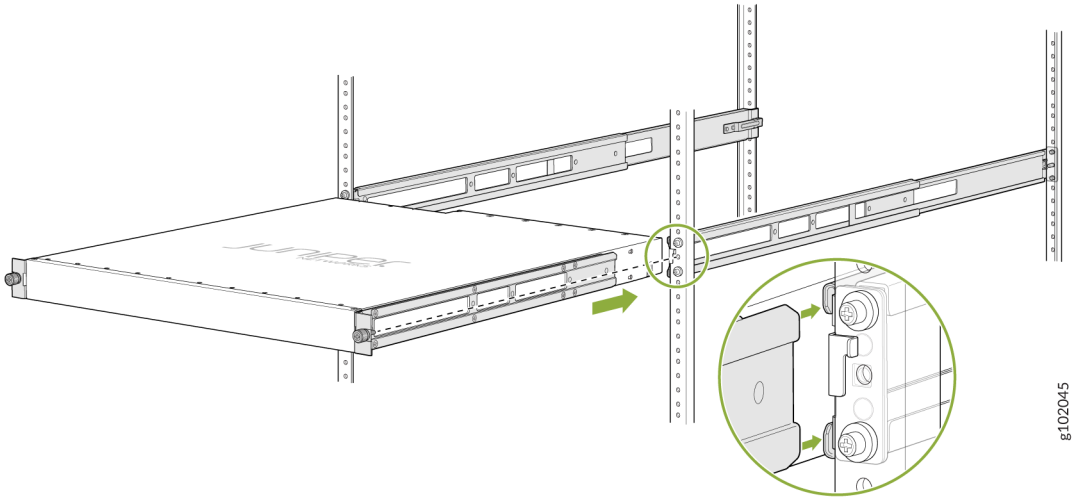


   b. Attach the mounting rail to the device using the mounting screws. Tighten the screws.

   c. Repeat the above steps for the second mounting rail.

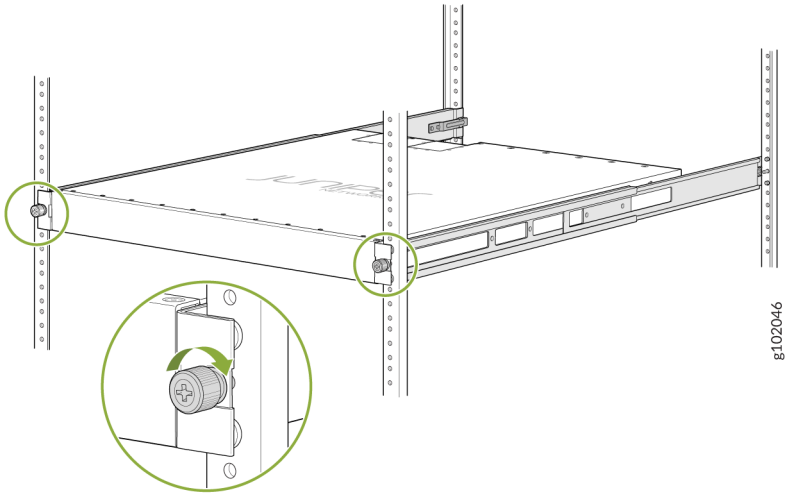
7. Grasp both sides of the device, lift it, and position the device so that the mounting rails slide into the channel of the front mounting brackets. See Figure 41 on page 91 .

Figure 41: Sliding the PTX10001-36MR into the Rack



8. Tighten the thumb screws on the front of the mounting rails. See Figure 42 on page 91 .

Figure 42: Tighten Thumb Screws



9. Ensure that the PTX10001-36MR chassis is level by verifying that all the screws on the front of the rack are aligned with the screws at the back of the rack.

Mount the PTX10001-36MR by Using the JNP10001-4PST-RMK Rack Mount Kit

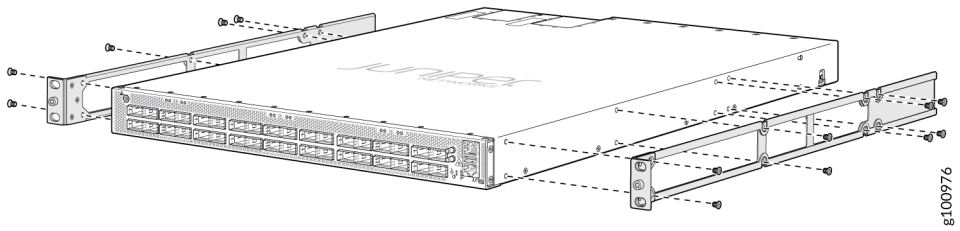
- ESD grounding strap (not provided).
- A pair of front mounting rails and rear mounting blades.

- Sixteen flathead screws for the mounting brackets (Phillips, M4 x 6 mm)
- Eight screws to secure the chassis and mounting blades to the rack (not provided).
- Screwdriver appropriate for the rack-mounting screws (not provided).

To mount the PTX10001-36MR on four posts in a rack by using the JNP10001-4PST-RMK rack mount kit:

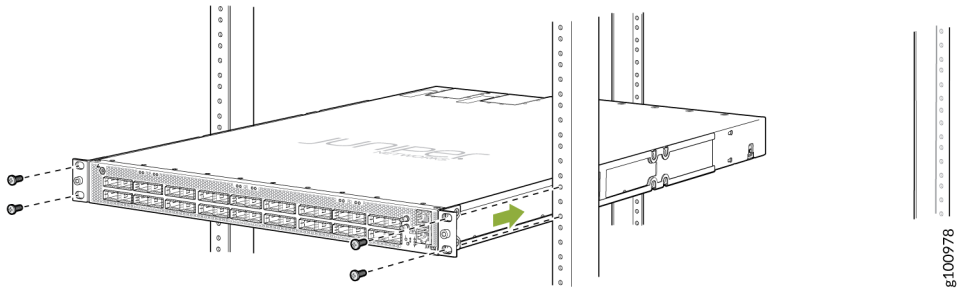
1. Wrap and fasten the ESD grounding strap to your bare wrist and an connect the other end of the strap to the ESD point on the device.
2. Decide whether to place the front (port) end or the back (FRU) end of the PTX10001-36MR at the front of the rack. Position the PTX10001-36MR in such a manner that the **AIR OUT** labels on components are next to the hot aisle.
3. Align the holes in the mounting rail with the screw holes on the side of the chassis. See Figure 43 on page 92 to see the proper alignment for the PTX10001-36MR.

Figure 43: Attach the Front Mounting Rails to the PTX10001-36MR



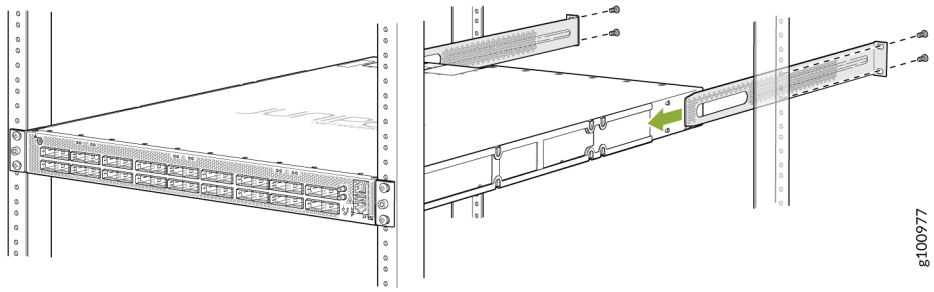
4. Attach the mounting rail to the device using the mounting screws. Tighten the screws.
5. Repeat Step 3 and Step 4 on the opposite side of the device.
6. Have one person grasp both sides of the device, lift it, and position it in the rack so that the front bracket is aligned with the rack holes.
7. Have a second person secure the front of the device to the rack by using 4 mounting screws (and cage nuts and washers if your rack requires them). Tighten the screws. See Figure 44 on page 93 .

Figure 44: Attach the PTX10001-36MR to the Rack



8. Continue to support the PTX10001-36MR while sliding the rear mounting blades into the channel of the side mounting rails and securing the blades to the rack. Use four mounting screws (and cage nuts and washers if your rack requires them) to attach the blade to the rack. Tighten the screws. See Figure 45 on page 93 .

Figure 45: Slide Mounting Blades into Mounting Rail



9. Ensure that the PTX10001-36MR chassis is level by verifying that all the screws on the front of the rack are aligned with the screws at the back of the rack.

Mount the PTX10001-36MR on Two Posts in a Rack

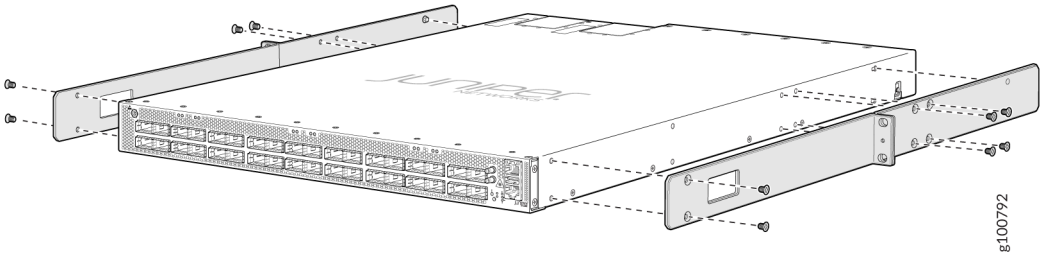
- ESD grounding strap (not provided).
- A pair of mounting rails.
- Screws to secure the mounting bracket to the chassis (12 screws are provided wit the 2-post rack mounting kit).
- Four screws to secure the chassis and mounting bracket to the rack (not provided).
- Screwdriver appropriate for the rack-mounting screws (not provided).

You can mount the PTX10001-36MR on two posts of a 19-in. rack (either a two-post or a four-post rack) by using a two-post rack-mounting kit (must be ordered separately).

To mount the PTX10001-36MR on two posts in a rack by using the two-post mounting kit that you purchased separately:

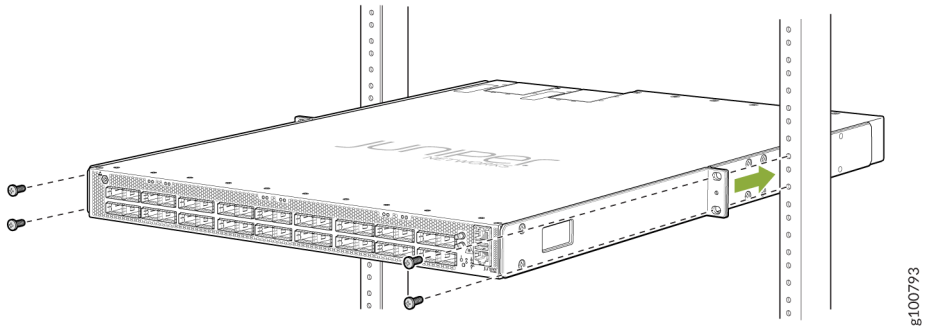
1. Wrap and fasten the ESD grounding strap to your bare wrist and an connect the other end of the strap to the ESD point on the device.
2. Decide whether to place the front (port) end or the back (FRU) end of the PTX10001-36MR at the front of the rack. Position the PTX10001-36MR in such a manner that the **AIR OUT** labels on components are next to the hot aisle.
3. Align the hooks and the screw holes on the mounting bracket with the screw holes on the side of the chassis. See Figure 46 on page 94 to see the proper alignment for the PTX10001-36MR.

Figure 46: Attach the Two Post Mounting Brackets to the PTX10001-36MR



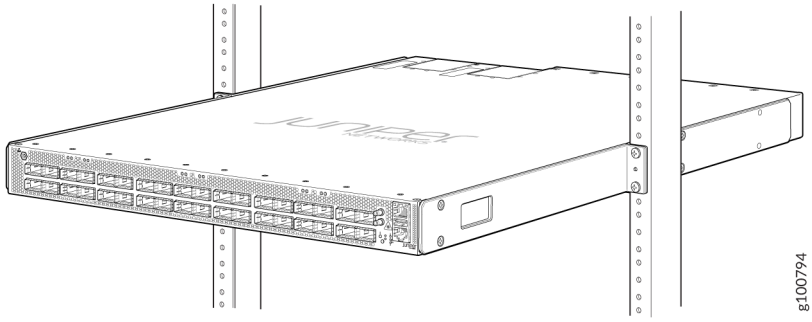
4. Attach the mounting bracket to the device using the mounting screws. Tighten the screws.
5. Repeat Step 3 and Step 4 on the opposite side of the device.
6. Have one person grasp both sides of the device, lift it, and position it in the rack so that the bracket is aligned with the rack holes.
7. Have a second person secure the device to the rack by using the appropriate mounting screws (and cage nuts and washers if your rack requires them). Tighten the screws. See Figure 47 on page 94 .

Figure 47: Attach the PTX10001-36MR to a Two-Post Rack



8. Ensure that the device is level by verifying that all the screws on one side of the rack are aligned with the screws on the other side of the rack.

Figure 48: The PTX10001-36MR Secured in a Two-Post Rack



RELATED DOCUMENTATION

PTX10001-36MR Installation Overview | **76**

Connect the PTX10001-36MR to Ground | **96**

Connect the PTX10001-36MR to Power

IN THIS SECTION

- Connect the PTX10001-36MR to Ground | **96**
- Connect AC/HVDC Power to the PTX10001-36MR | **98**
- Connect DC Power to the PTX10001-36MR | **100**

Connect the PTX10001-36MR to Ground

To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the chassis to earth ground before you connect it to power. For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the PTX10001-36MR chassis to connect to the earth ground.

NOTE: An AC-powered PTX10001-36MR gains additional grounding when you plug the power supply into a grounded AC power outlet by using an AC power cord appropriate for your geographical location. See "PTX10001-36MR Power System" on page 25 .

CAUTION: Before you connect power to the PTX10001-36MR, a licensed electrician must attach a cable lug to the grounding cables and power cables that you supply. A cable with an incorrectly attached lug can damage the PTX10001-36MR (for example, by causing a short circuit).

NOTE: Mount your device in the rack before attaching the grounding lug to the switch. See "Unpack and Mount the PTX10001-36MR" on page 78 .

NOTE: You must install the PTX10001-36MR in a restricted-access location and ensure that the chassis is always properly grounded. The PTX10001-36MR has a two-hole protective grounding terminal provided on the chassis. See Figure 49 on page 97 . We recommend that you use this protective grounding terminal as the preferred method for grounding the chassis regardless of the power supply configuration. However, if additional grounding methods are available, you can also use those methods. For example, you can use the grounding wire in the AC power cord or use the grounding terminal or lug on a DC power supply. This tested system meets or exceeds all applicable EMC regulatory requirements with the two-hole protective grounding terminal.

Ensure that you have the following parts and tools available (none are provided):

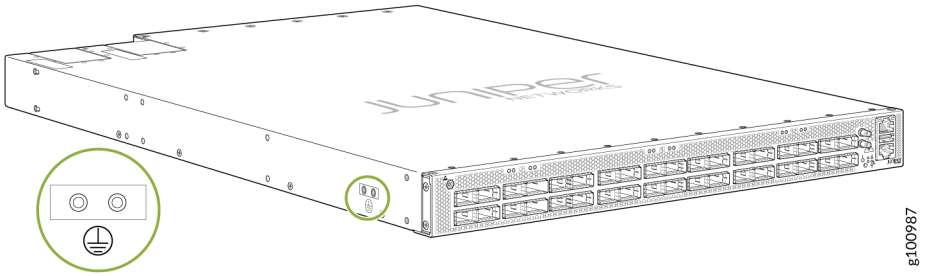
- Grounding cable—The grounding cable must be 8 AWG (8.4 mm^2), minimum 90° C wire, or as permitted by the local code.
- Grounding lug for your grounding cable—The grounding lug required is a Panduit LCD6-14AH-L or equivalent.
- Two M6 x 10 mm screws and washers.

- Screwdriver appropriate for the M6 x 10 mm screws.

To connect a grounding cable to the PTX10001-36MR:

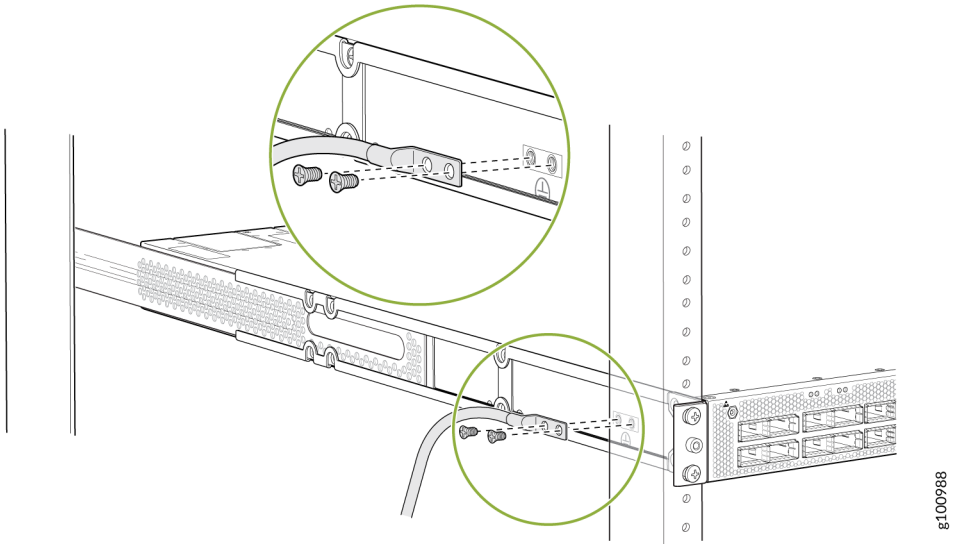
1. Attach a grounding cable to earth ground (such as the rack in which the PTX10001-36MR is mounted) and then attach it to the chassis grounding point. Figure 49 on page 97 shows the location of the chassis grounding point.

Figure 49: PTX10001-36MR Grounding Points



2. Secure the grounding lug to the protective earthing terminal with the washers and screws. See Figure 50 on page 97 .

Figure 50: Connect a Grounding Cable to a PTX10001-36MR Device



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

Connect AC/HVDC Power to the PTX10001-36MR

Before you begin connecting AC/HVDC power to the PTX10001-36MR:

- Ensure that you have a power cord appropriate for your geographical location available to connect AC power to the router. See Table 15 on page 31 .
- Read "General Electrical Safety Guidelines and Warnings" on page 181 and "Action to Take After an Electrical Accident" on page 182 .
- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see "Prevention of Electrostatic Discharge Damage" on page 183).
- Ensure that you have connected the PTX10001-36MR chassis to earth ground.
- Ensure that you have an ESD grounding strap.
- If not already installed, install the power supplies in the router. See "Maintain the PTX10001-36MR Power Supplies" on page 119 .

The power supplies automatically detect whether there is AC or HVDC input voltage and manage the power accordingly. Each 3000 W AC/HVDC power supply module has a single AC or HVDC input and provides 12 V of power to the system. The power supply in a PTX10001-36MR is a hot-removable and hot-insertable field-replaceable unit (FRU). After removing the power cord from an individual power supply, you can remove and replace it without powering off the router or disrupting router functions.

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

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

To connect AC power to a PTX10001-36MR:

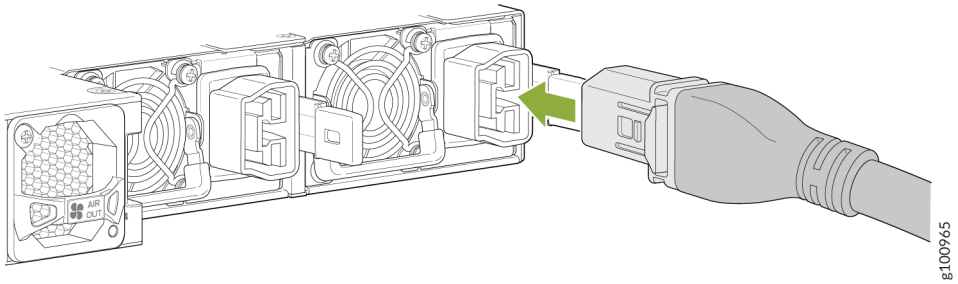
1. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to the ESD point on the device.
2. Ensure that the power supplies are fully inserted in the chassis and the latches are secure.
3. Locate the power cord or cords shipped with the PTX10001-36MR; the cords have plugs appropriate for your geographical location. See Table 15 on page 31 .

WARNING: Ensure that the power cord does not block access to router components or drape where people could trip on it.

4. Connect each power supply to the power sources. Insert the coupler end of the power cord into the AC power cord inlet on the AC power supply faceplate (see Figure 51 on page 99).

NOTE: The coupler end of the power cord model is APP-400.

Figure 51: Connect an AC Power Cord to the PTX10001-36MR



5. If the AC power source outlet has a power switch, set it to the off (**O**) position.

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

6. Insert the power cord plug into an AC power source outlet.
7. If the AC power source outlet has a power switch, set it to the on (**|**) position.
8. Verify that the status LEDs on each power supply are lit green.

   If the status LED is lit amber, remove power from the power supply, and replace the power supply (see "Maintain the PTX10001-36MR Power Supplies" on page 119). Do not remove the power supply until you have a replacement power supply ready.

CAUTION: Replace a failed power supply with a new power supply within 2 minutes of removal to prevent chassis overheating.

Connect DC Power to the PTX10001-36MR

Before you begin connecting DC power to the PTX10001-36MR:

- Read "General Electrical Safety Guidelines and Warnings" on page 181 , "Action to Take After an Electrical Accident" on page 182 , and the following warnings:
  - "DC Power Electrical Safety Guidelines" on page 186
  - "DC Power Copper Conductors Warning" on page 187
  - "DC Power Disconnection Warning" on page 188
  - "DC Power Grounding Requirements and Warning" on page 189
  - "DC Power Wiring Sequence Warning" on page 190
  - "DC Power Wiring Terminations Warning" on page 191
- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see "Prevention of Electrostatic Discharge Damage" on page 183).

> ⚠ **CAUTION**: Before you connect DC power to the PTX10001-36MR, a licensed electrician must attach a cable lug to the grounding and power cables that you supply. A cable with an incorrectly attached lug can damage the router (for example, by causing a short circuit).

> **NOTE**: To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the chassis to earth ground before you connect it to power. For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the PTX10001-36MR chassis to connect to the earth ground (see "Connect the PTX10001-36MR to Ground" on page 96).

- Install the DC power supply in the chassis. See "Maintain the PTX10001-36MR Power Supplies" on page 119 . The battery returns of the DC power supply must be connected as an isolated DC return (DC-I).
- Ensure that you have the following parts and tools available:
  - ESD grounding strap (provided)
  - Phillips (+) screwdriver, 1/4-in., with a torque range between 6 lb-in. (0.68 Nm) and 7 lb-in. (0.79 Nm) (not provided)

> **CAUTION**: You must use an appropriate torque-controlled tool to tighten the hex-nuts on the DC power cable connector. Do not overtighten the hex-nuts. Applying excessive torque damages the terminal block and the wiring tray.

- Power cable or cables appropriate for your geographical location to connect DC power to the PTX10001-36MR. We recommend you use a 4 AWG gauge DC power cable such as a Panduit/ LCDX4-14AH-L. The cable lugs are provided with the power supplies.

The DC power supply in a PTX10001-36MR is a hot-removable and hot-insertable field-replaceable unit. You can remove and replace it without powering off the router or disrupting router functions. You do, however, need to remove power from the power supply before attempting to remove the unit.

> **WARNING**: A DC-powered PTX10001-36MR is intended for installation only in a restricted-access location.

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

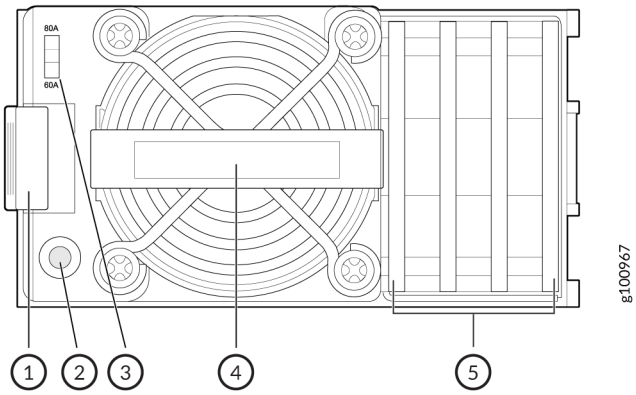
> **NOTE**: Each power supply must be connected to a dedicated power source outlet.

To connect DC power to a PTX10001-36MR:

1. Attach an ESD grounding strap to your bare wrist, and connect the strap to an approved site ESD grounding point.
2. Ensure that the power supplies are fully inserted in the chassis and the latches are secure.
3. Depending on the input power source, set the DC input current selector (DIP switch) to 80 A or 60 A.

   Figure 52 on page 102 shows the location of the DC input current selector (sometimes called the *DIP switch*).

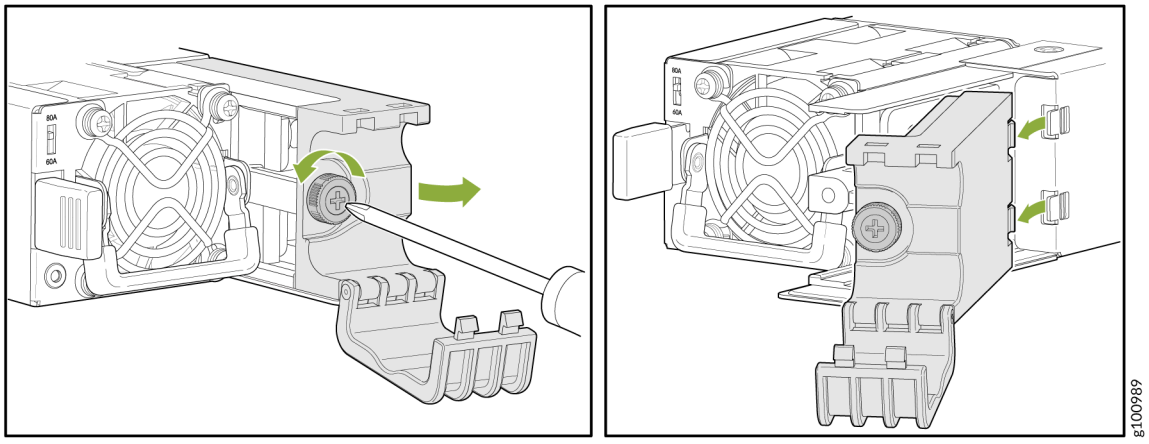
Figure 52: PTX10001-36MR DC Power Supply



1– Ejector lever	4– Handle
2– Status LED	5– Terminal block cover
3– DC input current selector (DIP switch)	

4. Open the cable manager latch on the terminal block cover of a power supply.
5. Use a Phillips screwdriver to loosen the screw holding the cable manager latch to the power supply terminal block cover. See Figure 53 on page 102 .

Figure 53: Loosen the Cable Manager Latch



6. Remove the cable manager bracket to expose the four terminal studs.
7. Install heat-shrink tubing insulation around the power cables.

   To install heat-shrink tubing:

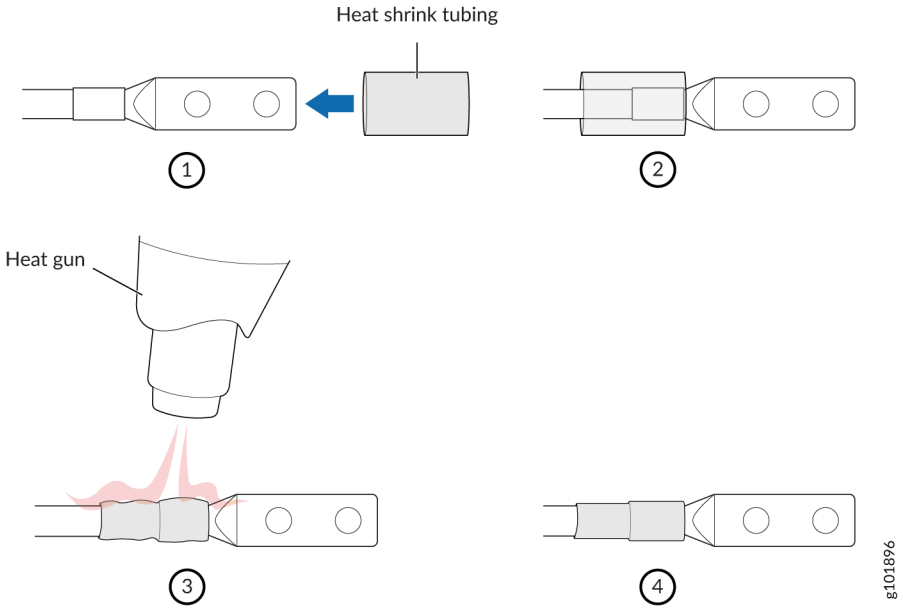
a. Slide the tubing over the portion of the cable where it is attached to the lug barrel. Ensure that tubing covers the end of the wire and the barrel of the lug attached to it.

b. Shrink the tubing with a heat gun. Ensure that you heat all sides of the tubing evenly so that it shrinks around the cable tightly.

Figure 54 on page 103 shows the steps to install heat-shrink tubing.

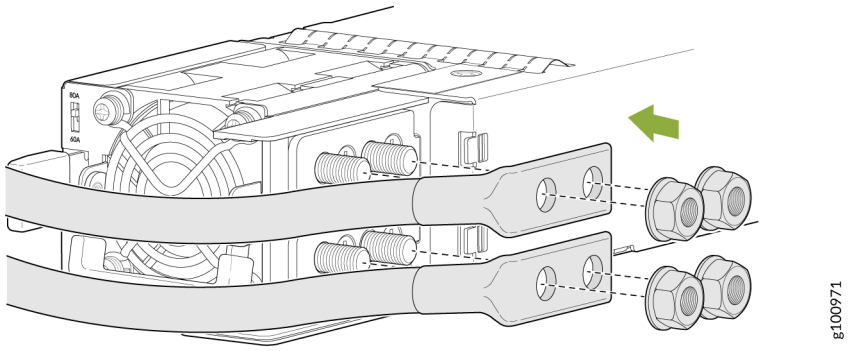
NOTE: Do not overheat the tubing.

Figure 54: How to Install Heat-Shrink Tubing



8. If you are using straight DC power cables, place the ends of the power cable connectors over the four terminal studs. See Figure 55 on page 104 .

Figure 55: Connect a Straight DC Power Cable to a DC Power Supply in a PTX10001-36MR



9. Connect the power supply to a 80 A or 60 A power source by securing the power cables to the four terminal studs with hex nuts.
10. Use a wrench to tighten the hex nuts by applying torque to between 6 lb-in. (0.68 Nm) and 7 lb-in. (0.79 Nm).

> **NOTE**: The PTX10001-36MR powers on as soon as power is provided to the power supply. There is no power switch on the router.

> ⚠ **CAUTION**: You must use an appropriate torque-controlled tool to tighten the hexnuts on the DC power cable connector. Do not overtighten the screws. Applying excessive torque damages the terminal block and the wiring tray.

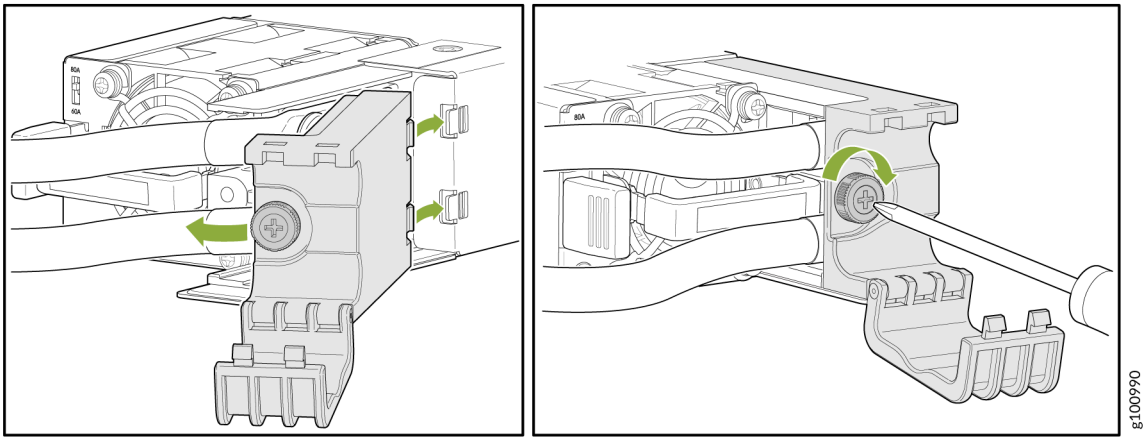
11. Repeat Step 3 through Step 8 to connect the other DC power supplies.
12. Verify that the status LEDs on each power supply are lit green and on steadily.

    If the status LED is lit amber, remove power from the power supply, and replace the power supply (see "Maintain the PTX10001-36MR Power Supplies" on page 119). Do not remove the power supply until you have a replacement power supply ready. The power supplies must be installed in the PTX10001-36MR to ensure proper airflow.

> ⚠ **CAUTION**: Replace a failed power supply with a new power supply within 2 minutes of removal to prevent chassis overheating.

13. Reattach the cable manager bracket that you removed in Step 6 and tighten the thumbscrew. See Figure 56 on page 105 .

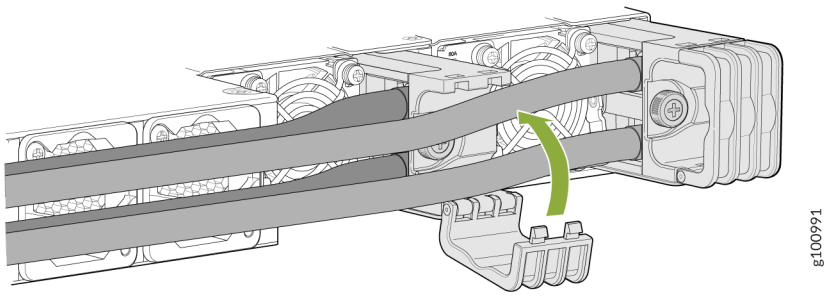
Figure 56: Reattach the Cable Manager Bracket



14. Close the cable manager latch to hold the power cables in place. See Figure 57 on page 105 .

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

Figure 57: Close the Cable Manager Latch



RELATED DOCUMENTATION

PTX10001-36MR Power System | **25**

PTX10001-36MR Chassis Grounding Cable and Lug Specifications | **51**

Connect the PTX10001-36MR to External Devices

IN THIS SECTION

- Connect the PTX10001-36MR to a Management Ethernet Device | 106
- Connect the PTX10001-36MR to a Management Console | 107

Connect the PTX10001-36MR to a Management Ethernet Device

Ensure that you have an appropriate cable available. See "Cable Specifications for Console and Management Connections for the PTX10001-36MR" on page 71 .

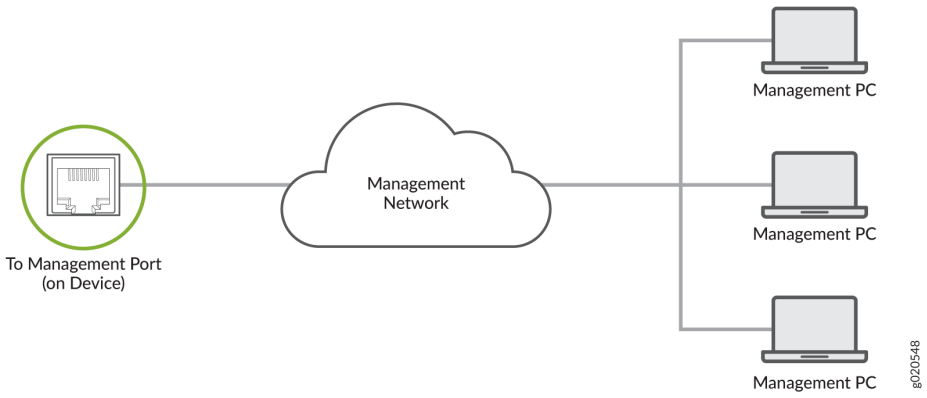
You can monitor and manage the PTX10001-36MR by using a dedicated management channel. The device has one management port—a 10/100/1000BASE-T RJ-45 port for copper connections. You use the management port to connect the device to a network for out-of-band management.

NOTE: You cannot use the management port to perform the initial configuration of the PTX10001-36MR. You must configure the management port through the console connection before you can successfully connect to the PTX10001-36MR by using this port. See "Perform the Initial Software Configuration for the PTX10001-36MR" on page 108 .

To connect a PTX10001-36MR to a network for out-of-band management (see Figure 58 on page 107):

1. Connect one end of the cable to the management port—labeled **MGMT**—on the PTX10001-36MR.
2. Connect the other end of the cable to the management network device.

Figure 58: Connect a PTX10001-36MR to a Network for Out-of-Band Management



Connect the PTX10001-36MR to a Management Console

Ensure that you have an RJ-45 to DB-9 rollover cable available. An RJ-45 cable with an RJ-45 to DB-9 adapter is provided with the PTX10001-36MR.

> **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 PTX10001-36MR, use a combination of the RJ-45 cable and RJ-45 to DB-9 adapter (provided) and a USB to DB-9 plug adapter (not provided).

The PTX10001-36MR has a console port with an RJ-45 connector. Use the console port to connect the device directly to a management console, such as a laptop, or to a console server.

To connect the PTX10001-36MR to a management console (see Figure 59 on page 108 or Figure 60 on page 108):

1. Connect one end of the RJ-45 Ethernet cable to the console port (labeled **COM/ToD**).
2. Connect the other end of the Ethernet cable directly to a management console or console server.

Figure 59: Connect the PTX10001-36MR Directly to a Management Console

Figure 60: Connect the PTX10001-36MR to a Management Console Through a Console Server

RELATED DOCUMENTATION

PTX10001-36MR Management Panel | 15

Perform the Initial Software Configuration for the PTX10001-36MR

Before you begin connecting and configuring a PTX10001-36MR, set the following parameter values on the management console or console server:

- Baud Rate—9600
- Flow Control—None
- Data—8
- Parity—None
- Stop Bits—1

- DCD State—Disregard

You'll need to perform the initial configuration of the PTX10001-36MR through the console port using the CLI or through zero-touch provisioning (ZTP). To provision the PTX10001-36MR using ZTP, you'll need access to a Dynamic Host Control Protocol (DHCP) server and a File Transfer Protocol (anonymous FTP), Hypertext Transfer Protocol (HTTP), or Trivial File Transfer Protocol (TFTP) server on which the software image and configuration files are stored.

To connect and configure the PTX10001-36MR using the CLI:

1. Connect the console port to a laptop or PC by using the supplied RJ-45 cable and RJ-45 to DB-9 adapter. The console port (labeled **CON/ToD**) is located on the management panel of the PTX10001-36MR (see "Connect the PTX10001-36MR to a Management Console" on page 107) .
2. Log in as **root**. There is no password. If the software boots before you connected to the console port, you might need to press the **Enter** key for the prompt to appear.

```
login: root
```

3. Start the CLI.

```
root@% cli
```

4. Enter configuration mode.

```
root> configure
```

5. Add a password to the root administration user account.

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

6. (Optional) Configure the name of the PTX10001-36MR. If the name includes spaces, enclose the name in quotation marks (“ ”).

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

7. Configure the default gateway.

```
[edit]
root@# set routing-options static route default next-hop address
```

8. Configure the IP address and prefix length for the management interface.

```
[edit]
root@# set interfaces re0:mgmt-0 unit 0 family inet address address/prefix-length
```

9. (Optional) Configure the static routes to remote prefixes with access to the management port.

```
[edit]
root@# set routing-instances mgmt_junos routing-options static route remote-prefix next-hop
destination-ip retain no-readvertise
```

10. Enable the Telnet service.

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

NOTE: When Telnet is enabled, you cannot log in to a PTX10001-36MR through Telnet by using root credentials. Root login is allowed only for SSH access.

11. Commit the configuration to activate it on the device.

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

RELATED DOCUMENTATION

PTX10001-36MR Management Cable Specifications and Pinouts | 70

Power Off the PTX10001-36MR

IN THIS SECTION

- Power Off the AC-Powered PTX10001-36MR | **111**
- Power Off the DC-Powered PTX10001-36MR | **112**

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See "Prevention of Electrostatic Discharge Damage" on page 183 .
- Ensure you do not need to route traffic through the PTX10001-36MR.
- Ensure you have the following parts and tools available to power off the PTX10001-36MR:
  - An ESD grounding strap
  - An external management device such as a PC
  - An RJ-45 to DB-9 rollover cable to connect the external management device to the console port

Power Off the AC-Powered PTX10001-36MR

1. Connect to the router by using one of the following methods:
   - Connect a management device to the console (**COM/ToD**) port on a PTX10001-36MR by following the instructions in "Connect the PTX10001-36MR to a Management Console" on page 107 .
   - Connect a management device to the management (**MGMT**) port by following the instructions in "Connect the PTX10001-36MR to a Management Ethernet Device" on page 106 .
2. Shut down Junos OS Evolved from the external management device by issuing the `request system halt` operational mode CLI command. This command shuts down Junos OS Evolved gracefully and

preserves system state information. A message appears on the console, confirming that the operating system has halted.

```
user@host> request system halt
Halt the system ? [yes,no] (no) yes
```

You see the following output (or something similar) after entering the command:

```
System going down IMMEDIATELY

*** System shutdown message from user@host***

halt the system at Thu Jun 20 04:57:23 2019

user@host> Connection to host closed by remote host.
Connection to host closed.
```

> ⚠ **CAUTION**: The final output of any version of the `request system halt` command is the "The operating system has halted." Although traffic and the operating system have stopped, the PTX10001-36MR power supply LEDs remain lit and a fan module continues to run. Wait at least 60 seconds after first seeing this message before continuing with this procedure.

3.

4. Disconnect power to the PTX10001-36MR. If the AC power source outlet has a power switch, set it to the off (**O**) position. If the AC power source outlet does not have a power switch, gently pull out the plug end of the power cord connected to the power source outlet.

5. Remove the power source cable from the power supply by pushing in the latch on the side of the power connector and gently pulling out the power plug from the power supply.

6. Uncable the device before removing it from the rack.

Power Off the DC-Powered PTX10001-36MR

1. Connect to the router by using one of the following methods:

- Connect a management device to the console (**COM/ToD**) port on a PTX10001-36MR by following the instructions in "Connect the PTX10001-36MR to a Management Console" on page 107 .
- Connect a management device to the management (**MGMT**) port by following the instructions in "Connect the PTX10001-36MR to a Management Ethernet Device" on page 106 .

2. Shut down Junos OS Evolved from the external management device by issuing the `request system halt` operational mode CLI command. This command shuts down Junos OS Evolved gracefully and preserves system state information. A message appears on the console, confirming that the operating system has halted.

```
user@host> request system halt
Halt the system ? [yes,no] (no) yes
```

You see the following output (or something similar) after entering the command:

```
Initiating  halt... ok
Initiating Junos shutdown...  shutdown: [pid 14318]
Shutdown NOW!
ok
Junos shutdown is in progress...
*** FINAL System shutdown message  ***

System going down IMMEDIATELY

...
...
Operating system  halted.
Please press any key to reboot.
```

CAUTION: The final output of any version of the `request system halt` command is the “The operating system has halted.” Although traffic and the operating system have stopped, the PTX10001-36MR power supply LEDs remain lit and a fan module continues to run. Wait at least 60 seconds after first seeing this message before following continuing with this procedure.

3.

4. Turn off the circuit breaker for the DC power source.

CAUTION: Turn off the circuit breaker for the HVDC power source before disconnecting the power cord from the power supply. Unplugging an HVDC connection while the power supply is powered up might damage the electrical connectors.

5. Loosen the thumbscrews for the power cable.
6. Disconnect a connector for the power cables or release each of three cables from the power supply (requires a standard screwdriver).
7. Gently pull out the socket end of the power cable connected to the power supply.
8. Uncable the device before removing it from the rack.

CHAPTER 4

Remove, Install, and Maintain Components

Maintain the PTX10001-36MR Fan Modules | 116

Maintain the PTX10001-36MR Power Supplies | 119

Maintain the PTX10001-36MR Transceivers and Fiber-Optic Cables | 125

Uninstall the PTX10001-36MR | 136

Maintain the PTX10001-36MR Fan Modules

IN THIS SECTION

- Remove a Fan Module from the PTX10001-36MR | **116**
- Install a Fan Module in the PTX10001-36MR | **117**

Remove a Fan Module from the PTX10001-36MR

Before you remove a fan module from a PTX10001-36MR, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see "Prevention of Electrostatic Discharge Damage" on page 183).

Ensure that you have the following parts and tools available:

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

The fan modules in a PTX10001-36MR are hot-removable and hot-insertable field-replaceable units (FRUs); you can remove and replace them without powering off the PTX10001-36MR or disrupting routing functions.

CAUTION: Before removing the fan module, ensure you have a replacement fan module at hand. If one fan is absent, the chassis will operate for four minutes, and then shut down. If two fans are absent, the chassis will shut down immediately.

To remove a fan module from a PTX10001-36MR:

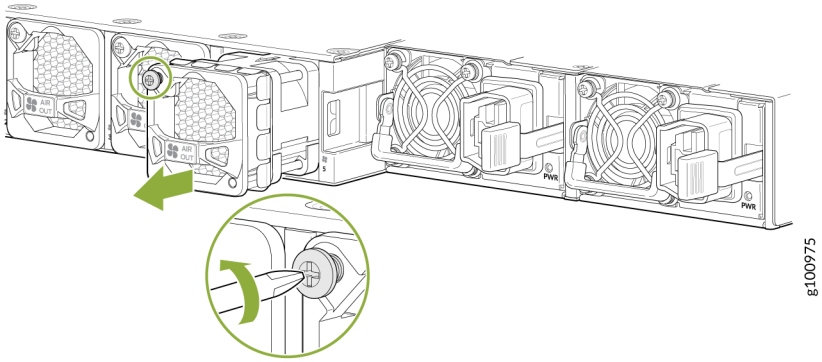
1. Place the antistatic bag or the antistatic mat on a flat, stable surface.
2. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to the ESD point on the device.
3. Using the Phillips screwdriver, loosen the locking screw (3 or 4 turns).

4. Grasp the handle on the fan module and pull firmly to slide the fan module halfway out of the chassis.

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

5. When the fan stops spinning, slide the fan module completely out of the chassis.
6. Place the fan module in the antistatic bag or on the antistatic mat placed on a flat, stable surface. See Figure 61 on page 117 .

Figure 61: Remove a Fan Module from a PTX10001-36MR



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

Install a Fan Module in the PTX10001-36MR

Before you install a fan module in a PTX10001-36MR, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see "Prevention of Electrostatic Discharge Damage" on page 183).

Ensure that you have the following parts and tools available:

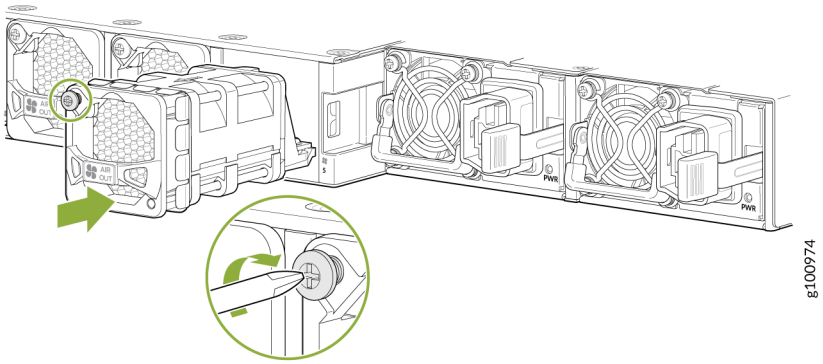
- ESD grounding strap
- Phillips (+) screwdriver, number 1

The fan modules in a PTX10001-36MR are hot-removable and hot-insertable field-replaceable units (FRUs)—you can remove and replace them without powering off the PTX10001-36MR or disrupting routing functions.

To install a fan module in a PTX10001-36MR:

1. To prevent damage to the equipment caused by static discharge, 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. Taking care not to touch the connectors, remove the fan module from its bag.
3. Align the module with the open slot on the FRU end of the PTX10001-36MR and slide it in until it is fully seated.
4. Using the Phillips screwdriver, tighten the locking screw (3 or 4 turns). See Figure 62 on page 118 .

Figure 62: Install a Fan Module in a PTX10001-36MR



RELATED DOCUMENTATION

Maintain the PTX10001-36MR Power Supplies | **119**

Maintain the PTX10001-36MR Transceivers and Fiber-Optic Cables | **125**

Maintain the PTX10001-36MR Power Supplies

IN THIS SECTION

- Remove the AC/HVDC Power Supply from the PTX10001-36MR | **119**
- Install the AC/HVDC Power Supply in the PTX10001-36MR | **121**
- Remove the DC Power Supply from the PTX10001-36MR | **122**
- Install the DC Power Supply in the PTX10001-36MR | **124**

The power supplies in a PTX10001-36MR are hot-removable and hot-insertable field-replaceable units; You can remove and replace them without powering off the PTX10001-36MR or disrupting routing functions.

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

Here are the parts and tools you'll need to replace a power supply:

- ESD grounding strap (provided)
- Antistatic bag or an antistatic mat (not provided)
- (For a DC power supply) Phillips (+) screwdriver, number 2 (not provided)

Remove the AC/HVDC Power Supply from the PTX10001-36MR

WARNING: Turn off the power source before disconnecting the power cord to prevent damage to the power connector contact.

WARNING: If you need to replace all the power supplies installed in your PTX10001-36MR, you must power off the PTX10001-36MR before removing the power supplies. See "Power Off the PTX10001-36MR" on page 111 .

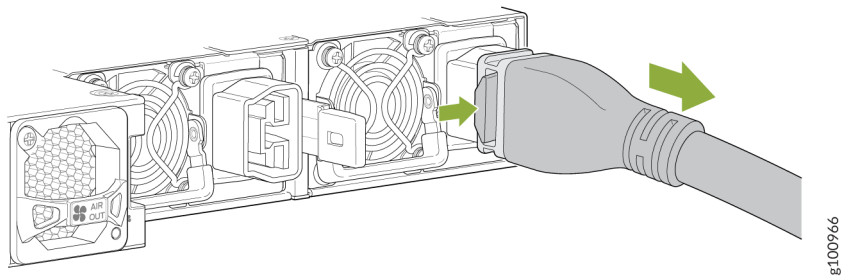
CAUTION: Replace the power supply within two minutes of removal to prevent chassis overheating. Before removing the power supply, ensure you have a replacement power supply available.

CAUTION: The AC/HVDC power supply you are installing must use the same airflow direction as the fan trays installed in the router. Labels on the power supply handle indicate the direction of airflow. See "PTX10001-36MR Cooling System" on page 21 .

CAUTION: Before you replace a power supply in a PTX10001-36MR, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see "Prevention of Electrostatic Discharge Damage" on page 183).

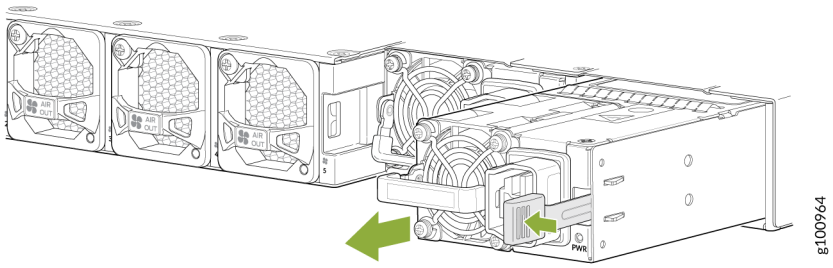
1. Place the antistatic bag or the antistatic mat on a flat, stable surface.
2. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to the ESD point on the device.
3. Disconnect power to the PTX10001-36MR power supply you are going to replace. If the AC input power source outlet has a power switch, set it to the off (**O**) position. If the AC input power source outlet does not have a power switch, gently pull out the plug end of the power cord connected to the power source outlet.
4. Remove the power cord from the power supply by pressing in the locking button on the side of the power connector and gently pulling the connector out of the power supply faceplate. Refer to Figure 63 on page 120 .

Figure 63: Remove the Power Cord from the Power Supply



5. Slide the ejector lever on the power supply toward the orange handle until it stops.
6. Place one hand under the power supply to support it and slide it completely out of the chassis. Take care not to touch power supply components, pins, leads, or solder connections. See Figure 64 on page 121 .

Figure 64: Remove an AC/HVDC Power Supply



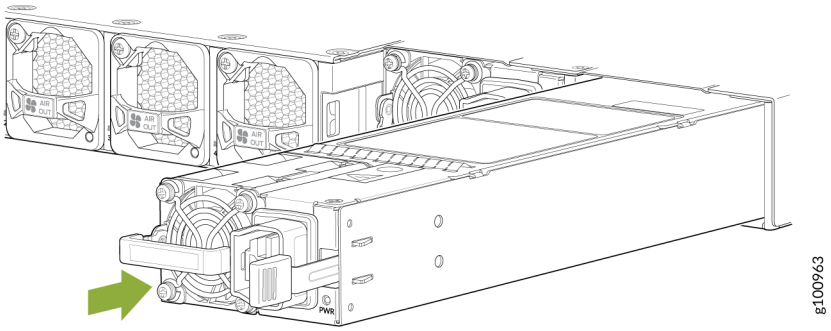
7. Place the power supply in the antistatic bag or on the antistatic mat placed on a flat, stable surface.
8. Install a new power supply within two minutes of removing the old one.

Install the AC/HVDC Power Supply in the PTX10001-36MR

CAUTION: Install the power supply within two minute of removal to prevent chassis overheating. Before removing the power supply, ensure you have a replacement power supply available.

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. If the power supply has protective plastic wrap, peel and remove the plastic wrap from all four sides of the power supply.
3. Taking care not to touch power supply components, pins, leads, or solder connections, remove the power supply from its bag.
4. Using both hands, place the power supply in the power supply slot on the field replaceable units (FRU) panel of the PTX10001-36MR and slide it in until it is fully seated and the ejector lever slides into place. See Figure 65 on page 122 .

Figure 65: Install a PTX10001-36MR AC/HVDC Power Supply



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

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

Remove the DC Power Supply from the PTX10001-36MR

WARNING: Turn off the circuit breaker for the DC power source before disconnecting the power cord from the power supply. Unplugging an DC connection while the power supply is powered up might damage the electrical connectors.

WARNING: If you need to replace all the power supplies installed in your PTX10001-36MR, you must power off the PTX10001-36MR before removing the power supplies. See "Power Off the PTX10001-36MR" on page 111 .

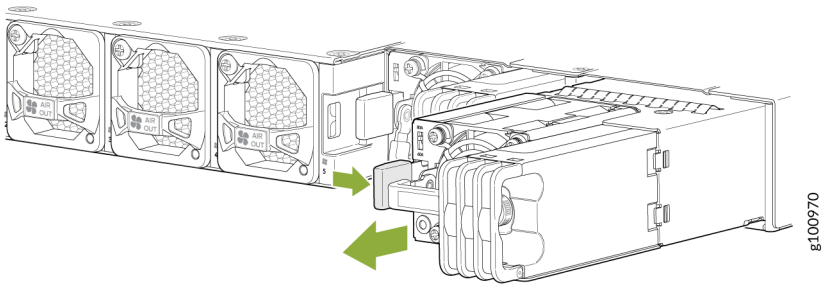
CAUTION: Replace the power supply within two minutes of removal to prevent chassis overheating. Before removing the power supply, ensure you have a replacement power supply available.

CAUTION: The DC power supply you are installing must use the same airflow direction as the fan trays installed in the router. Labels on the power supply handle indicate the direction of airflow. See "PTX10001-36MR Cooling System" on page 21 .

CAUTION: Before you replace a power supply in a PTX10001-36MR, ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see "Prevention of Electrostatic Discharge Damage" on page 183).

1. Place the antistatic bag or the antistatic mat on a flat, stable surface.
2. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to the ESD point on the device.
3. Turn off the circuit breaker for the power feed to the power supply that you are replacing. Be sure the LEDs turn off on the power supply that you are removing.
4. Loosen the thumbscrews for the power cable. Gently pull out the socket end of the power plug connected to the power supply faceplate.
5. Disconnect a connector for the power cables or release each of three cables from the power supply (requires a standard screwdriver).
6. Grasp the power supply handle while pressing the release latch towards the power supply handle.
7. Place one hand under the power supply to support it and slide it completely out of the chassis. Take care not to touch power supply components, pins, leads, or solder connections. See Figure 66 on page 123 .

Figure 66: Remove a DC Power Supply



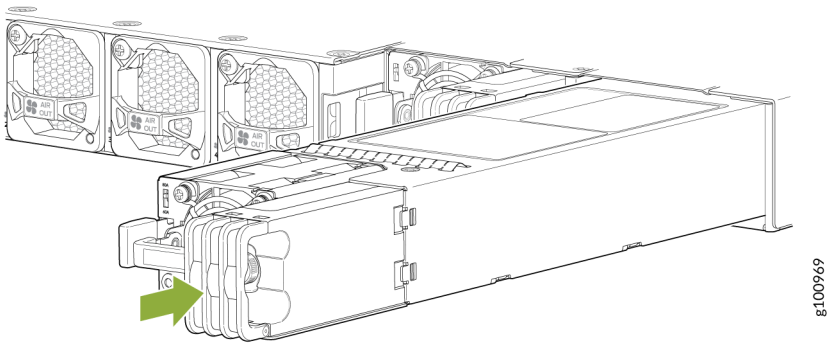
8. Place the power supply in the antistatic bag or on the antistatic mat placed on a flat, stable surface.
9. Install a new power supply within two minutes of removing the old one.

Install the DC Power Supply in the PTX10001-36MR

CAUTION: Install the power supply within two minutes of removal to prevent chassis overheating. Before removing the power supply, ensure you have a replacement power supply available.

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. If the power supply has protective plastic wrap, peel and remove the plastic wrap from all four sides of the power supply.
3. Taking care not to touch power supply components, pins, leads, or solder connections, remove the power supply from its bag.
4. To prevent damage to the equipment caused by static discharge, attach an ESD grounding strap to your bare wrist, and connect the strap to one of the ESD points on the chassis.
5. Taking care not to touch power supply components, pins, leads, or solder connections, remove the power supply from its bag.
6. Using both hands, place the power supply in the power supply slot on the field replaceable units (FRU) panel of the PTX10001-36MR and slide it in until it is fully seated and the locking lever slides into place. See Figure 67 on page 124 .

Figure 67: Install a DC Power Supply



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

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

RELATED DOCUMENTATION

PTX10001-36MR Power System | 25

Connect the PTX10001-36MR to Power | 95

Maintain the PTX10001-36MR Transceivers and Fiber-Optic Cables

IN THIS SECTION

- Remove a QSFP28 or QSFP56-DD Transceiver | 126
- Install a QSFP28 or QSFP56-DD Transceiver | 127
- Remove a Transceiver | 128
- Install a Transceiver | 130
- Disconnect a Fiber-Optic Cable from the PTX10001-36MR | 133
- Connect a Fiber-Optic Cable to the PTX10001-36MR | 134
- Maintain Fiber-Optic Cables in the PTX10001-36MR | 135

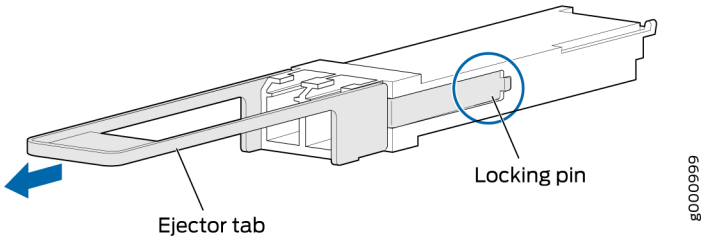
The transceivers for the PTX10001-36MR router are hot-removable and hot-insertable field-replaceable units (FRUs). You can remove and replace them without powering off the device or disrupting device functions.

To understand how to install or remove a transceiver of a PTX10001-36MR router, read the following sections.

Remove a QSFP28 or QSFP56-DD Transceiver

28-Gbps quad small form-factor pluggable (QSFP28) transceivers and double density quad small-form factor pluggable (QSFP56-DD) transceivers can be removed from the device. Transceivers are hot-insertable and hot-removable. Removing a transceiver does not interrupt the device functioning, but the removed transceiver no longer receives or transmits data.

Figure 68: QSFP28 or QSFP56-DD Transceiver



To remove a QSFP28 or QSFP56-DD transceiver (see Figure 68 on page 126):

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

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

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

5. Arrange the cable in the cable management system to prevent it from dislodging or developing stress points. Secure the cable so that it is not supporting its own weight as it hangs to the floor. Place

excess cable out of the way in a neatly coiled loop in the cable management system. Placing fasteners on the loop helps to maintain its shape.

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

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

Install a QSFP28 or QSFP56-DD Transceiver

To install a replacement QSFP28 or QSFP56-DD transceiver:

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. Verify that a rubber safety cap covers the transceiver, installing one if necessary.
3. Orient the transceiver over the port so that the transceiver connector faces the appropriate direction.
4. Slide the transceiver into the slot 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.
5. Remove the rubber safety cap from the transceiver and the end of the cable, and insert the cable into the transceiver.

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

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

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

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

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

7. Verify that the status LEDs on the indicate that the QSFP28 is functioning correctly.

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

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 69 on page 130 shows how to remove an SFP+ or QSFP+ transceiver.

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 switch.
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 from the PTX10001-36MR" on page 133). 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.

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

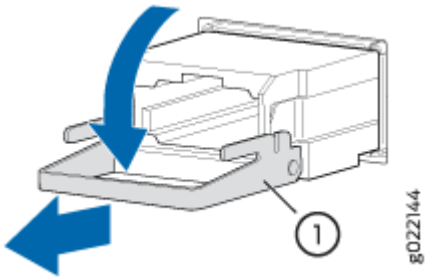
6. To remove a QSFP+ or SFP+ transceiver:
   a. Using your fingers, pull open the ejector lever on the transceiver to unlock the transceiver.

CAUTION: Before removing the transceiver, make sure that you open the ejector lever completely until you hear it click. This 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 69: Remove an SFP+ or QSFP+ Transceiver



1– Ejector lever

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

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.

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

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

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

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

Figure 70 on page 133 shows how to install a SFP+ or QSFP+ transceiver.

To install a transceiver:

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

1. Wrap and fasten one end of the ESD wrist strap around your bare wrist, and connect the other end of the strap to the ESD point on the switch.
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 and save it in case you need to cover the port later. If you are hot-swapping a transceiver, wait for at least 10 seconds after removing the transceiver from the port before installing a new transceiver.
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. Misalignment might cause the pins to bend, making the transceiver unusable.

6. Slide the transceiver in gently until it is fully seated.
7. Remove the rubber safety cap from the transceiver and the end of the cable, and insert the cable into the transceiver.

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

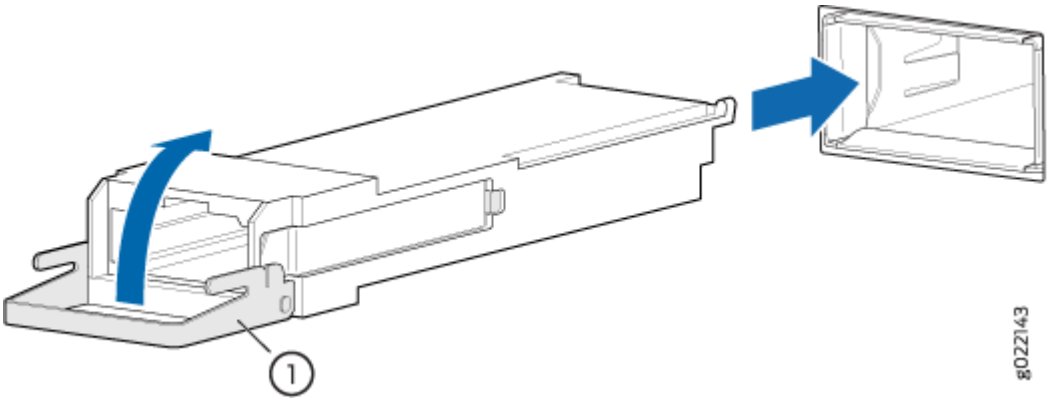
CAUTION: Do not leave a fiber-optic transceiver uncovered except when inserting or removing cable. The safety cap keeps the port clean and protects your eyes from accidental exposure to laser light.

8. 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. Secure the cable so that it does not support its own weight as it hangs toward the floor. Place excess cable out of the way in a neatly coiled loop in the cable management system. Placing fasteners on the loop helps to maintain its shape.

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

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

Figure 70: Install a SFP+ or QSFP+ Transceiver



1– Ejector lever	

Disconnect a Fiber-Optic Cable from the PTX10001-36MR

Before you disconnect a fiber-optic cable from a PTX10001-36MR, ensure that you have taken the necessary precautions for safe handling of lasers (see "Radiation from Open Port Apertures Warning" on page 174 and "Laser and LED Safety Guidelines and Warnings" on page 171).

Ensure that you have the following parts and tools available:

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

The PTX10001-36MR has optical transceivers to which you can connect fiber-optic cables.

To disconnect a fiber-optic cable from an optical transceiver installed in the PTX10001-36MR:

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

```
[edit interfaces]
set interface-name disable
```

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

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

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

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

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

Connect a Fiber-Optic Cable to the PTX10001-36MR

Before you connect a fiber-optic cable to a PTX10001-36MR, ensure that you have taken the necessary precautions for safe handling of lasers (see "Radiation from Open Port Apertures Warning" on page 174 and "Laser and LED Safety Guidelines and Warnings" on page 171).

The PTX10001-36MR has optical transceivers to which you can connect fiber-optic cables.

To connect a fiber-optic cable to an optical transceiver installed in the PTX10001-36MR:

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

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

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

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

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

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

Maintain Fiber-Optic Cables in the PTX10001-36MR

To maintain fiber-optic cables in a PTX10001-36MR:

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

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

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

Uninstall the PTX10001-36MR

IN THIS SECTION

- Remove the PTX10001-36MR from a Rack or Cabinet | **136**

Remove the PTX10001-36MR from a Rack or Cabinet

Before removing a PTX10001-36MR from a rack:

Here's what you'll need to relocate the PTX10001-36MR:

- Two people. One to hold the rack while the other one removes the screws.
- Screwdriver appropriate for your rack-mounting screws.

If you need to relocate an installed PTX10001-36MR, use the procedure described in this topic. (The remainder of this topic uses "rack" to mean "rack or cabinet.")

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

- Ensure that the rack is stable and secured to the building.
- Ensure that there is enough space to place the removed PTX10001-36MR in its new location and along the path to the new location.
- Read "General Safety Guidelines and Warnings" on page 158 and "PTX10001-36MR Installation Safety Guidelines" on page 77 .

- Power off the device (see "Power Off the PTX10001-36MR" on page 111).
- Disconnect the power cords.
- Ensure that you have disconnected any cables or wires attached to the PTX10001-36MR (see "Disconnect a Fiber-Optic Cable from the PTX10001-36MR" on page 133).

To remove a PTX10001-36MR from a rack:

1. Have one person support the weight of the device while another person uses the screwdriver to remove the front mounting screws that attach the chassis mounting brackets to the rack.
2. Remove the PTX10001-36MR from the rack.
3. Use the screwdriver to remove the mounting screws that attach the mounting blades attached to the rear of the rack.
4. Place the removed screws and rear mounting blades in a labeled bag. You will need them when you reinstall the chassis.
5. Transport the PTX10001-36MR to the new location.

RELATED DOCUMENTATION

Unpack and Mount the PTX10001-36MR | 78

5
CHAPTER

Troubleshoot the Hardware

Troubleshoot the PTX10001-36MR | 139

Troubleshoot the PTX10001-36MR

IN THIS SECTION

- PTX10001-36MR Troubleshooting Resources Overview | 139
- PTX10001-36MR Alarm Messages Overview | 140
- System Alarm Messages on the PTX10001-36MR | 140

PTX10001-36MR Troubleshooting Resources Overview

To troubleshoot a PTX10001-36MR, you use the Junos OS Evolved CLI, alarms, and LEDs on the network ports, management panel, and components.

- LEDs—When the Routing Engine detects an alarm condition, it lights the red or yellow alarm LED on the management panel as appropriate. You can also use component LEDs and network port LEDs to troubleshoot the PTX10001-36MR. For more information, see the following topics:
  - "PTX10001-36MR Chassis Status LEDs" on page 18
  - "PTX10001-36MR Management Panel LEDs" on page 17
  - "PTX10001-36MR Network Port LEDs" on page 14
  - "PTX10001-36MR Fan Module LEDs" on page 24
  - "PTX10001-36MR AC Power Supply LED" on page 27
  - "PTX10001-36MR DC Power Supply LED" on page 39
- CLI—The CLI is the primary tool for controlling and troubleshooting hardware, Junos OS Evolved, routing protocols, and network connectivity. CLI commands display information from routing tables, information specific to routing protocols, and information about network connectivity derived from the ping and traceroute utilities. For information about using the CLI to troubleshoot Junos OS Evolved, see the appropriate Junos OS Evolved user 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 here, contact JTAC.

PTX10001-36MR Alarm Messages Overview

When the Routing Engine detects an alarm condition, it lights the red or yellow alarm LED on the management panel as appropriate. To view a more detailed description of the alarm cause, issue the `show system alarm` CLI command:

```
user@host> show system alarm
1 alarm currently active
Alarm time               Class  Description
2020-07-01 01:18:35 PDT  Major  chassis No Redundant Power
```

System Alarm Messages on the PTX10001-36MR

System alarms indicate a failure on the device or one of its components. System alarms are preset and cannot be modified.

System alarms on PTX10001-36MR devices have two severity levels:

- Major (red)—Indicates a critical situation on the device that has resulted from one of the conditions described in Table 36 on page 140 . A red alarm condition requires immediate action.
- Minor (yellow or amber)—Indicates a noncritical condition on the device that, if left unchecked, might cause an interruption in service or degradation in performance. A yellow alarm condition requires monitoring or maintenance.

Table 36 on page 140 describes the system alarm messages on the PTX10001-36MR.

Table 36: PTX10001-36MR System Alarm Messages

Component	Alarm Type	CLI Message	Recommended Action
Fans	Major (red)	`Fan Failure`	Replace the fan module and report the failure to customer support.

Table 36: PTX10001-36MR System Alarm Messages *(Continued)*

Component	Alarm Type	CLI Message	Recommended Action
		`Fan I2C Failure`	Check the system log for one of the following messages and report the error message to customer support: • `CM ENV Monitor: Get fan speed failed.` • *`fan-number`* `is NOT spinning @ correct speed`, where *`fan-number`* can be 0, 1, 2, 3, 4, or 5.
		`Fan` *`fan-number`* `Not Spinning`	Remove and check the fan module for obstructions, and then reinsert the fan module. If the problem persists, replace the fan module.
	Minor (yellow)	`Fan/Blower Absent`	Check the system log for the message *`fan-number`* `Absent`, where *`fan-number`* can be 0, 1, 2, 3, 4, or 5. Install the fan module.
Power supplies	Major (red)	`PEM` *`pem-number`* `Airflow not matching Chassis Airflow`	Replace the power supply with a power supply that supports the same airflow direction as the chassis.
		`PEM` *`pem-number`* `I2C Failure`	Check the system log for one of the following messages and report the error message to customer support: • `I2C Read failed for device` *`number`*, where *`number`* can be from 123 throgh 125. • `PS` *`number`*`: Transitioning from online to offline`, where power supply (PS) *`number`* can be 0 or 1.

Table 36: PTX10001-36MR System Alarm Messages *(Continued)*

Component	Alarm Type	CLI Message	Recommended Action
		PEM *pem-number* is not powered	Check the power cord connection and reconnect, if necessary.
		PEM *pem-number* is not supported	Replace the power supply with a supported power supply.
		PEM *pem-number* Not OK	Indicates a problem with the incoming AC power or outgoing DC power. Report the error to customer support.
	Minor (yellow)	PEM *pem-number* Absent	A power supply is not installed. Install a supported power supply in the appropriate slot.
		PEM *pem-number* Power Supply Type Mismatch	Check if there is a mix of AC and DC power supplies in the same chassis. Reboot the device with only AC or only DC power supplies.
		PEM *pem-number* Removed	Replace the removed power supply.
Temperature sensors	Major (red)	*sensor-location* Temp Sensor Fail	Check the system log for the following message and report it to customer support: Temp sensor *sensor-number* failed, where *sensor-number* ranges from 1 through 10.

Table 36: PTX10001-36MR System Alarm Messages *(Continued)*

Component	Alarm Type	CLI Message	Recommended Action
		sensor-location Temp Sensor Too Hot	Check environmental conditions and alarms on other devices. Ensure that environmental factors (such as hot air blowing around the equipment) do not affect the temperature sensor. If the condition persists, the device might shut down.
	Minor (yellow)	*sensor-location* Temp Sensor Too Warm	For information only. Check environmental conditions and alarms on other devices. Ensure that environmental factors (such as hot air blowing around the equipment) do not affect the temperature sensor.
Routing Engine	Major (red)	RE *RE number* /var partition is full	Clean up the system file storage space on the device. For more information, see *request system storage cleanup*.
	Minor (yellow)	RE *RE number* /var partition usage is high	Clean up the system file storage space on the device. For more information, see *request system storage cleanup*.

Table 36: PTX10001-36MR System Alarm Messages *(Continued)*

Component	Alarm Type	CLI Message	Recommended Action
Management Ethernet interface	Major (red)	`Management Ethernet 1 Link Down`	Check whether a cable is connected to the management Ethernet interface, or whether the cable is defective. Replace the cable, if required. If you are unable to resolve the problem, open a support case by using the Case Manager link at https://www.juniper.net/support/ or call 1-888-314-5822 (toll free, US or 1-408-745-9500 (from outside the United States).

RELATED DOCUMENTATION

- PTX10001-36MR Management Panel | **15**
- Definitions of Safety Warning Levels | **159**
- *Configuring Junos OS to Determine Conditions That Trigger Alarms on Different Interface Types*
- *alarm*
- Contact Customer Support | **146**

CHAPTER 6

Contact Customer Support and Return the Chassis or Components

Contact Customer Support | 146

Return the PTX10001-36MR Chassis or Components | 147

Contact Customer Support

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

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

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

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

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

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

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

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

Return the PTX10001-36MR Chassis or Components

IN THIS SECTION

- Locate the Serial Number on a PTX10001-36MR Chassis or Component | 147
- Remove the Solid-State Drives for RMA | 151
- Return a PTX10001-36MR or Component for Repair or Replacement | 152
- Contact Customer Support to Obtain a Return Material Authorization | 153
- How to Pack a PTX10001-36MR Chassis or Component for Shipping | 154

Locate the Serial Number on a PTX10001-36MR Chassis or Component

IN THIS SECTION

- List the Chassis and Component Details by Using the CLI | 148
- Locate the PTX10001-36MR Chassis Serial Number ID Label | 149
- Locate the Serial Number ID Labels on FRU Components | 149

If you are returning a PTX10001-36MR or a PTX10001-36MR field-replaceable unit (FRU) to Juniper Networks for repair or replacement, you must locate the serial number of the router or FRU. You must provide the serial number to the Juniper Networks Technical Assistance Center (JTAC) when you contact them to obtain a Return Materials Authorization (RMA). See "Contact Customer Support to Obtain a Return Material Authorization" on page 153 .

If the PTX10001-36MR is operational and you can access the command-line interface (CLI), you can list serial numbers for the router and some components with a CLI command. If you do not have access to the CLI or if the serial number for the FRU does not appear in the command output, you can locate the serial number ID label on the router or FRU.

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

NOTE: You must remove the fan module to read the serial number from the serial number ID label. The fan module serial number cannot be viewed through the CLI. The fan module numbering starts at 0 and counts from left to right.

List the Chassis and Component Details by Using the CLI

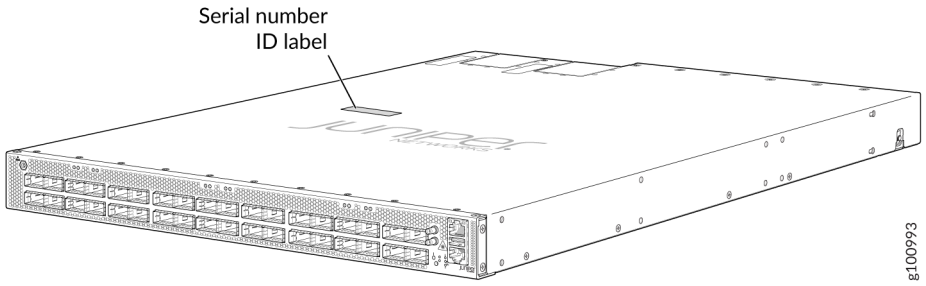
To list the PTX10001-36MR and components and their serial numbers, use the `show chassis hardware` CLI operational mode command.

```
user@host> show chassis hardware
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                EG811             JNP10001-36MR [PTX10001-36MR]
PSM 0            REV 03   740-073765   1GE28380110       AC AFO 3000W PSU
PSM 1            REV 03   740-073765   1GE28380134       AC AFO 3000W PSU
Routing Engine 0 REV 06   750-100243   BCAZ6056          RE-JNP10001-36MR
CB 0             REV 10   750-099260   BCBA2529          Control Board
FPC 0                     BUILTIN      BUILTIN           FPC-JNP10001-36MR
  PIC 0                   BUILTIN      BUILTIN           8X400GE-MR + 4X100GE-MR
    Xcvr 0       REV 01   740-061405   1ACQ13150DA       QSFP-100GBASE-SR4-T2
    Xcvr 1       REV 01   740-058734   1ECQ133001B       QSFP-100GBASE-SR4
    Xcvr 6       REV 01   740-054053   XW30R10           QSFP+-4X10G-SR
  PIC 1                   BUILTIN      BUILTIN           8X400GE-MR + 4X100GE-MR
    Xcvr 4       REV 01   740-061405   1ACQ13140TM       QSFP-100GBASE-SR4-T2
    Xcvr 6       REV 01   740-061001   1PC422083KP       QSFP28-100G-CU3M
    Xcvr 7       UEV 01   740-061001   1RC4230303F       QSFP28-100G-CU3M
  PIC 2                   BUILTIN      BUILTIN           8X400GE-MR + 4X100GE-MR
    Xcvr 0       REV 01   740-054053   XYJ0RDE           QSFP+-4X10G-SR
    Xcvr 1       REV 01   740-054053   XZG0KQJ           QSFP+-4X10G-SR
    Xcvr 2       REV 01   740-067443   XXK04AD           QSFP+-40G-SR4
    Xcvr 4       REV 01   740-061001   1PC422083KP       QSFP28-100G-CU3M
    Xcvr 6       REV 01   740-054050   INFAJ0492142      QSFP+-4X10G-LR
    Xcvr 10      REV 01   740-058734   1ACQ13290EN       QSFP-100GBASE-SR4
    Xcvr 11      REV 01   740-061405   1ACQ1315053       QSFP-100GBASE-SR4-T2
SIB 0                     BUILTIN      BUILTIN           SIB-JNP10001-36MR
```

```
Fan Tray 0                                          JNP10001 Fan Tray, Front to Back
Airflow - AFO
Fan Tray 1                                          JNP10001 Fan Tray, Front to Back
Airflow - AFO
Fan Tray 2                                          JNP10001 Fan Tray, Front to Back
Airflow - AFO
Fan Tray 3                                          JNP10001 Fan Tray, Front to Back
Airflow - AFO
Fan Tray 4                                          JNP10001 Fan Tray, Front to Back
Airflow - AFO
Fan Tray 5                                          JNP10001 Fan Tray, Front to Back
Airflow - AFO
```

Locate the PTX10001-36MR Chassis Serial Number ID Label

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



Locate the Serial Number ID Labels on FRU Components

For each FRU, you must remove the FRU from the chassis to see the FRU's serial number ID label.

- AC power supply—The serial number ID label is on the top of the AC power supply. See Figure 71 on page 150 .
- DC power supply—The serial number ID label is on the top of the DC power supply. See Figure 72 on page 150 .
- Fan module—The serial number ID label is on the top of the fan module. See Figure 73 on page 150 .

Figure 71: Locate the PTX10001-36MR AC Power Supply Serial Number Label

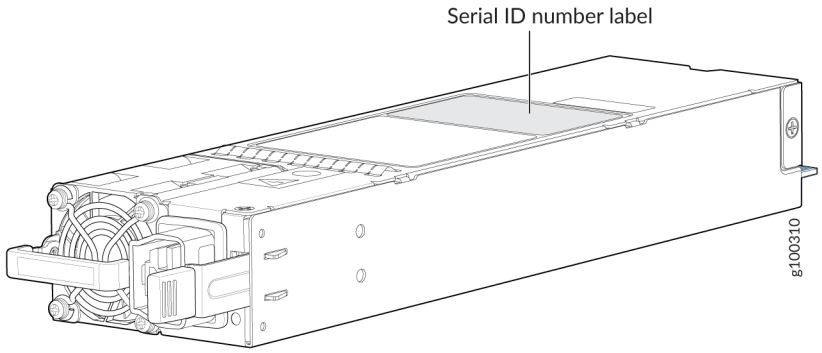


Figure 72: Locate the PTX10001-36MR DC Power Supply Serial Number Label

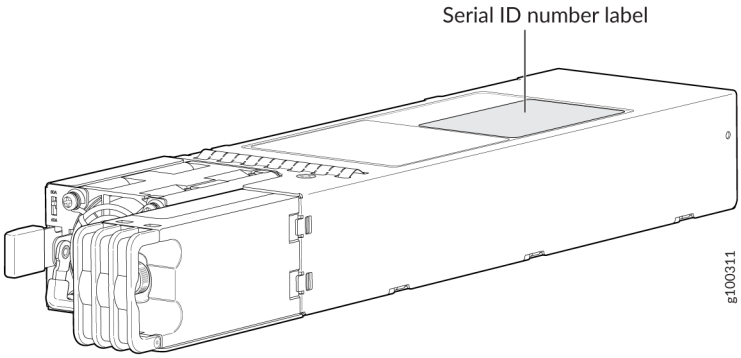
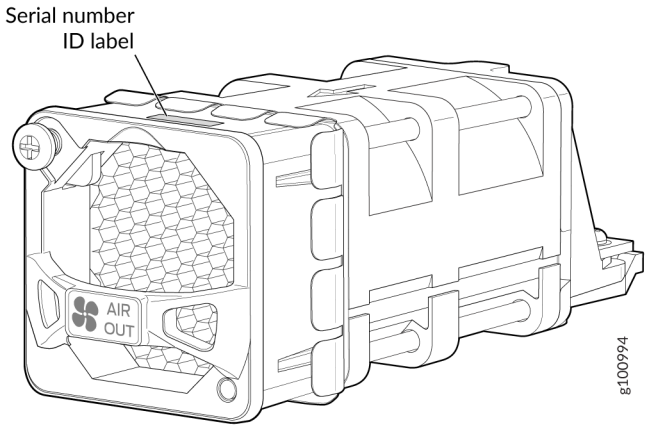


Figure 73: Locate the PTX10001-36MR Fan Module Serial Number Label



Remove the Solid-State Drives for RMA

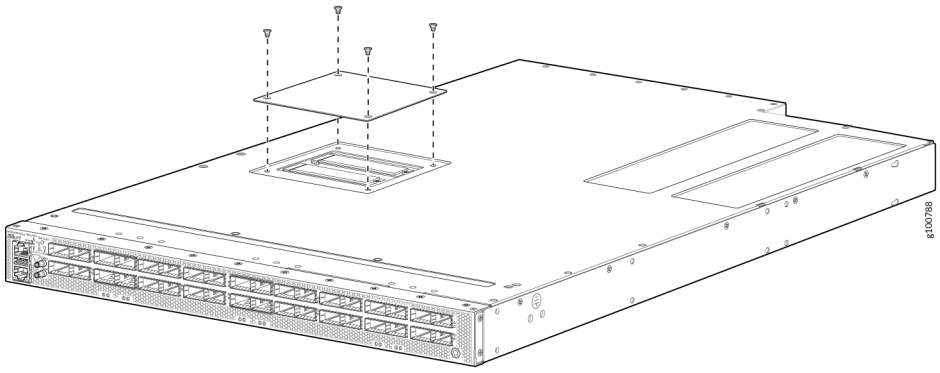
The PTX10001-36MR has two solid-state drives (SSDs) that store the software images, system logs, and the configuration files. Before returning a chassis to Juniper Networks as part of a Return Merchandise Authorization (RMA), you have the option of removing the SSDs and disposing them according to your own company's security procedures. Before you begin this procedure, ensure you have the following tools:

- ESD grounding strap (not provided)
- Number 2 Phillips screwdriver

Use this optional procedure to remove the drives from the PTX10001-36MR after the device has shutdown and removed from the rack.

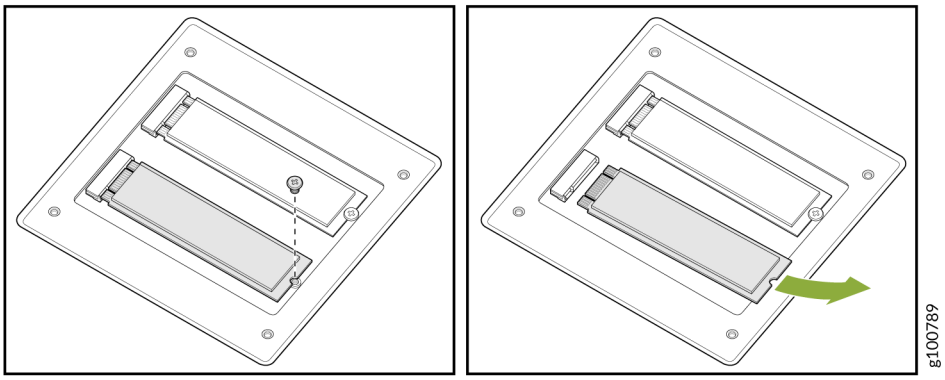
1. Attach the ESD grounding strap to your bare wrist and to a site ESD point.
2. Place the device on a firm surface such as a workbench or a table.
3. Turn the device over to locate the SSD access door.
4. Using the number 2 Phillips screwdriver, remove the four flat-head screws that secure the access door on the the device. Retain the screws for later use.

Figure 74: Removing Flat-head Screws in the Access Door



5. Remove the screw holding the SSD in place.
6. Slide the SSD out of the slot and set aside; repeat with the second SSD.

Figure 75: Removing the SSDs



7. Replace the two screws and tighten.
8. Replace the four flat-head screws and hand tighten using the number 2 Phillips screwdriver.
9. Dispose of the SSDs according to your site security procedures.

Return a PTX10001-36MR or Component for Repair or Replacement

If you need to return a PTX10001-36MR or component to Juniper Networks for repair or replacement, follow this procedure:

1. Determine the serial number of the component. For instructions, see "Locate the Serial Number on a PTX10001-36MR Chassis or Component" on page 147 .
2. Obtain a Return Material Authorization (RMA) number from the Juniper Technical Assistance Center (JTAC) as described in "Contact Customer Support to Obtain a Return Material Authorization" on page 153 .

   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. Refused shipments are returned to the customer through collect freight.

3. Pack the router or component for shipping as described in "How to Pack a PTX10001-36MR Chassis or Component for Shipping" on page 154 .

For more information about return and repair policies, see the customer support page at https://www.juniper.net/support/guidelines.html.

Contact Customer Support to Obtain a Return Material Authorization

If you need to return a device or hardware component to Juniper Networks for repair or replacement, obtain a Return Material Authorization (RMA) number from Juniper Networks Technical Assistance Center (JTAC). You must obtain an RMA number before you attempt to return the component.

After locating the serial number of the device or hardware component you want to return, open a service request with the Juniper Networks Technical Assistance Center (JTAC) on the Web or by telephone.

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

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

You can contact JTAC 24 hours a day, seven days a week on the Web or by telephone:

- Service Request Manager: https://support.juniper.net/support
- Telephone: +1-888-314-JTAC (+1-888-314-5822), toll free in U.S., Canada, and Mexico

> **NOTE**: For international or direct-dial options in countries without toll free numbers, see https://support.juniper.net/support.

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

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

How to Pack a PTX10001-36MR Chassis or Component for Shipping

IN THIS SECTION

- How to Pack a PTX10001-36MR for Shipping | 154
- How to Pack PTX10001-36MR Components for Shipping | 155

If you are returning a PTX10001-36MR chassis or component to Juniper Networks for repair or replacement, pack the item as described in this topic.

Before you pack a PTX10001-36MR or component:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See "Prevention of Electrostatic Discharge Damage" on page 183 .
- Retrieve the original shipping carton and packing materials. Contact your JTAC representative if you do not have these materials, to learn about approved packing materials (see "Contact Customer Support" on page 146).

Ensure that you have the following parts and tools available:

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

How to Pack a PTX10001-36MR for Shipping

Here's how to pack a PTX10001-36MR for shipping:

1. Power off the PTX10001-36MR and remove the AC power cords or DC power cables. See "Power Off the PTX10001-36MR" on page 111 .
2. Remove the cables that connect the PTX10001-36MR to all external devices. See "Disconnect a Fiber-Optic Cable from the PTX10001-36MR" on page 133 .
3. Remove all field-replaceable units (FRUs) from the router. See:
   - "Remove a Fan Module from the PTX10001-36MR" on page 116
   - "Remove the AC/HVDC Power Supply from the PTX10001-36MR" on page 119
   - "Remove the DC Power Supply from the PTX10001-36MR" on page 122

4. Remove the PTX10001-36MR from the rack or cabinet. See "Uninstall the PTX10001-36MR" on page 136 .
5. Place the PTX10001-36MR in an antistatic bag.
6. Place the PTX10001-36MR in the shipping carton.
7. Place the packing foam on top of and around the PTX10001-36MR.
8. If you are returning accessories or FRUs with the PTX10001-36MR, pack them as instructed in "How to Pack PTX10001-36MR Components for Shipping" on page 155 .
9. Close the top of the cardboard shipping box and seal it with packing tape.
10. Write the return materials authorization (RMA) number on the exterior of the box to ensure proper tracking. See "Contact Customer Support to Obtain a Return Material Authorization" on page 153 for instructions on obtaining an RMA number.

How to Pack PTX10001-36MR Components for Shipping

CAUTION: Do not stack PTX10001-36MR components. Return individual components in separate boxes if they do not fit together on one level in the shipping box.

Here's how to pack a PTX10001-36MR component for shipping:

1. Place individual FRUs in antistatic bags.
2. Ensure that the components are adequately protected with packing materials and packed so that the pieces are prevented from moving around inside the carton.
3. Close the top of the cardboard shipping box and seal it with packing tape.
4. Write the RMA number on the exterior of the box to ensure proper tracking. See "Contact Customer Support to Obtain a Return Material Authorization" on page 153 for instructions on obtaining an RMA number.

CHAPTER 7

Safety and Compliance Information

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General Safety Guidelines and Warnings

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

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

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

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

Definitions of Safety Warning Levels

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Qualified Personnel Warning

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

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

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

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

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

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

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

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

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

Warning Statement for Norway and Sweden

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

Varning! Apparaten skall anslutas till jordat nätuttag.

Fire Safety Requirements

IN THIS SECTION

- Fire Suppression | 162
- Fire Suppression Equipment | 162

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

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

Fire Suppression

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

Fire Suppression Equipment

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

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

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

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

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

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

Installation Instructions Warning

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

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

Varoitus Lue asennusohjeet ennen järjestelmän yhdistämistä virtalähteeseen.

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

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

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

Advarsel Les installasjonsinstruksjonene før systemet kobles til strømkilden.

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

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

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

Chassis and Component Lifting Guidelines

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

Restricted Access Warning

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

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

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

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

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

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

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

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

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

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

Ramp Warning

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

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

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

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

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

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

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

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

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

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

Rack-Mounting and Cabinet-Mounting Warnings

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Grounded Equipment Warning

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

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

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

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

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

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

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

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

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

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

Laser and LED Safety Guidelines and Warnings

IN THIS SECTION

- General Laser Safety Guidelines | **172**
- Class 1 Laser Product Warning | **172**
- Class 1 LED Product Warning | **173**
- Laser Beam Warning | **173**

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

Observe the following guidelines and warnings:

General Laser Safety Guidelines

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

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

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

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

Class 1 Laser Product Warning

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

Varoitus Luokan 1 lasertuote.

Avertissement Produit laser de classe I.

Warnung Laserprodukt der Klasse 1.

Avvertenza Prodotto laser di Classe 1.

Advarsel Laserprodukt av klasse 1.

Aviso Produto laser de classe 1.

¡Atención! Producto láser Clase I.

Varning! Laserprodukt av klass 1.

Class 1 LED Product Warning

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

Varoitus Luokan 1 valodiodituote.

Avertissement Alarme de produit LED Class I.

Warnung Class 1 LED-Produktwarnung.

Avvertenza Avvertenza prodotto LED di Classe 1.

Advarsel LED-produkt i klasse 1.

Aviso Produto de classe 1 com LED.

¡Atención! Aviso sobre producto LED de Clase 1.

Varning! Lysdiodprodukt av klass 1.

Laser Beam Warning

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

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

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

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

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

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

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

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

Varning! Rikta inte blicken in mot strålen och titta inte direkt på den genom optiska instrument.

Radiation from Open Port Apertures Warning

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

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

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

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

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

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

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

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

EXposição à radiação e não deverá olhar fixamente para orifícios que se encontrarem a descoberto.

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

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

Maintenance and Operational Safety Guidelines and Warnings

IN THIS SECTION

- Battery Handling Warning | **175**
- Jewelry Removal Warning | **177**
- Lightning Activity Warning | **178**
- Operating Temperature Warning | **179**
- Product Disposal Warning | **180**

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

Battery Handling Warning

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

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

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

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

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

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

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

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

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

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

Jewelry Removal Warning

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

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

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

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

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

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

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

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

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

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

Lightning Activity Warning

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

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

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

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

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

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

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

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

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

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

Operating Temperature Warning

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

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

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

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

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

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

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

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

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

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

Product Disposal Warning

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

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

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

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

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

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

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

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

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

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

General Electrical Safety Guidelines and Warnings

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

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

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

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

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

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

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

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

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

Action to Take After an Electrical Accident

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

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

Prevention of Electrostatic Discharge Damage

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

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

  If a grounding strap is not available, hold the component in its antistatic bag (see Figure 76 on page 184) in one hand and touch the exposed, bare metal of the device with the other hand immediately before inserting the component into the device.

  WARNING: For safety, periodically check the resistance value of the ESD grounding strap. The measurement must be in the range 1 through 10 Mohms.

  Avertissement Par mesure de sécurité, vérifiez régulièrement la résistance du bracelet antistatique. Cette valeur doit être comprise entre 1 et 10 mégohms (Mohms).

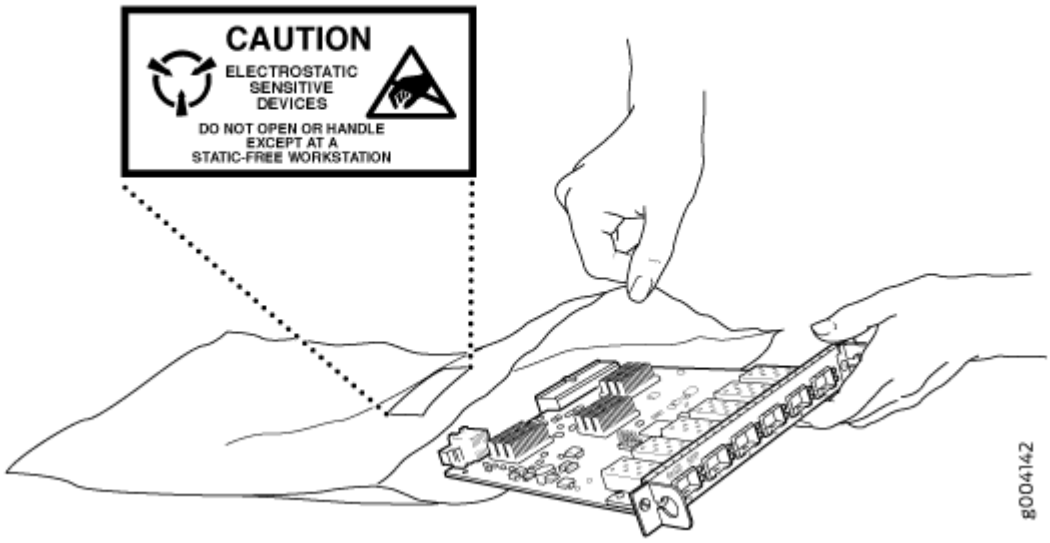
- When handling any component that is subject to ESD damage and that is removed from the device, make sure the equipment end of your ESD wrist strap is attached to the ESD point on the chassis.

  If no grounding strap is available, touch the exposed, bare metal of the device to ground yourself before handling the component.

- Avoid contact between the component that is subject to ESD damage and your clothing. ESD voltages emitted from clothing can damage components.

- When removing or installing a component that is subject to ESD damage, always place it component-side up on an antistatic surface, in an antistatic card rack, or in an antistatic bag (see Figure 76 on page 184). If you are returning a component, place it in an antistatic bag before packing it.

Figure 76: Placing a Component into an Antistatic Bag



CAUTION: ANSI/TIA/EIA-568 cables such as Category 5e and Category 6 can get electrostatically charged. To dissipate this charge, always ground the cables to a suitable and safe earth ground before connecting them to the system.

Attention Les câbles ANSI/TIA/EIA-568, par exemple Cat 5e et Cat 6, peuvent emmagasiner des charges électrostatiques. Pour évacuer ces charges, reliez toujours les câbles à une prise de terre adaptée avant de les raccorder au système.

AC Power Electrical Safety Guidelines

The following electrical safety guidelines apply to AC-powered devices:

- Note the following warnings printed on the device:

  "**CAUTION:** THIS UNIT HAS MORE THAN ONE POWER SUPPLY CORD. DISCONNECT ALL POWER SUPPLY CORDS BEFORE SERVICING TO AVOID ELECTRIC SHOCK."

  "**ATTENTION:** CET APPAREIL COMPORTE PLUS D'UN CORDON D'ALIMENTATION. AFIN DE PRÉVENIR LES CHOCS ÉLECTRIQUES, DÉBRANCHER TOUT CORDON D'ALIMENTATION AVANT DE FAIRE LE DÉPANNAGE."

- AC-powered devices are shipped with a three-wire electrical cord with a grounding-type plug that fits only a grounding-type power outlet. Do not circumvent this safety feature. Equipment grounding must comply with local and national electrical codes.
- You must provide an external certified circuit breaker (2-pole circuit breaker or 4-pole circuit breaker based on your device) rated minimum 20 A in the building installation.
- The power cord serves as the main disconnecting device for the AC-powered device. The socket outlet must be near the AC-powered device and be easily accessible.
- For devices that have more than one power supply connection, you must ensure that all power connections are fully disconnected so that power to the device is completely removed to prevent electric shock. To disconnect power, unplug all power cords (one for each power supply).

Power Cable Warning (Japanese)

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

注意

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

AC Power Disconnection Warning

WARNING: Before working on the device or near power supplies, unplug all the power cords from an AC-powered device.

Waarschuwing Voordat u aan een frame of in de nabijheid van voedingen werkt, dient u bij wisselstroom toestellen de stekker van het netsnoer uit het stopcontact te halen.

Varoitus Kytke irti vaihtovirtalaitteiden virtajohto, ennen kuin teet mitään asennuspohjalle tai työskentelet virtalähteiden läheisyydessä.

Avertissement Avant de travailler sur un châssis ou à proximité d'une alimentation électrique, débrancher le cordon d'alimentation des unités en courant alternatif.

Warnung Bevor Sie an einem Chassis oder in der Nähe von Netzgeräten arbeiten, ziehen Sie bei Wechselstromeinheiten das Netzkabel ab bzw.

Avvertenza Prima di lavorare su un telaio o intorno ad alimentatori, scollegare il cavo di alimentazione sulle unità CA.

Advarsel Før det utføres arbeid på kabinettet eller det arbeides i nærheten av strømforsyningsenheter, skal strømledningen trekkes ut på vekselstrømsenheter.

Aviso Antes de trabalhar num chassis, ou antes de trabalhar perto de unidades de fornecimento de energia, desligue o cabo de alimentação nas unidades de corrente alternada.

¡Atención! Antes de manipular el chasis de un equipo o trabajar cerca de una fuente de alimentación, desenchufar el cable de alimentación en los equipos de corriente alterna (CA).

Varning! Innan du arbetar med ett chassi eller nära strömförsörjningsenheter skall du för växelströmsenheter dra ur nätsladden.

DC Power Electrical Safety Guidelines

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

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

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

DC Power Copper Conductors Warning

WARNING: Use copper conductors only.
Waarschuwing Gebruik alleen koperen geleiders.

Varoitus Käytä vain kuparijohtimia.

Attention Utilisez uniquement des conducteurs en cuivre.

Warnung Verwenden Sie ausschließlich Kupferleiter.

Avvertenza Usate unicamente dei conduttori di rame.

Advarsel Bruk bare kobberledninger.

Aviso Utilize apenas fios condutores de cobre.

¡Atención! Emplee sólo conductores de cobre.

Varning! Använd endast ledare av koppar.

DC Power Disconnection Warning

WARNING: Before performing any of the DC power procedures, ensure that power is removed from the DC circuit. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the OFF position, and tape the device handle of the circuit breaker in the OFF position.

Waarschuwing Voordat u een van de onderstaande procedures uitvoert, dient u te controleren of de stroom naar het gelijkstroom circuit uitgeschakeld is. Om u ervan te verzekeren dat alle stroom UIT is geschakeld, kiest u op het schakelbord de stroomverbreker die het gelijkstroom circuit bedient, draait de stroomverbreker naar de UIT positie en plakt de schakelaarhendel van de stroomverbreker met plakband in de UIT positie vast.

Varoitus Varmista, että tasavirtapiirissä ei ole virtaa ennen seuraavien toimenpiteiden suorittamista. Varmistaaksesi, että virta on KATKAISTU täysin, paikanna tasavirrasta huolehtivassa kojetaulussa sijaitseva suojakytkin, käännä suojakytkin KATKAISTU-asentoon ja teippaa suojakytkimen varsi niin, että se pysyy KATKAISTU-asennossa.

Avertissement Avant de pratiquer l'une quelconque des procédures ci-dessous, vérifier que le circuit en courant continu n'est plus sous tension. Pour en être sûr, localiser le disjoncteur situé sur le panneau de service du circuit en courant continu, placer le disjoncteur en position fermée (OFF) et, à l'aide d'un ruban adhésif, bloquer la poignée du disjoncteur en position OFF.

Warnung Vor Ausführung der folgenden Vorgänge ist sicherzustellen, daß die Gleichstromschaltung keinen Strom erhält. Um sicherzustellen, daß sämtlicher Strom abgestellt ist, machen Sie auf der Schalttafel den Unterbrecher für die Gleichstromschaltung ausfindig, stellen Sie den Unterbrecher auf AUS, und kleben Sie den Schaltergriff des Unterbrechers mit Klebeband in der AUS-Stellung fest.

Avvertenza Prima di svolgere una qualsiasi delle procedure seguenti, verificare che il circuito CC non sia alimentato. Per verificare che tutta l'alimentazione sia scollegata (OFF), individuare l'interruttore automatico sul quadro strumenti che alimenta il circuito CC, mettere l'interruttore in posizione OFF e fissarlo con nastro adesivo in tale posizione.

Advarsel Før noen av disse prosedyrene utføres, kontroller at strømmen er frakoblet likestrømkretsen. Sørg for at all strøm er slått AV. Dette gjøres ved å lokalisere strømbryteren på brytertavlen som betjener likestrømkretsen, slå strømbryteren AV og teipe bryterhåndtaket på strømbryteren i AV-stilling.

Aviso Antes de executar um dos seguintes procedimentos, certifique-se que desligou a fonte de alimentação de energia do circuito de corrente contínua. Para se assegurar que toda a corrente foi DESLIGADA, localize o disjuntor no painel que serve o circuito de corrente contínua e coloque-o na posição OFF (Desligado), segurando nessa posição a manivela do interruptor do disjuntor com fita isoladora.

¡Atención! Antes de proceder con los siguientes pasos, comprobar que la alimentación del circuito de corriente continua (CC) esté cortada (OFF). Para asegurarse de que toda la alimentación esté cortada (OFF), localizar el interruptor automático en el panel que alimenta al circuito de corriente continua, cambiar el interruptor automático a la posición de Apagado (OFF), y sujetar con cinta la palanca del interruptor automático en posición de Apagado (OFF).

Varning! Innan du utför någon av följande procedurer måste du kontrollera att strömförsörjningen till likströmskretsen är bruten. Kontrollera att all strömförsörjning är BRUTEN genom att slå AV det överspänningsskydd som skyddar likströmskretsen och tejpa fast överspänningsskyddets omkopplare i FRÅN-läget.

DC Power Grounding Requirements and Warning

An insulated grounding conductor that is identical in size to the grounded and ungrounded branch circuit supply conductors but is identifiable by green and yellow stripes is installed as part of the branch circuit that supplies the device. The grounding conductor is a separately derived system at the supply transformer or motor generator set.

WARNING: When you install the device, the ground connection must always be made first and disconnected last.

Waarschuwing Bij de installatie van het toestel moet de aardverbinding altijd het eerste worden gemaakt en het laatste worden losgemaakt.

Varoitus Laitetta asennettaessa on maahan yhdistäminen aina tehtävä ensiksi ja maadoituksen irti kytkeminen viimeiseksi.

Avertissement Lors de l'installation de l'appareil, la mise à la terre doit toujours être connectée en premier et déconnectée en dernier.

Warnung Der Erdanschluß muß bei der Installation der Einheit immer zuerst hergestellt und zuletzt abgetrennt werden.

Avvertenza In fase di installazione dell'unità, eseguire sempre per primo il collegamento a massa e disconnetterlo per ultimo.

Advarsel Når enheten installeres, må jordledningen alltid tilkobles først og frakobles sist.

Aviso Ao instalar a unidade, a ligação à terra deverá ser sempre a primeira a ser ligada, e a última a ser desligada.

¡Atención! Al instalar el equipo, conectar la tierra la primera y desconectarla la última.

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

DC Power Wiring Sequence Warning

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

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

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

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

Warnung Die Stromzufuhr ist nur mit geeigneten Ringösen an das DC Netzteil anzuschliessen. Die richtige Anschlusssequenz ist: Erdanschluss zu Erdanschluss, +RTN zu +RTN und dann -48V zu -48V. Die richtige Sequenz zum Abtrennen der

Stromversorgung ist -48V zu -48V, +RTN zu +RTN und dann Erdanschluss zu Erdanschluss. Es ist zu beachten dass der Erdanschluss immer zuerst angeschlossen und als letztes abgetrennt wird.

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

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

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

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

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

DC Power Wiring Terminations Warning

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

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

Varoitus Jos säikeellinen johdin on tarpeen, käytä hyväksyttyä johdinliitäntää, esimerkiksi suljettua silmukkaa tai kourumaista liitäntää, jossa on ylöspäin käännetyt kiinnityskorvat. Tällaisten liitäntöjen tulee olla kooltaan johtimiin sopivia ja niiden tulee puristaa yhteen sekä eristeen että johdinosan.

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

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

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

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

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

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

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

Multiple Power Supplies Disconnection Warning

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

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

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

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

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

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

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

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

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

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

TN Power Warning

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

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

Varoitus Koje on suunniteltu toimimaan TN-sähkövoimajärjestelmien yhteydessä.

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

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

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

Advarsel Utstyret er utfomet til bruk med TN-strømsystemer.

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

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

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

PTX10001-36MR Agency Approvals and Compliance Statements

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The PTX10001-36MR complies with the following standards

Electromagnetic Compatibility (EMC) Requirements

- FCC 47 CFR Part 15
- ICES-003 / ICES-GEN
- EN 300 386 V1.6.1
- EN 300 386 V2.1.1
- EN 55032
- CISPR 32
- EN 55024
- CISPR 24
- EN 55035
- CISPR 35
- IEC/EN 61000 Series
- AS/NZS CISPR 32
- VCCI-CISPR 32
- BSMI CNS 13438
- KN 32 and KN 35
- KN 61000 Series
- TEC/SD/DD/EMC-221/05/OCT-16
- TCVN 7189

- TCVN 7317

Safety Requirements

- CAN/CSA-C22.2 No. 62368-1 and 60950-1
- UL 62368-1 and 60950-1
- IEC 62368-1 and 60950-1 (All country deviations): CB Scheme report
- IEC 62368-3 for USB and PoE: CB Scheme report
- 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

The PTX10001-36MR complies with the following standards:

- GR-1089-Core
- GR-3160-Core

Compliance Statement for Argentina

EQUIPO DE USO IDÓNEO.

Compliance Statements for EMC Requirements

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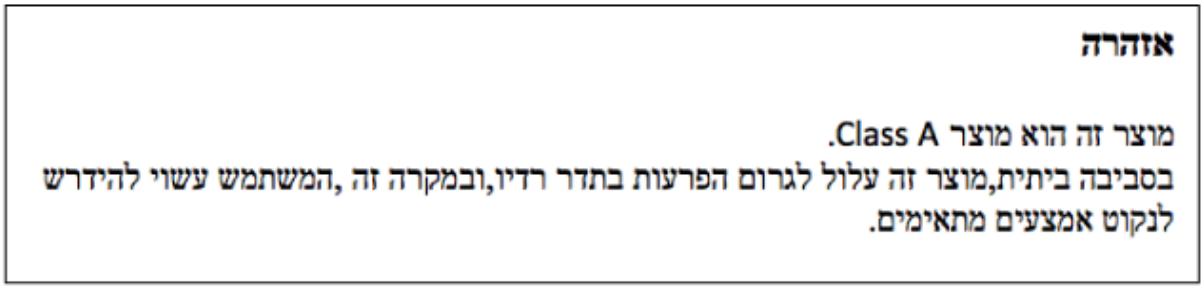
Canada

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

European Community

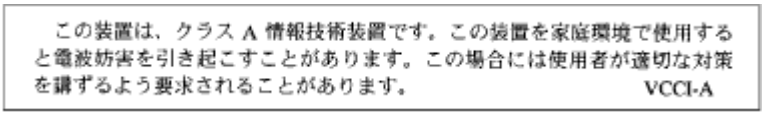
This is a Class A product. In a domestic environment, this product might cause radio interference in which case the user might be required to take adequate measures.

Israel



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

Japan



The preceding translates as follows:

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

Korea

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

Korean Class A Warning g040913

The preceding translates as follows:

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

Taiwan

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

Chinese Class A warning g100090

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.

Compliance Statements for NEBS

- 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.

  NOTE:

  - PTX10001-36MR meets the NEBS GR-1089 Issue 6 requirements.

- 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.

PTX10001-36MR Compliance Statements for Acoustic Noise

Maschinenlärminformations-Verordnung - 3. GPSGV, der höchste Schalldruckpegel beträgt 70dB(A) oder weniger gemäss EN ISO 7779

Translation:

The emitted sound pressure is below 70 dB(A) per EN ISO 7779.