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PTX10008 Packet Transport Router Hardware Guide

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PTX10008 Packet Transport Router Hardware Guide
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About This Guide

Use this guide to install hardware and perform initial software configuration, routine maintenance, and troubleshooting for the PTX10008 Packet Transport Router.

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

If your PTX10008 has JNP10008-SF Switch Interface Boards (SIBs), refer to the Junos OS documentation. If your PTX10008 has JNP10008-SF3 SIBs, refer to the Junos OS Evolved documentation.

CHAPTER 1

Overview

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PTX10008 System Overview

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PTX10008 Hardware Overview

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The Juniper Networks PTX10008 Packet Transport Router helps network operators achieve their business goals while effectively handling current and future traffic demands. For more information, read the following topics:

System Overview

The Juniper Networks PTX10008 Packet Transport Router enables cloud and data center operators to smoothly transition from 10-Gigabit and 40-Gigabit Ethernet networks to 100-Gigabit and 400-Gigabit Ethernet high-performance networks. This flexible, 13 rack unit (13-U) modular chassis has eight line card slots.

The switch fabric consists of six Switch Interface Boards (SIBs). There are two models of SIBs that correspond to the two types of switch fabric that support two different types of line cards. The JNP10008-SF SIB supports five standard line cards and operates in standard Junos OS. The JNP10008-SF switch fabric has a 42 Tbps of forwarding capacity. The JNP10008-SF3 SIB supports the 14.4 Tbps line card and operates in Junos OS Evolved systems. In the JNP10008-SF3 switch fabric the forwarding plane can provide 115 Tbps of forwarding capacity.

The PTX10008 (IP core) router is available in both base and redundant configurations for both AC and DC operation. All systems feature front-to-back airflow.

Benefits of the PTX10008 Router

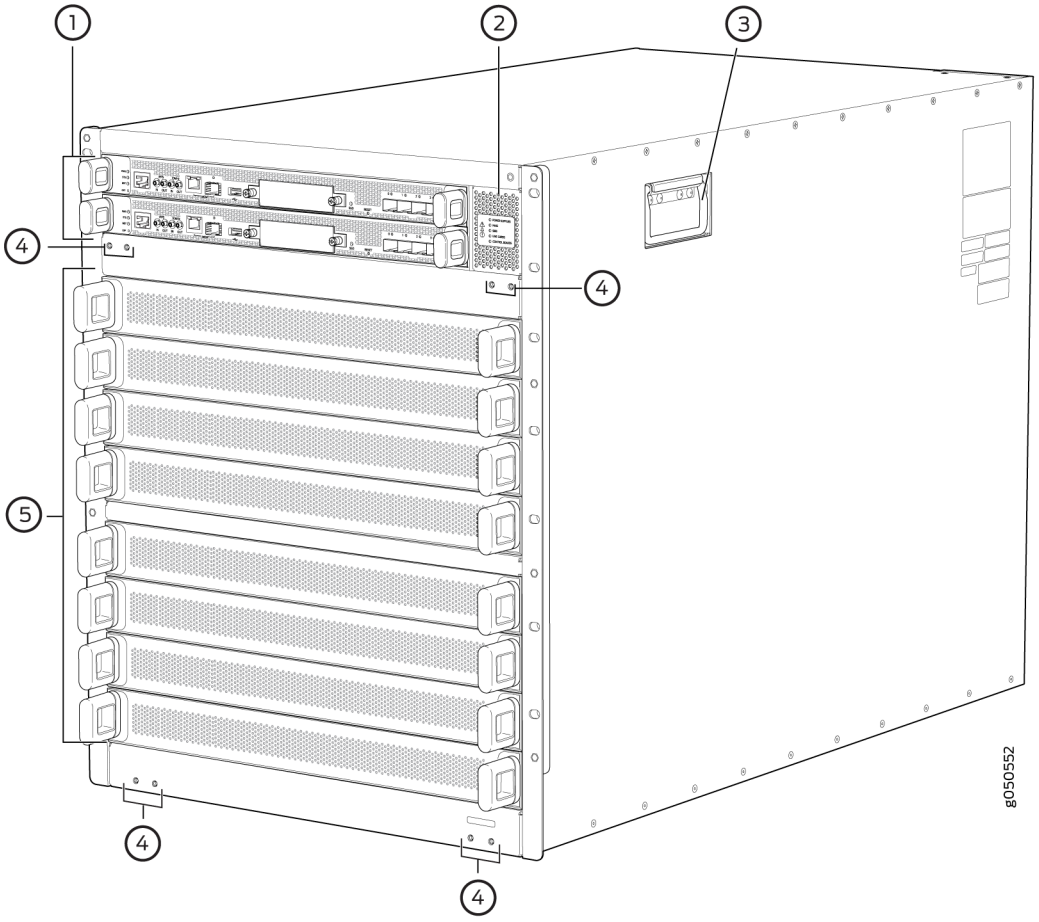
- **System capacity**—The PTX10008 Packet Transport Router has a 13-U form factor and supports 115.2 Tbps per chassis.
- **Full-scale IP and MPLS routing**—PTX10008 software scales to thousands of BGP peers, tens of millions of routes in the routing tables,and supports high forwarding table scale suitable for internet peering deployments.
- **Source Packet Routing in Networking (SPRING)**—SPRING on PTX10008 supports the latest SPRING innovations such as path provisioning via BGP SR-TE, and PCED protocols. It also supports many more features such as Topology independent loop free alternates (TI-LFA) and Operation, Administration, and Maintenance (OAM).
- **Always-on infrastructure base**—The PTX10008 is engineered with full hardware redundancy for cooling, power, switch fabric, and control plane.
- **Nondisruptive software upgrades**—The Junos operating system (Junos OS) on the PTX10008 supports high availability (HA) features such as graceful Routing Engine switchover (GRES), and nonstop active routing (NSR), providing software upgrades and changes without disrupting network traffic.

Chassis Description

The PTX10008 router is 13 U tall. Up to three PTX10008 routers can fit in a standard 42-U rack with adequate cooling and power. All key PTX10008 router components are field-replaceable units (FRUs). Figure 1 on page 4 illustrates the key components visible from the front of the chassis, Figure 2 on

page 5 illustrates the components that are visible from the rear of the chassis, and Figure 3 on page 6 illustrates the components that are internal to the chassis.

Figure 1: PTX10008 Chassis Front

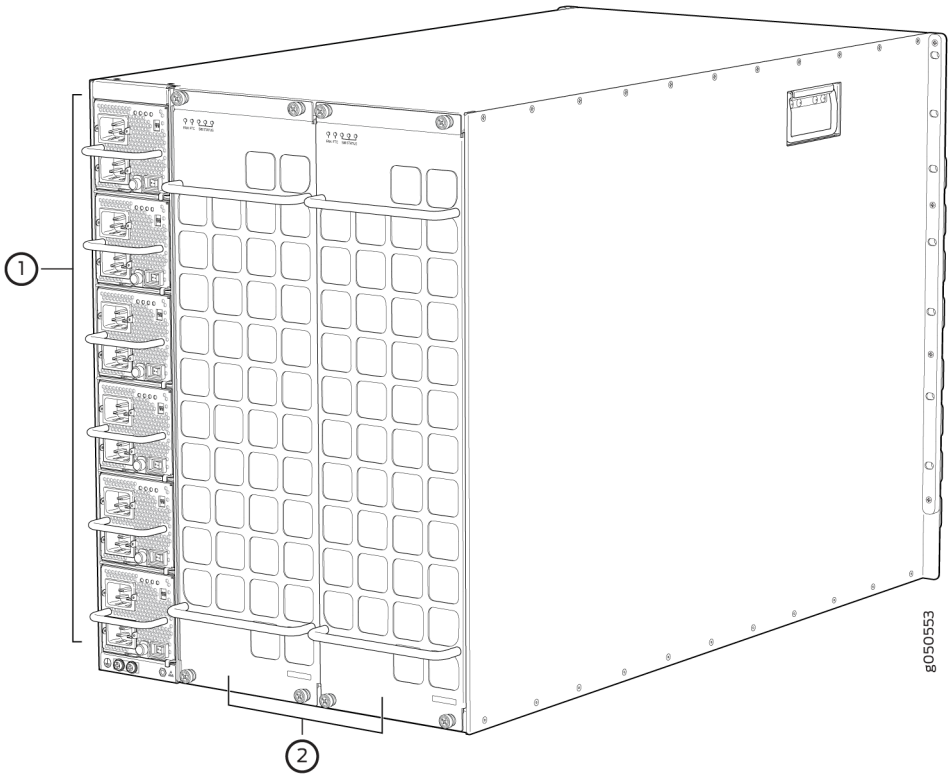


1– Routing and Control Boards	4– Installation holes for the front panel
2– Status panel	5– Line card slots 0–7 (numbered top to bottom)
3– Handle	

Some chassis ship with an enhanced power bus to future-proof the chassis beyond the current generation of line cards. If you are using any of the JNP10008-SF3 compatible line cards, the standard

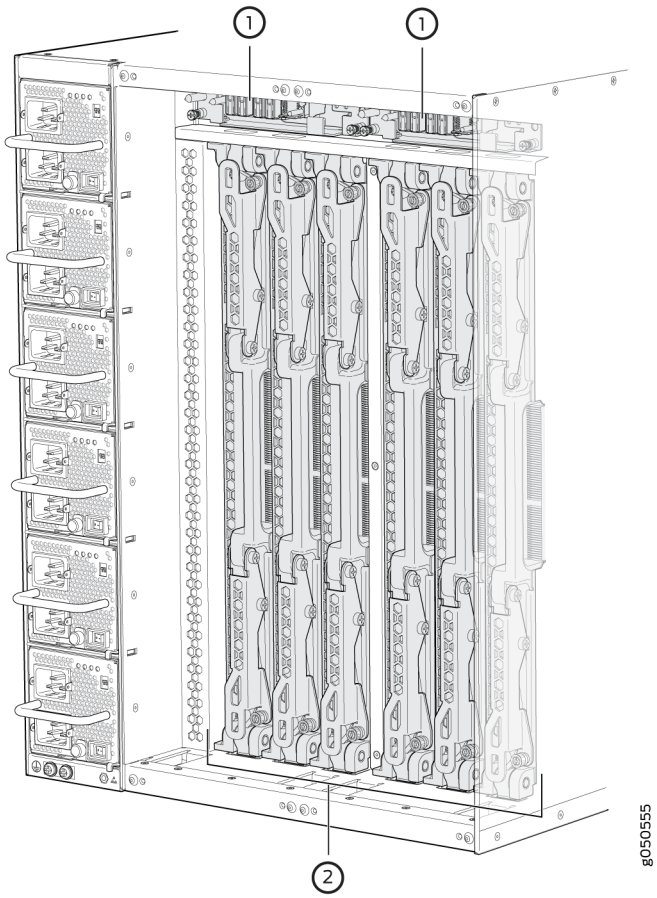
chassis is sufficient for your operation. You can determine which chassis you have by markings on the status panel (see "PTX10008 Status Panel" on page 37).

Figure 2: PTX10008 Chassis Rear



1– AC or DC power supplies numbered 0–5 (top to bottom)	2– Fan trays with redundant fans

Figure 3: PTX10008 Chassis Internal Components



1– Fan tray controllers	2– Switch fabric

See "PTX10008 Chassis Physical Specifications" on page 177 and "PTX10008 Field-Replaceable Units" on page 35.

Switch Fabric

Switch Interface Boards (SIBs) create the switch fabric for the PTX10008. There are two SIB models: JNP10008-SF and JNP10008-SF3. Each SIB model has a set of unique connectors to mate the line cards and the RCB to the switch fabric. Some system components are also designed to operate with a specific switch fabric. See Table 1 on page 7 for the components that each switch fabric supports. Also see Figure 4 on page 8 for an example of the JNP10008-SF SIB and see Figure 5 on page 9 for an example of JNP10008-SF3.

For the JNP10008-SF switch fabric, five SIBs provide the necessary switching functionality to a PTX10008 router (see Figure 4 on page 8). Up to six SIBs can be installed to provide *n*+1 redundancy. For the JNP10008-SF3 switch fabric, there are three supported configurations that range from three to six SIBs. In both switch fabric configurations, SIBs are installed between the line cards and the fan trays inside the chassis. Each PTX10008 SIB has eight connectors that match to a line-card slot, eliminating the need for a backplane. See "PTX10008 Switch Interface Board Description" on page 95.

Each switch fabric has designated components.

Table 1: Switch Fabric Component Compatibility

Component	JNP10008-SF	JNP10008-SF3
Operating system	Junos OS Release 15.1X53-D30 and later	Junos OS Evolved Release 19.4R1-S1 and later
RCB	• JNP10K-RE0 • JNP10K-RE1 • JNP10K-RE1-LT • JNP10K-RE1-128G	• JNP10K-RE1-E • JNP10K-RE1-E128 • JNP10K-RE2-E128 (Junos OS Evolved Release 22.4R1 and later) • JNP10K-RE1-ELT
Fan tray and fan tray controller	JNP10008-FAN with JNP10008-FAN-CTRL or JNP10008-FAN2 with JNP10008-FAN-FTC2	JNP10008-FAN2 with JNP10008-FAN-FTC2
Power supply	• JNP10K-PWR-AC • JNP10K-PWR-DC • JNP10K-PWR-AC2 • JNP10K-PWR-DC2	• JNP10K-PWR-AC2 • JNP10K-PWR-DC2

Table 1: Switch Fabric Component Compatibility *(Continued)*

Component	JNP10008-SF	JNP10008-SF3
Line cards	• PTX10K-LC1101 • PTX10K-LC1102 • PTX10K-LC1104 • PTX10K-LC1105 • QFX10000-60S-6Q	PTX10K-LC1201-36CD PTX10K-LC1202-36MR

Figure 4: JNP10008-SF SIB

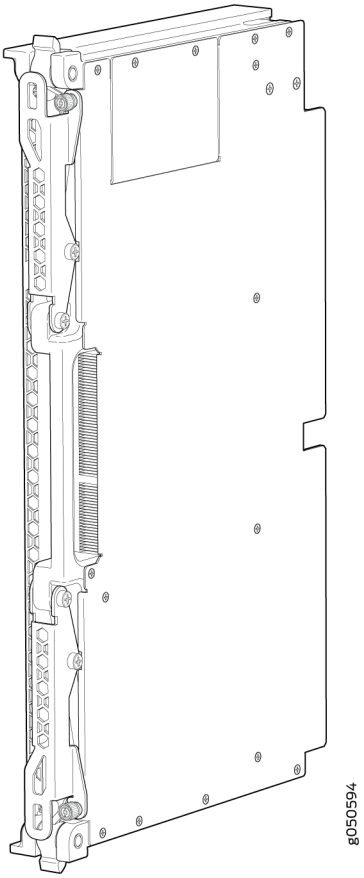
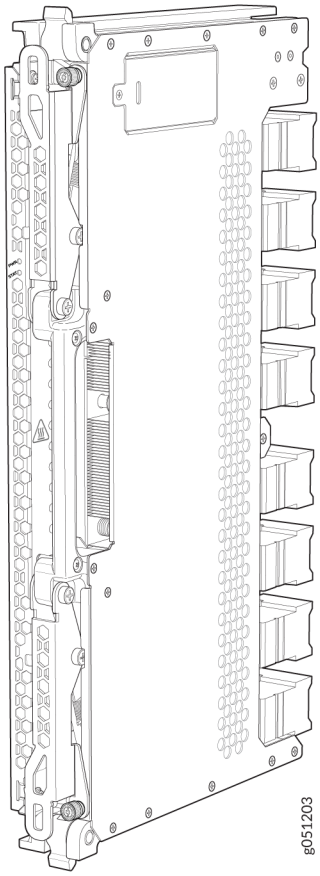


Figure 5: JNP10008-SF3 SIB

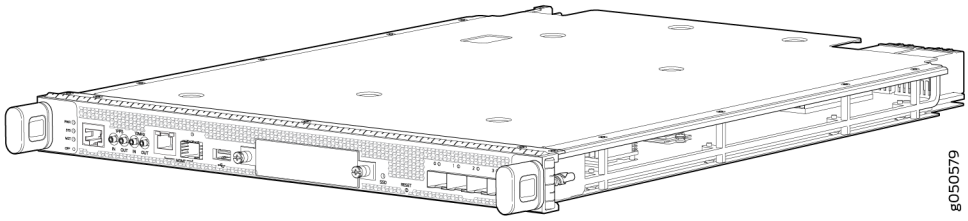


Routing and Control Board

The Routing and Control Board (RCB) (see Figure 6 on page 10) contains a Routing Engine and is responsible for system management and system control in the PTX10008. See "PTX10008 Routing and Control Board Components and Descriptions" on page 84. RCBs are FRUs that are installed in the front of the chassis in the slots labeled **CB0** and **CB1**. The base configuration has a single RCB. The fully redundant configuration has two RCBs. The RCB also contains Precision Time Protocol (PTP) ports and

four Media Access Control Security (MACsec) capable ports. See "PTX10008 Configurations and Upgrade Options" on page 17.

Figure 6: PTX10008 Routing and Control Board



The supported models of RCB for JNP10008-SF fabric systems are:

- JNP10K-RE0
- JNP10K-RE1
- JNP10K-RE1-LT
- JNP10K-RE1-128G

The supported models of RCB for For JNP10008-SF3 fabric systems are:

- JNP10K-RE1-E
- JNP10K-RE1-ELT (Junos OS Evolved Release 20.3R1 and later)
- JNP10K-RE1-E128
- JNP10K-RE2-E128 (Junos OS Evolved Release 22.4R1 and later).

  The RCB comes with Trusted Platform Module (TPM) 2.0 chip that supports DevID.

  DevID is an X.509 cryptographic certificate. It is programmed into the TPM 2.0 chip during manufacturing and contains the serial number of the device.

Line Cards

The PTX10008 has eight horizontal line card slots. The line cards combine a Packet Forwarding Engine and Ethernet interfaces enclosed in a single assembly. PTX10008 line card-architecture is based on a number of identical, independent Packet Forwarding Engine slices. Line cards are FRUs that can be installed in the line-card slots labeled **0** through **7** (top to bottom) on the front of the chassis. All line cards are hot-removable and hot-insertable. After the hot insertion, you need to bring the card online (see *Taking a Line Card Online or Offline*).

There are two types of line cards for the PTX10008, those line cards that are compatible with the JNP10008-SF switch fabric and those that are compatible with the JNP10008-SF3 switch fabric. The line cards that operate with the JNP10008-SF switch fabric are:

- PTX10K-LC1101, a 30-port 100-Gigabit or 40-Gigabit Ethernet quad small form-factor 28 (QSFP28) line card. By default, the interfaces are created with 100-Gbps port speed. Using the CLI, you can set the speed to 40-Gbps that can be used as either a native 40-gigabit interface or four independent 10-gigabit interfaces using a breakout cable. With breakout cables, the line card supports a maximum of 96 logical 10-Gigabit Ethernet interfaces.

- PTX10K-LC1102, a 36-port 40-Gigabit Ethernet line card that supports quad small form-factor plus (QSFP+) transceivers. Twelve out of the 36 ports on this line card also support the 100-Gigabit Ethernet QSFP28 transceivers. You can configure each of the QSFP+ ports as either a native 40-Gigabit Ethernet interface or channelize the port as four 10-Gigabit Ethernet interfaces by using a breakout cable. When the 40 Gigabit Ethernet port is channelized, the line card supports a maximum of 144 logical 10-Gigabit Ethernet ports.

- PTX10K-LC1104, a 6-port coherent dense wavelength-division multiplexing (DWDM) line card with Media Access Control Security (MACsec). The line card features built-in optics that support flexible rate modulation at 100-Gbps, 150-Gbps, and 200-Gbps speeds.

- PTX10K-LC1105, a 30-port flexible configuration line card that supports QSFP+, QSFP28, QSFP28-DD, QSFP56, and QSFP-DD transceivers. You can configure either as 100-Gigabit Ethernet interfaces or as40-Gigabit Ethernet interfaces. The PTX10K-LC1105 line card supports MACsec security features.

- QFX10000-60S-6Q, a 66-port multiple speed line card that provides 60 small form-factor pluggable plus (SFP+) ports that support 10-Gbps or 1-Gbps port speeds. The line card also has 2 dual-speed QSFP28 ports that support either 40-Gbps or 100-Gbps port speed, and 4 QSFP+ ports that support 40-Gbps speed.

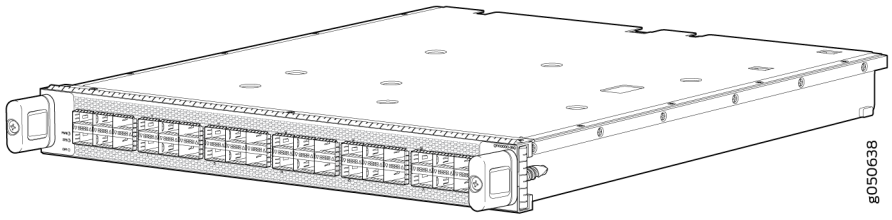
The line cards that operate with the JNP10008-SF3 switch fabric are:

- PTX10K-LC1201-36CD, a 36-port multiple speed line card that can be configured as 400-Gigabit, 200-Gigabit, 100-Gigabit, 50-Gigabit, 25-Gigabit, or 10-Gigabit Ethernet ports.

- PTX10K-LC1202-36MR, a 36-port line card that has thirty-two QSFP28 ports capable of supporting 100-Gbps speed, and four QSFP56-DD ports capable of supporting 400-Gbps speed.

See Figure 7 on page 12 for an example of a PTX10008 line card.

Figure 7: PTX10K-LC1102 Line Card



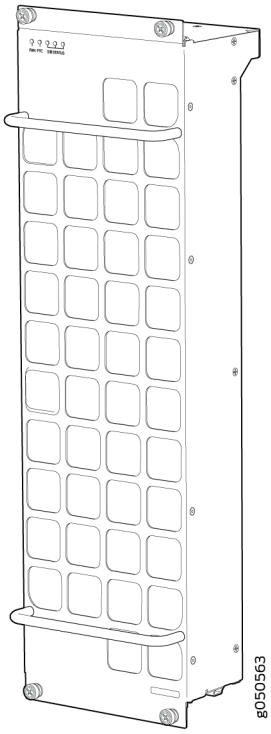
Cooling System

The cooling system in a PTX10008 router consists of two fan trays (see Figure 8 on page 13) and two fan tray controllers (see Figure 9 on page 13).

Two fan tray models and their associated fan tray controllers are available. The JNP10008-FAN fan tray contains an array of 11 fans and operates in systems with the JNP10008-SF switch fabric. The JNP10008-FAN2 fan tray contains an array of 22 fans and operates in either the JNP10008-SF switch fabric or in the JNP10008-SF3 switch fabric. These fan arrays operate as a single hot-removable and hot-insertable field-replaceable unit. The fan trays install vertically on the rear of the chassis and provide

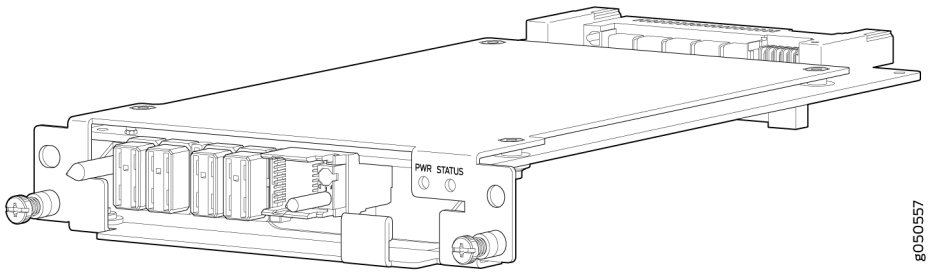
front-to-back chassis cooling. For model differences, see "PTX10008 Cooling System and Airflow" on page 44.

Figure 8: Fan Tray JNP10008-FAN



The two fan tray controllers also have two models that correspond to the two fan tray models. JNP10008-FAN-CTRL is the fan controller for the JNP10008-FAN and the JNP10008-FTC2 is the fan tray controller for the JNP10008-FAN2.

Figure 9: Fan Tray Controller JNP10008-FAN-CTRL



Power Supplies

PTX10008 routers support AC, DC, high-voltage alternating current (HVAC) and high-voltage direct current (HVDC), by offering the following power supplies:

- JNP10K-PWR-AC
- JNP10K-PWR-AC2
- JNP10K–PWR-DC
- JNP10K-PWR-DC2

Power supplies for the PTX10008 router are fully redundant, load-sharing, and hot-removable and hot-insertable FRUs. Each PTX10008 router operates with a minimum of three AC power supplies to a maximum of six AC, high-voltage alternating current (HVAC), DC, or high-voltage direct current (HVDC) power supplies. Each power supply has an internal fan for cooling. You can install the power supplies in any slot. See Figure 10 on page 15 through Figure 13 on page 16.



CAUTION: Do not mix power supply models in the same chassis in a running environment. DC and HVDC power supplies can coexist in the same chassis when you hot swap of DC for an HVDC model. The system provides 2*n* source redundancy and *n*

+1 power supply redundancy. If one power source fails, the power supply switches to the alternate source.

Figure 10: JNP10K-PWR AC Power Supply

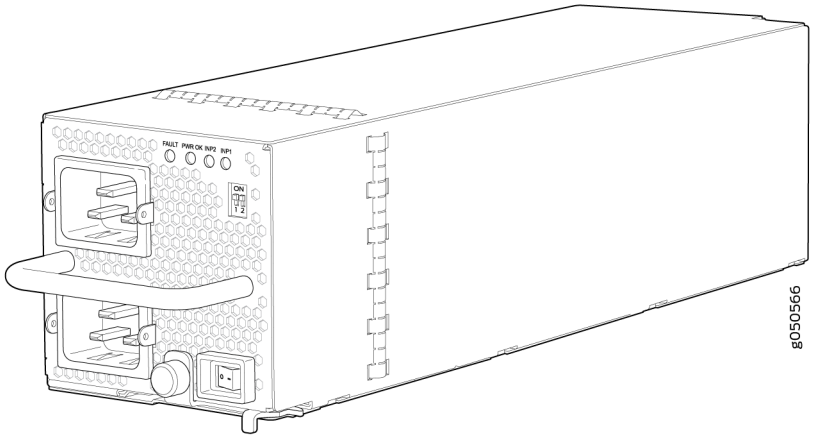


Figure 11: JNP10K-PWR-AC2 Power Supply

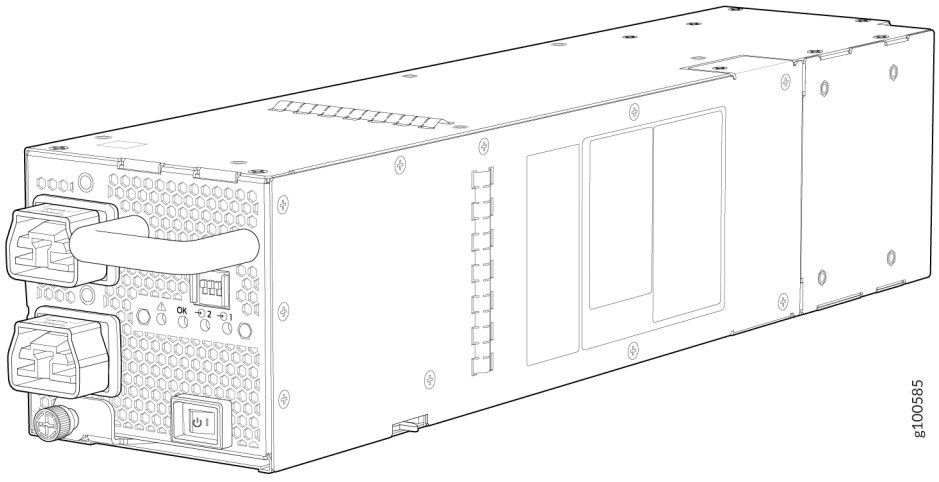


Figure 12: JNP10K-PWR DC Power Supply

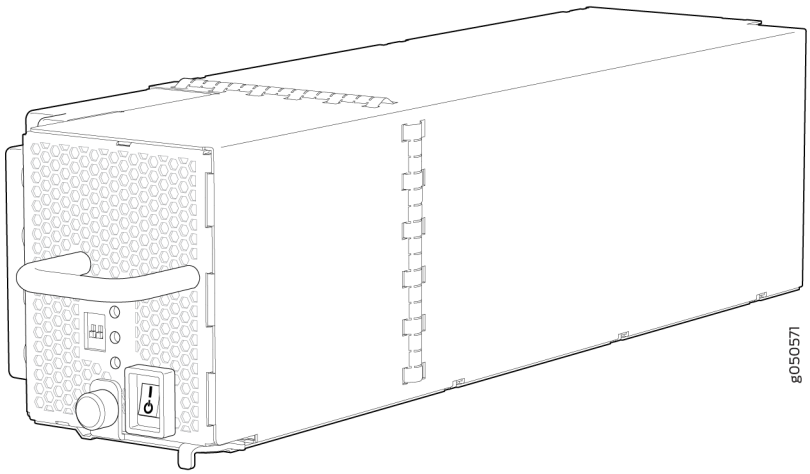


Figure 13: JNP10K-PWR-DC2 Power Supply

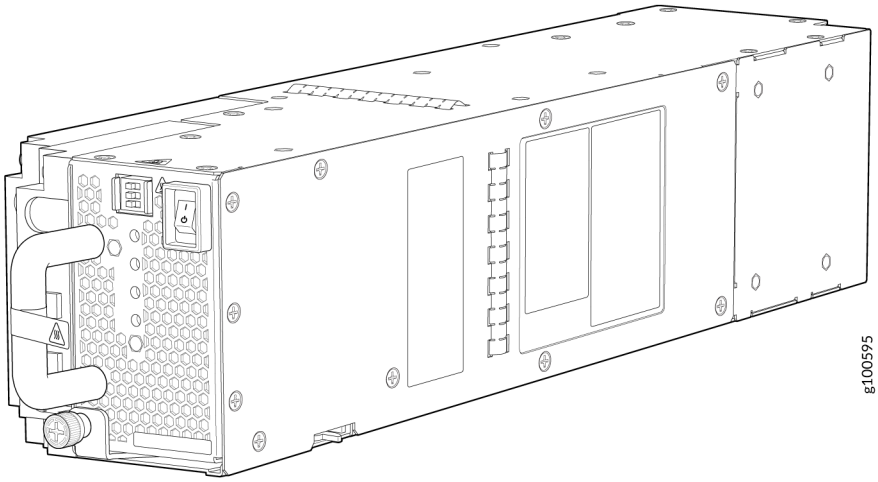


Table 2 on page 16 provides an overview of the differences among the power supplies.

Table 2: Power Supply Overview

Power Supply Model	Input Type	Wattage	Minimum Junos OS Release	Minimum Junos OS Evolved Release
JNP10K-PWR AC	AC only	2700 W	Junos OS 17.2R1	—

Table 2: Power Supply Overview *(Continued)*

Power Supply Model	Input Type	Wattage	Minimum Junos OS Release	Minimum Junos OS Evolved Release
JNP10K-PWR-AC2	AC, HVAC, or HVDC	5000 W, single feed; 5500 W, dual feed	Junos OS 19.2R1	Junos OS Evolved 19.4R1-S1
JNP10K-PWR DC	DC only	2500 W	Junos OS 17.2R1	—
JNP10K-PWR-DC2	DC only	2750 W, single feed; 5500 W, dual feed	Junos OS 19.2R1	Junos OS Evolved 19.4R1-S1

Software

The Juniper Networks PTX10008 line of packet transport routers run the Junos operating system (Junos OS), which provides Layer 3 routing services. The same Junos OS code base that runs on the PTX10008 and PTX10016 routers also runs on all Juniper Networks ACX Series Routers, EX Series Ethernet Switches, QFX Series Switches, M Series Multiservice Edge Routers, MX Series 5G universal Routing Platforms, and SRX Series Services Gateways.

SEE ALSO

PTX10008 Cooling System and Airflow | 44

PTX10008 Field-Replaceable Units | 35

PTX10008 Optional Equipment | 41

PTX10008 Configurations and Upgrade Options

IN THIS SECTION

PTX10008 Configurations | 18

Upgrade Kits | 23

PTX10008 Configurations

Table 3 on page 18 lists the hardware configurations for a PTX10008 modular chassis—base (AC and DC versions), redundant (AC and DC versions), and redundant (HVAC, DC, and HVDC)—and the components included in each configuration.

Table 3: PTX10008 Hardware Configurations

Router Configuration	Configuration Components
Base AC configuration PTX10008-BASE	• Chassis • One RCB (JNP10K-RE1, JNP10K-RE1-LT, or JNP10K-RE1-128) • Two fan tray controllers (JNP10008-FAN-CTRL) • Two fan trays (JNP10008-FAN) • Three AC power supplies (JNP10K-PWR-AC) • Three power supply covers • Five SIBs (JNP10008-SF) • One SIB cover (JNP10008-SF-BLNK) • Eight line-card covers • One RCB cover

Table 3: PTX10008 Hardware Configurations *(Continued)*

Router Configuration	Configuration Components
Base AC configuration with JNP10008-SF3-compatible components PTX10008-BASE3	• Chassis • One RCBs (JNP10K-RE1-E, JNP10K-RE1-ELT, JNP10K-RE1-E128, or JNP10K-RE2-E128) • Two fan tray controllers (JNP10008-FTC2) • Two fan trays (JNP10008-FAN2) • Six AC power supplies (JNP10K-PWR-AC2) • Three SIBs (JNP10008-SF3) • Three SIB covers (JNP10008-SF-BLNK2) • Eight line-card covers • One RCB cover
Base DC configuration PTX10008-BASE	• Chassis • One RCB (JNP10K-RE1, JNP10K-RE1-LT, or JNP10K-RE1-128) • Two fan tray controllers (JNP10008-FAN-CTRL) • Two fan trays (JNP10008-FAN) • Three DC power supplies (JNP10K-PWR-DC) • Three power supply covers • Five SIBs (JNP10008-SF) • One SIB cover (JNP10008-SF-BLNK) • Eight line-card covers • One RCB cover

Table 3: PTX10008 Hardware Configurations *(Continued)*

Router Configuration	Configuration Components
Base DC configuration with JNP10008-SF3-compatible components PTX10008-BASE3	• Chassis • One RCBs (JNP10K-RE1-E, JNP10K-RE1-ELT, JNP10K-RE1-E128, or JNP10K-RE2-E128) • Two fan tray controllers (JNP10008-FTC2) • Two fan trays (JNP10008-FAN2) • Six DC power supplies (JNP10K-PWR-DC2) • Three SIBs (JNP10008-SF3) • Three SIB covers (JNP10008-SF-BLNK2) • Eight line-card covers • One RCB cover
Redundant AC configuration PTX10008-PREMIUM	• Chassis • Two RCBs (JNP10K-RE1, JNP10K-RE1-LT, or JNP10K-RE1-128) • Two fan tray controllers (JNP10008-FAN-CTRL) • Two fan trays (JNP10008-FAN) • Six AC power supplies (JNP10K-PWR-AC) • Six SIBs (JNP10008-SF) • Eight line-card covers

Table 3: PTX10008 Hardware Configurations *(Continued)*

Router Configuration	Configuration Components
Base AC configuration with JNP10008-SF3 compatible components PTX10008-PREM2	• Chassis • Two RCBs (JNP10K-RE1-E, JNP10K-RE1-ELT, JNP10K-RE1-E128, or JNP10K-RE2-E128) • Two fan tray controllers (JNP10008-FTC2) • Two fan trays (JNP10008-FAN2) • Six AC power supplies (JNP10K-PWR-AC2) • Four SIBs (JNP10008-SF3) • Two SIB covers (JNP10008-SF-BLNK2) • Eight line-card covers
Redundant AC configuration with JNP10008-SF3 compatible components PTX10008-PREM3	• Chassis • Two RCBs (JNP10K-RE1-E, JNP10K-RE1-ELT, JNP10K-RE1-E128, or JNP10K-RE2-E128) • Two fan tray controllers (JNP10008-FTC2) • Two fan trays (JNP10008-FAN2) • Six AC power supplies (JNP10K-PWR-AC2) • Six SIBs (JNP10008-SF3) • Eight line-card covers

Table 3: PTX10008 Hardware Configurations *(Continued)*

Router Configuration	Configuration Components
Redundant DC configuration PTX10008-PREMIUM	• Chassis • Two RCBs (JNP10K-RE1, JNP10K-RE1-LT, or JNP10K-RE1-128) • Two fan tray controllers (JNP10008-FAN-CTRL) • Two fan trays (JNP10008-FAN) • Six DC power supplies (JNP10K-PWR-DC) • Six SIBs (JNP10008-SF3) • Eight line-card covers
Base DC configuration with JNP10008-SF3 compatible components PTX10008-PREM2	• Chassis • Two RCBs (JNP10K-RE1-E, JNP10K-RE1-ELT, JNP10K-RE1-E128, or JNP10K-RE2-E128) • Two fan tray controllers (JNP10008-FTC2) • Two fan trays (JNP10008-FAN2) • Six AC power supplies (JNP10K-PWR-DC2) • Four SIBs (JNP10008-SF3) • Two SIB covers (JNP10008-SF-BLNK2) • Eight line-card covers

Table 3: PTX10008 Hardware Configurations *(Continued)*

Router Configuration	Configuration Components
Redundant DC configuration with JNP10008-SF3 compatible components PTX10008-PREM3	• Chassis • Two RCBs (JNP10K-RE1-E, JNP10K-RE1-ELT, JNP10K-RE1-E128, or JNP10K-RE2-E128) • Two fan tray controllers (JNP10008-FTC2) • Two fan trays (JNP10008-FAN2) • Six DC power supplies (JNP10K-PWR-DC2) • Six SIBs (JNP10008-SF3) • Eight line-card covers

NOTE: You can install up to eight line cards that support any switch fabric compatible line card in the router.

NOTE: Line cards and the cable management system are not part of the base or redundant configurations. You must order them separately.

NOTE: If you want to purchase additional power supplies (AC, DC, HVAC, or HVDC), SFBs, or RCBs for your router configuration, you must order them separately.

Upgrade Kits

If you would like to be using newer technologies, such as 14.4 Tbps line cards, you can upgrade your existing PTX10008 router, MX10008 router, or QFX10008 switch hardware configurations to become one of the newer PTX10008 hardware offerings. You can convert your existing chassis to a PTX10008 router using an upgrade kit. Upgrading requires JNP10008-FAN2 and 5500 W power supplies. Depending on whether you already have the newer fan trays and power supplies will determine your upgrade kit. You can use Table 4 on page 24 to find the right upgrade kit.

Table 4: Upgrade Kit Matrix

Original Configuration	Upgrading to Configuration	Current Power and Cooling	Order Power Supply Upgrade Kit
PTX10008-BASE	PTX10008-BASE3	JNP10K-PWR-AC and JNP10008-FAN	PTX10008-AC-UPGKIT and PTX10008-B3-UPGKIT
		JNP10K-PWR-AC2 and JNP10008-FAN2	PTX10008-P3-UPGKIT
		JNP10K-PWR-DC and JNP10008-FAN	PTX10008-DC-UPGKIT and PTX10008-B3-UPGKIT
		JNP10K-PWR-DC2 and JNP10008-FAN 2	PTX10008-B3-UPGKIT
PTX10008-BASE	PTX10008-PREM2	JNP10K-PWR-AC and JNP10008-FAN	PTX10008-AC-UPGKIT and PTX10008-P2-UPGKIT
		JNP10K-PWR-AC2 and JNP10008-FAN2	PTX10008-P2-UPGKIT
		JNP10K-PWR-DC and JNP10008-FAN	PTX10008-DC-UPGKIT and PTX10008-P2-UPGKIT
		JNP10K-PWR-DC2 and JNP10008-FAN 2	PTX10008-P2-UPGKIT
PTX10008-BASE	PTX10008-PREM3	JNP10K-PWR-AC and JNP10008-FAN	PTX10008-AC-UPGKIT and PTX10008-P3-UPGKIT
		JNP10K-PWR-AC2 and JNP10008-FAN2	PTX10008-P2-UPGKIT
		JNP10K-PWR-DC and JNP10008-FAN	PTX10008-DC-UPGKIT and PTX10008-P3-UPGKIT

Table 4: Upgrade Kit Matrix *(Continued)*

Original Configuration	Upgrading to Configuration	Current Power and Cooling	Order Power Supply Upgrade Kit
		JNP10K-PWR-DC2 and JNP10008-FAN 2	PTX10008-P3-UPGKIT
PTX10008-PREMIUM	PTX10008-BASE3	JNP10K-PWR-AC and JNP10008-FAN	PTX10008-AC-UPGKIT and PTX10008-B3-UPGKIT
		JNP10K-PWR-AC2 and JNP10008-FAN2	PTX10008-B3-UPGKIT
		JNP10K-PWR-DC and JNP10008-FAN	PTX10008-DC-UPGKIT and PTX10008-B3-UPGKIT
		JNP10K-PWR-DC2 and JNP10008-FAN 2	PTX10008-B3-UPGKIT
PTX10008-PREMIUM	PTX10008-PREM2	JNP10K-PWR-AC and JNP10008-FAN	PTX10008-AC-UPGKIT and PTX10008-P2-UPGKIT
		JNP10K-PWR-AC2 and JNP10008-FAN2	PTX10008-P2-UPGKIT
		JNP10K-PWR-DC and JNP10008-FAN	PTX10008-DC-UPGKIT and PTX10008-P2-UPGKIT
		JNP10K-PWR-DC2 and JNP10008-FAN 2	PTX10008-P2-UPGKIT
PTX10008-PREMIUM	PTX10008-PREM3	JNP10K-PWR-AC and JNP10008-FAN	PTX10008-AC-UPGKIT and PTX10008-P3-UPGKIT
		JNP10K-PWR-AC2 and JNP10008-FAN2	PTX10008-P3-UPGKIT

Table 4: Upgrade Kit Matrix *(Continued)*

Original Configuration	Upgrading to Configuration	Current Power and Cooling	Order Power Supply Upgrade Kit
		JNP10K-PWR-DC and JNP10008-FAN	PTX10008-DC-UPGKIT and PTX10008-P3-UPGKIT
		JNP10K-PWR-DC2 and JNP10008-FAN 2	PTX10008-P3-UPGKIT

NOTE: You can install up to eight line cards that support any switch fabric compatible line card in the PTX10008.

NOTE: Line cards and the cable management system are not part of the base or redundant configurations. You must order them separately.

SEE ALSO

PTX10008 Routing and Control Board Components and Descriptions | **84**

JNP10K-PWR-AC Power Supply | **61**

JNP10K-PWR-DC Power Supply | **67**

PTX10008 Switch Interface Board Description | **95**

PTX10008 Component Redundancy

The PTX10008 router is designed so that no single point of failure can cause the entire system to fail. The following major hardware components in the redundant configuration provide redundancy:

- Routing and Control Board (RCB)—The RCB consolidates the Routing Engine function with control plane function in a single unit. The PTX10008 router can have one or two RCBs. When two RCBs are installed, one functions as the primary and the other functions as the backup. If the primary RCB (or either of its components) fails, the backup can take over as the primary. See "PTX10008 Routing and Control Board Components and Descriptions" on page 84.

- Switch Interface Boards (SIBs)—The PTX10008 routers have six SIB slots for either the JNP10008-SF or the JNP10008-SF3. You can't mix the two types of SIBs in the same running chassis. For the JNP10008-SF switch fabric, five SIBs provide the necessary switching functionality to a PTX10008 router. Up to six SIBs can be installed to provide *n*+1 redundancy. For the JNP10008-SF3 switch fabric, all six SIBs are required for operation. All six SIBs are active and can sustain full throughput rate. See the "PTX10008 Switch Interface Board Description" on page 95.

- Power supplies—On systems with the JNP10008-SF fabric configuration, the system requires three JNP10K-PWR-AC power supplies for minimum operation (two RCBs, two fan trays, six SIBs, and no line cards). Additional power supplies provide *n*+1 redundancy for the system. DC, HVAC, and HVDC systems require six 5.5KW power supplies and can tolerate a failure of a single power supply without system interruption. If one power supply fails in a fully redundant system, the other power supplies can provide full power to the PTX10008 router indefinitely. In JNP10008-SF3 fabric configurations, six JNP10K-PWR-AC2 or JNP10K-PWR-DC2 power supplies are required for operation.

  The PTX10008 router also supports power source redundancy. Two sets of lugs are provided for the JNP10K-PWR-DC cables, four sets of lugs are provided for the JNP10K-PWR-DC2 cables, and two AC power cords are provided for each JNP10K-PWR-AC and JNP10K-PWR-AC2 power supply.

- Cooling system—The PTX10008 has two fan trays with redundant fans, which are controlled by the fan tray controller. There are two models of fans, JNP10008-FAN and JNP10008-FAN2; each fan model has a corresponding fan tray controller (JNP10008-FAN-CTRL and JNP10008-FAN-FTC2). If one of the fans in a JNP10008-FAN fan tray fails, the host subsystem increases the speed of the remaining fans to provide sufficient cooling for the router indefinitely. Each fan module itself consists of two independently driven counter-rotating fans. It is an extremely low-probability event that both fans within a fan module will fail. If one of the fans in a JNP10008-FAN2 fan tray fails, under most conditions the fan tray will rebalance the remaining fans to continue. A system receiving half the airflow has adequate time to replace the failing fan tray, even if the temperature rises within the chassis.

  Each fan tray controller drives four different fan tray power rails that are isolated from each other. In the event one rail fails, only a quarter of the fans in that fan tray are impacted. The fans driven by each rail are distributed throughout the fan tray in such a manner, that all line cards slots are equally affected. Also, unless the system is already running with all fans at maximum fan speed, other fans can increase their speed to compensate for a rail failure. See "PTX10008 Cooling System and Airflow" on page 44.

SEE ALSO

PTX10008 Configurations and Upgrade Options | 17

PTX10008 Hardware and CLI Terminology Mapping

This topic describes the hardware terms used in PTX10008 router documentation and the corresponding terms used in the Junos OS CLI. See Table 5 on page 28.

Table 5: CLI Equivalents of Terms Used in Documentation for PTX10008 Routers

Hardware Item (CLI)	Description (CLI)	Value (CLI)	Item In Documentation	Additional Information
Chassis	PTX10008	–	Router chassis	"PTX10008 Chassis Physical Specifications" on page 177
Fan tray	JNP10008-FAN or JNP10008-FAN2	`Fan Tray 0/1 Fan n` *n* is a value in the range of 0–10 for the JNP10008-FAN and 0–21 for the JNP10008-FAN2. The value corresponds to the individual fan number in the fan tray.	Fan tray	"PTX10008 Cooling System and Airflow" on page 44
FPC (*n*)	Abbreviated name of the Flexible PIC Concentrator (FPC) On PTX10008, an FPC is equivalent to a line card.	*n* is a value in the range of 0–7 for the PTX10008. The value corresponds to the line-card slot number in which the line card is installed.	Line card (The router does not have actual FPCs—the line cards are the FPC equivalents on the router.)	*Understanding Interface Naming Conventions*
PIC (*n*)	–	Value of *n* is always 0.	–	*Understanding Interface Naming Conventions*

Table 5: CLI Equivalents of Terms Used in Documentation for PTX10008 Routers *(Continued)*

Hardware Item (CLI)	Description (CLI)	Value (CLI)	Item In Documentation	Additional Information
PSM (*n*)	Abbreviation for power supply module One of the following: • JNP10K-PWR-AC • JNP10K-PWR-AC2 • JNP10K-PWR-DC • JNP10K-PWR-DC2	*n* is a value in the range of 0–5. The value corresponds to the power-supply slot number.	AC, DC, HVAC, or HVDC power supply	One of the following: • "JNP10K-PWR-AC Power Supply" on page 61 • "JNP10K-PWR-AC2 Power Supply" on page 64 • "JNP10K-PWR-DC Power Supply" on page 67 • "JNP10K-PWR-DC2 Power Supply" on page 69
Routing Engine	RE (*n*)	*n* is a value in the range of 0–1. Multiple line items appear in the CLI if more than one RCB is installed in the chassis.	RCB	"PTX10008 Routing and Control Board Components and Descriptions" on page 84

Table 5: CLI Equivalents of Terms Used in Documentation for PTX10008 Routers *(Continued)*

Hardware Item (CLI)	Description (CLI)	Value (CLI)	Item In Documentation	Additional Information

SIB (*n*)	This field indicates:
	• State of the fabric plane:
	  • Active
	  • Spare
	  • Check state
	• Status of the Packet Forwarding Engine in each fabric plane:
	  • Links OK
	  • Error
		n is a value in the range of 0–5.	Fabric plane	*show chassis fabric sibs*

Xcvr (*n*)	Abbreviated name of the transceiver	*n* is a value equivalent to the number of the port in which the transceiver is installed.	Optical transceivers	"PTX10008 Optical Transceiver and Cable Support" on page 223

PTX10008 Chassis

IN THIS SECTION

- PTX10008 Chassis Physical Specifications | **31**
- PTX10008 Field-Replaceable Units | **35**

PTX10008 Status Panel | 37
PTX10008 Optional Equipment | 41

The PTX10008 chassis houses the hardware components. The chassis components include the fan trays, fan tray controllers, power supplies, Routing and Control Boards (RCBs), line cards, optional cable management system, and the status panel.

PTX10008 Chassis Physical Specifications

The PTX10008 modular chassis is a rigid sheet-metal structure that houses the other router components. You can mount up to three PTX10008 routers in a standard 19-in. 4-post rack (42 U) provided the rack can handle the combined weight and there is adequate power and cooling. Table 6 on page 31 summarizes the physical specifications of the chassis. See Figure 14 on page 34.

Table 6: PTX10008 Router Physical Specifications

Description	Weight	Height	Width	Depth
Chassis, spare	145.2 lb (65.86 kg)	22.6 in. (57.4 cm)	17.4 in. (44.2 cm) **NOTE**: The outer edges of the chassis flange extend the width to 19 in. (48.3 cm).	32 in. (81.28 cm) chassis only
Chassis base AC configuration	273 lb (123.83 kg)	22.6 in. (57.4 cm)	17.4 in. (44.2 cm) **NOTE**: The outer edges of the chassis flange extend the width to 19 in. (48.3 cm).	35 in. (88.9 cm) with JNP10K-PWR-AC power supplies 42.4 in. (107.7 cm) with EMI door

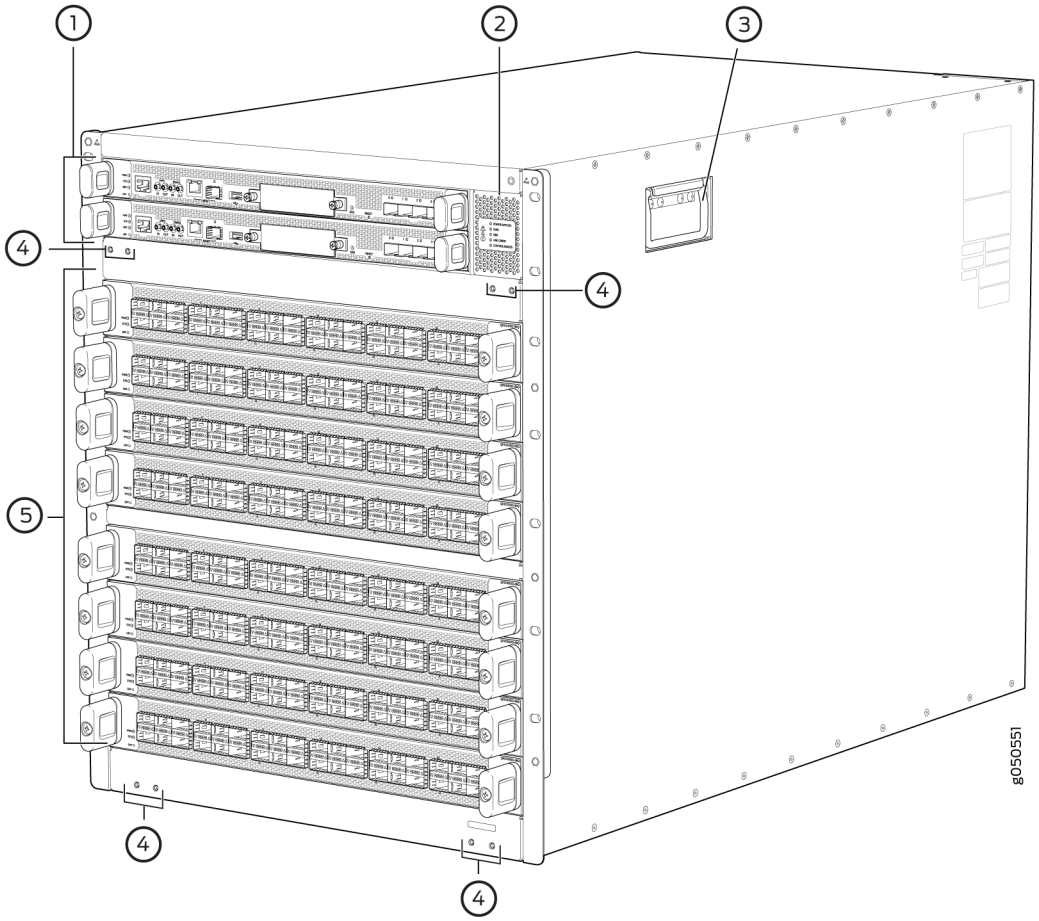
Table 6: PTX10008 Router Physical Specifications *(Continued)*

Description	Weight	Height	Width	Depth
Chassis base DC configuration	270 lb (122.47 kg)	22.6 in. (57.4 cm)	17.4 in. (44.2 cm) **NOTE**: The outer edges of the chassis flange extend the width to 19 in. (48.3 cm).	35 in. (88.9 cm) with JNP10K-PWR-DC power supplies 42.4 in. (107.7 cm) with EMI door
Chassis BASE3 AC configuration	394.05 lb (178.74 kg)	22.6 in. (57.4 cm)	17.4 in. (44.2 cm) **NOTE**: The outer edges of the chassis flange extend the width to 19 in. (48.3 cm).	36.7 in. (93.2 cm) with JNP10K-PWR-AC2 power supplies 44.1 in. (112 cm) with EMI door
Chassis PREM2 AC configuration	390.85 lb (177.29 kg)	22.6 in. (57.4 cm)	17.4 in. (44.2 cm) **NOTE**: The outer edges of the chassis flange extend the width to 19 in. (48.3 cm).	36.7 in. (93.2 cm) with JNP10K-PWR-AC2 power supplies 44.1 in. (112 cm) with EMI door
Chassis PREM2 DC configuration	375.65 (170.39 kg)	22.6 in. (57.4 cm)	17.4 in. (44.2 cm) **NOTE**: The outer edges of the chassis flange extend the width to 19 in. (48.3 cm).	36.7 in. (93.2 cm) with JNP10K-PWR-DC2 power supplies 44.1 in. (112 cm) with EMI door
Chassis PREMIUM redundant AC configuration	353 lb (160.12 kg)	22.6 in. (57.4 cm)	17.4 in. (44.2 cm) **NOTE**: The outer edges of the chassis flange extend the width to 19 in. (48.3 cm).	35 in. (88.9 cm) with JNP10K-PWR-AC power supplies 42.4 in. (107.7 cm) with EMI door

Table 6: PTX10008 Router Physical Specifications *(Continued)*

Description	Weight	Height	Width	Depth
Chassis PREMIUM redundant DC configuration	350.6 lb (159 kg)	22.6 in. (57.4 cm)	17.4 in. (44.2 cm) **NOTE**: The outer edges of the chassis flange extend the width to 19 in. (48.3 cm).	35 in. (88.9 cm) with JNP10K-PWR-DC power supplies 42.4 in. (107.7 cm) with EMI door
Chassis redundant AC PTX10008-PREM3 configuration	421.25 lb (191.07 kg)	22.6 in. (57.4 cm)	17.4 in. (44.2 cm) **NOTE**: The outer edges of the chassis flange extend the width to 19 in. (48.3 cm).	36.7 in. (93.2 cm) with JNP10K-PWR-AC2 power supplies 44.1 in. (112 cm) with EMI door
PTX10K-LC1101 Line Card	27 lb (12.2 kg)	1.89 in. (4.8 cm)	17.2 in. (43.7 cm)	20.54 in. (52.2 cm)
PTX10K-LC1102 Line Card	22.6 lb (10.2 kg)	1.89 in. (4.8 cm)	17.2 in. (43.7 cm)	20.54 in. (52.2 cm)
PTX10K-LC1104 Line Card	32 lb (14.5 kg)	1.89 in. (4.8 cm)	17.2 in. (43.7 cm)	20.54 in.(52.2 cm)
PTX10K-LC1105 Line Card	28.5 lb (12.9 kg)	1.89 in. (4.8 cm)	17.2 in. (43.7 cm)	20.54 in.(52.2 cm)
QFX10000-60S-6Q Line Card	21.4 lb (9.7 kg)	1.89 in. (4.8 cm)	17.2 in. (43.7 cm)	20.54 in.(52.2 cm)
JNP10K-LC1201 Line Card	29.2 lb (13.2 kg)	1.89 in. (4.8 cm)	17.2 in. (43.7 cm)	21.3 in. (54.1 cm)
JNP10K-LC1202 Line Card	21 lb (9.5 kg)	1.9 in. (4.8 cm)	17.2 in. (43.68 cm)	21.3 in. (54.1 cm)

Figure 14: Front View of PTX10008



1– RCBs	4– Mounting holes for front door
2– Status panel	5– Line cards
3– Handles	

WARNING: The handles on each side of the chassis facilitate the fine-tune positioning of the chassis on the base brackets. Do not use the handles to lift the chassis, even when the chassis is empty. See "Mount the PTX10008 by Using the JNP10004-RMK-4POST Rack Mount Kit" on page 245or "Mount the PTX10008 by Using the EX-MOD-RMK-4POST Rack Mount Kit" on page 253 for instructions for properly moving a loaded chassis.

SEE ALSO

PTX10008 Rack Requirements | **182**

PTX10008 Configurations and Upgrade Options | 17
PTX10008 Cooling System and Airflow | 44

PTX10008 Field-Replaceable Units

Field-replaceable units (FRUs) are router components that you can replace at your site. The router uses the following types of FRUs:

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

Table 7 on page 35 lists the FRUs and their types for the PTX10008 routers.

Table 7: FRUs in an PTX10008 Router

FRU	Type
Power supplies	Hot-insertable and hot-removable.
Fan trays	Hot-insertable and hot-removable.
Fan tray controllers	Hot-insertable and hot-removable.

Table 7: FRUs in an PTX10008 Router *(Continued)*

FRU	Type
Routing and Control Boards (RCBs)	Redundant configuration: • Primary RCB is hot-pluggable. • Backup RCB is hot-insertable and hot-removable. Base configuration: • Removal of the RCB causes the router to shut down.In order to prevent a disruption in traffic, take the chassis offline. If a temporary disruption is acceptable, you can install a replacement RCB in the second slot. The system restarts to elect a primary RCB and a backup RCB. If necessary, you can switch the primary and backup RCB using the `request chassis routing-engine master switch` command. See "PTX10008 Configurations and Upgrade Options" on page 17.
Switch Interface Boards (SIBs)	SIBs are hot-insertable and hot-removable. We recommend that you take SIBs offline before removing them to avoid traffic loss while the router fabric is being reconfigured. Use the following command: `user@router> request chassis sib slot slot-number offline`
Line cards	Hot-insertable. We recommend that you take line cards offline before removing them. Use the following command: `user@router> request chassis fpc-slot slot-number offline`
Optical transceivers See "PTX10008 Optical Transceiver and Cable Support" on page 223 for how to find detailed specifications and the Junos OS release in which the transceivers were introduced.	Hot-insertable and hot-removable.

NOTE: Line cards are not part of the base or redundant configuration. You must order them separately.

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 an existing component with the same type of component.

SEE ALSO

PTX10008 Configurations and Upgrade Options | 17

PTX10008 Optical Transceiver and Cable Support | 223

PTX10008 Status Panel

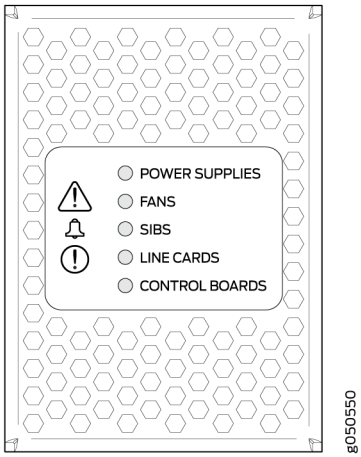
The status panel of the PTX10008 has two purposes:

- Shows the overall status of the chassis
- Indicates the type of power bus internal to the chassis

Some chassis ship with an enhanced power bus to future-proof the chassis for potential power growth.

The status panel indicates the chassis status through a set of five bicolor LEDs. See Figure 15 on page 38 for a chassis status panel with the standard power bus.

Figure 15: Status Panel on Chassis with the Standard Power Bus



Other chassis also have the same set of five bicolor LEDs, but also have an azure blue line to indicate the presence of the enhanced power bus (see Figure 16 on page 38).

Figure 16: Status Panel on Chassis with the Enhanced Power Bus

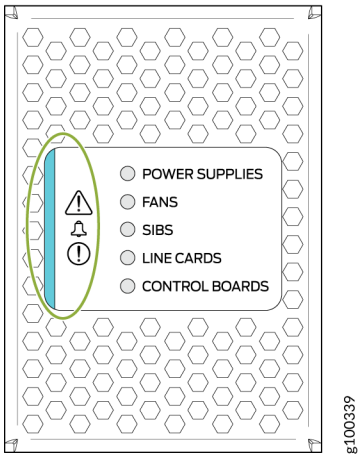


Table 8 on page 39 describes the status panel LEDs.

Table 8: Status Panel LEDs in a PTX10008

Name	Color	State	Description
! Minor alarm (Triangle warning symbol)	Yellow	Off	No minor alarms are active.
		On steadily	A minor alarm is active.
! Major alarm (Circle warning symbol)	Red	Off	No major alarms are active.
		On steadily	A major alarm is active.
POWER SUPPLIES	Green	On steadily	All of the power supplies are online and operating normally.
	Yellow	On steadily (if Junos OS Evolved is installed in your router)/Blinking (if Junos OS is installed in your router)	One or more of the power supplies has an error.
	None	Off	None of the power supplies is receiving power.
FANS	Green	On steadily	The fans and the fan tray controllers are online and operating normally.
	Yellow	On steadily (if Junos OS Evolved is installed in your router)/Blinking (if Junos OS is installed in your router)	There is an error in a fan or in one of the fan tray controllers.
	None	Off	The fan tray controllers and fan trays are not receiving power.

Table 8: Status Panel LEDs in a PTX10008 *(Continued)*

Name	Color	State	Description
SIBS	Green	On steadily	At least one installed Switch Interface Board (SIB) is online.
	Yellow	On steadily (if Junos OS Evolved is installed in your router)/Blinking (if Junos OS is installed in your router)	There is a hardware error in one or more SIBs.
	None	Off	All the SIBs are offline.
LINE CARDS	Green	On steadily	At least one installed line card is online.
	Yellow	On steadily (if Junos OS Evolved is installed in your router)/Blinking (if Junos OS is installed in your router)	There is a hardware error in one or more line cards.
	None	Off	All the line cards are offline.
CONTROL BOARDS	Green	On steadily	All installed Routing and Control Boards (RCBs) are online.
	Yellow	On steadily (if Junos OS Evolved is installed in your router)/Blinking (if Junos OS is installed in your router)	One or more RCBs have an error condition.

Table 8: Status Panel LEDs in a PTX10008 *(Continued)*

Name	Color	State	Description
	None	Off	The installed RCBs are offline.

SEE ALSO

- PTX10008 Line Card Components and Descriptions | **101**
- PTX10008 Cooling System and Airflow | **44**
- PTX10008 Switch Fabric | **95**
- PTX10008 Power System | **61**

PTX10008 Optional Equipment

IN THIS SECTION

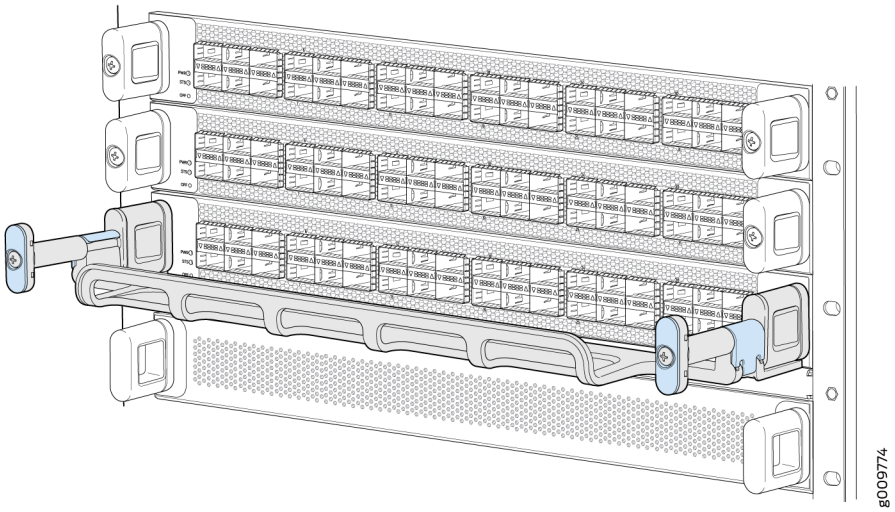
- PTX10008 Cable Management System | **42**

The PTX10008 routers supports the cable management system (JLC-CBL-MGMT-KIT) as an optional equipment:

PTX10008 Cable Management System

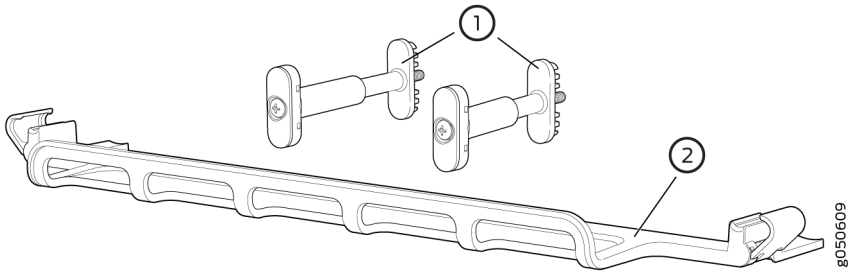
You can use the PTX10008 cable management system (see Figure 17 on page 42) to route optical cables away from the line-card ports for better airflow through the chassis. Using this optional system also makes it easier to use cable ties or strips to organize the cabling.

Figure 17: PTX10008 Cable Management System



The cable management system comprises a set of handle extensions and a tray that snaps to the extensions (see Figure 18 on page 42) for an individual line card. You can use the handle extensions with or without the cable tray. You don't need to remove the handle extensions if you want to remove a line card.

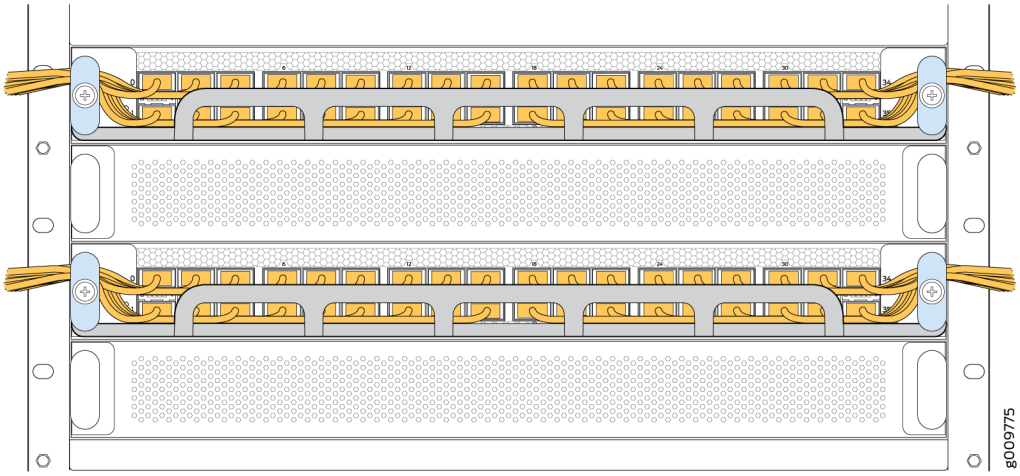
Figure 18: Cable Management Parts



1– Handle extensions	2– Cable tray

Cables are draped across or under the handle extensions and then secured with cable wraps (see Figure 19 on page 43).

Figure 19: Two Cable Management Systems Installed on PTX10008



SEE ALSO

Install the PTX10008 Cable Management System | 373

PTX10008 Cooling System

IN THIS SECTION

- PTX10008 Cooling System and Airflow | 44
- PTX10008 Fan Tray LEDs and Fan Tray Controller LEDs | 54

The PTX10008 cooling system components work together to keep all components within the acceptable temperature range. If the maximum temperature specification is exceeded and the system cannot be adequately cooled, the Routing and Control Board shuts down some or all of the hardware components.

PTX10008 Cooling System and Airflow

IN THIS SECTION

- Fan Trays | 44
- Fan Tray Controllers | 48
- Airflow Direction in the PTX10008 | 53

The cooling system in a PTX10008 chassis consists of dual fan trays with matching dual fan tray controllers.

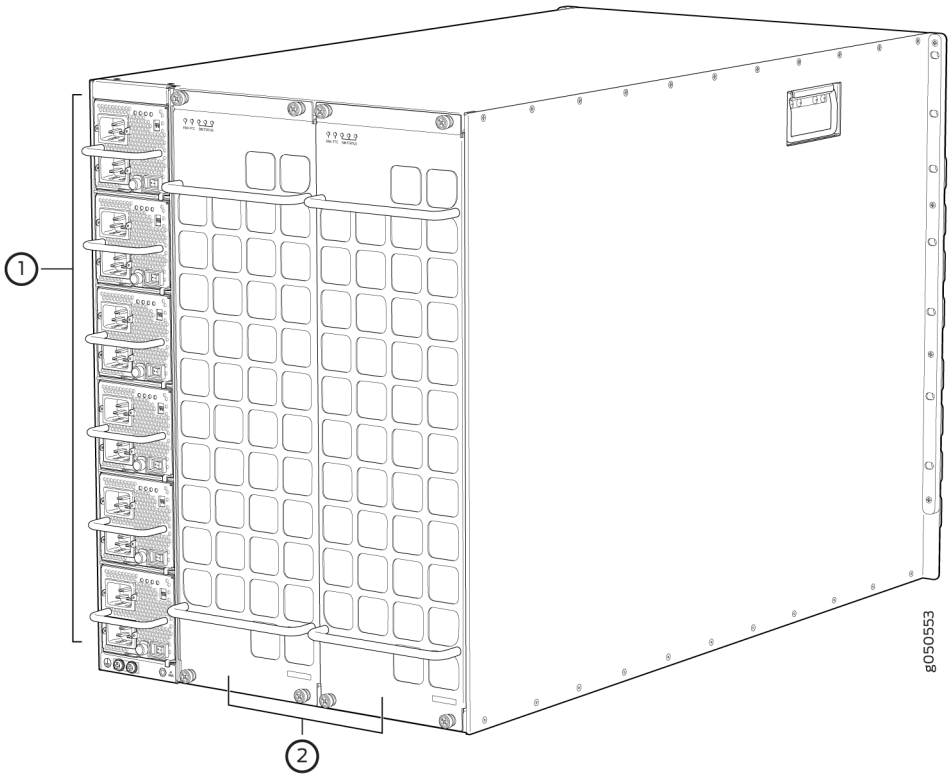
Two fan tray models (JNP10008-FAN, JNP10008-FAN2) and their associated fan tray controllers (JNP10008-FAN-CTLR, JNP10008-FTC2) are available and operate in systems with either the JNP10008-SF switch fabric or the JNP10008-SF3 switch fabric. Each fan tray requires a companion fan controller to be installed and operational to be hot-insertable and hot-removable. When upgrading from a JNP10008-FAN and JNP10008-FAN-CTRL system to a JNP10008-FAN2 and JNP10008-FTC2 system, be sure to upgrade the power supplies to JNP10K-PWR-AC2 or JNP10K-PWR-DC2 to ensure adequate airflow.

Fan Trays

Both fan tray models contain an array of internal fans, a non-removable control board, and LEDs.

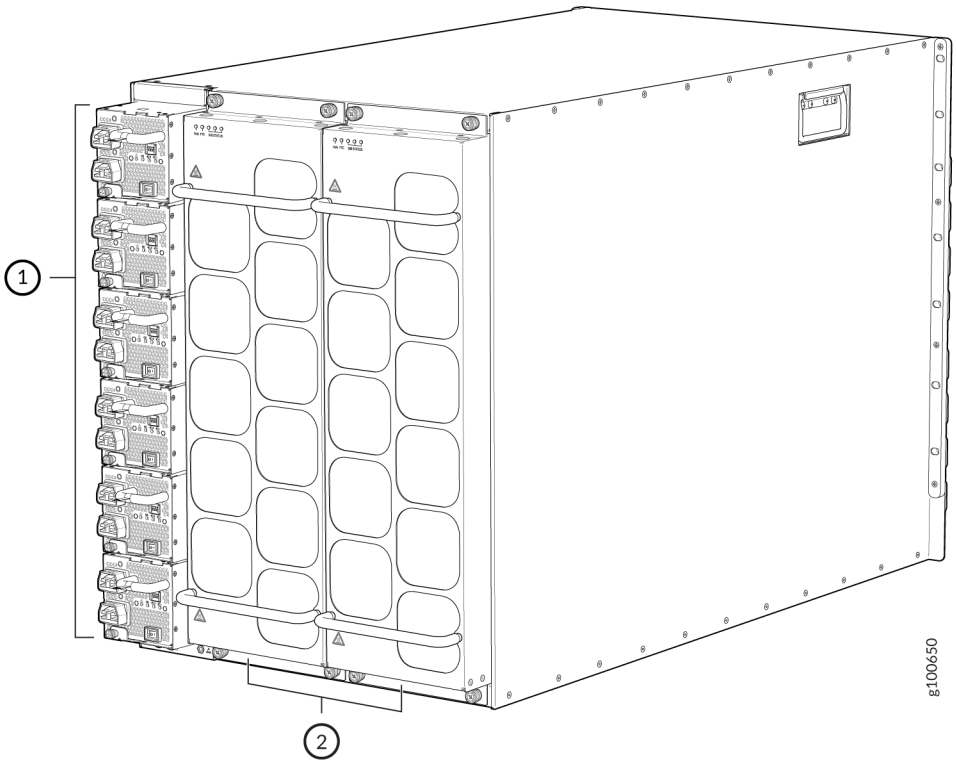
The two fan trays install vertically, side by side, next to the power supplies on the FRU side of the chassis. Two handles on each front faceplate facilitate handling of the fan tray. See Figure 20 on page 45 and Figure 21 on page 46.

Figure 20: JNP10008-FAN Installed in a PTX10008 Router



1– Power supplies	2– Fan trays

Figure 21: JNP10008-FAN2 Installed in a PTX10008 Router



1– Power supplies	2– Fan trays

See Table 9 on page 46 for the physical specifications for the fan trays.

Table 9: Fan Tray Specifications

Specification	JNP10008-FAN	JNP10008-FAN2
Corresponding fan tray controller model	JNP10008-FAN-CTLR	JNP10008-FTC2
Number of fans per fan tray	11	22
Number of fans per chassis	22	44

Table 9: Fan Tray Specifications *(Continued)*

Specification	JNP10008-FAN	JNP10008-FAN2
Fan numbering	0 through 10	0 through 21
Volume flow at 100%	1437.37 cubic feet per minute (CFM) per fan tray	1793 CFM per fan tray
Switch fabric compatibility	JNP10008-SF	JNP10008-SF or JNP10008-SF3
Introduced in Junos OS Release	15.1X53-D30	19.2R1-S1
Height	22.4 in. (56.9 cm)	22.4 in. (56.9 cm)
Width	6.6 in. (16.8 cm)	6.6 in. (16.8 cm)
Depth	4.0 in. (10.2 cm) without handles, 5.2 in. (13.2 cm) with handles	5.5 in. (13.97 cm) without handles, 6.7 in. (17.01 cm) with handles
Weight	11.8 lb (5.4 kg)	20 lb (9.07 kg)

The array of fans in both models operate as a single unit. If an individual fan in the array fails, the entire fan tray must be replaced.

If you want to replace an existing fan tray while the router is running, remove only one fan tray. The router continues to operate for a limited time with a single operating fan tray without triggering a thermal alarm.

CAUTION: To avoid a thermal alarm, do not remove both fan trays while the router is operating.

CAUTION: The chassis will shut down if a thermal alarm is raised for more than three minutes.

The internal fan control board in each fan tray contains the LEDs for the associated fan tray controllers and the LEDs for the three SIBs directly behind the fan tray.

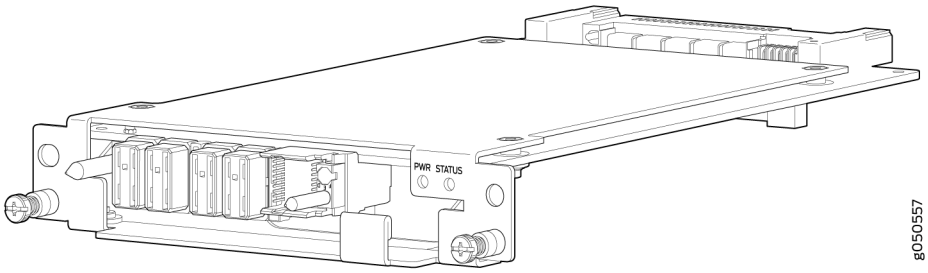
Fan Tray Controllers

The two fan tray controllers provide the control logic and power to hot-insert and hot-remove a fan tray.

There are two fan tray controller models:

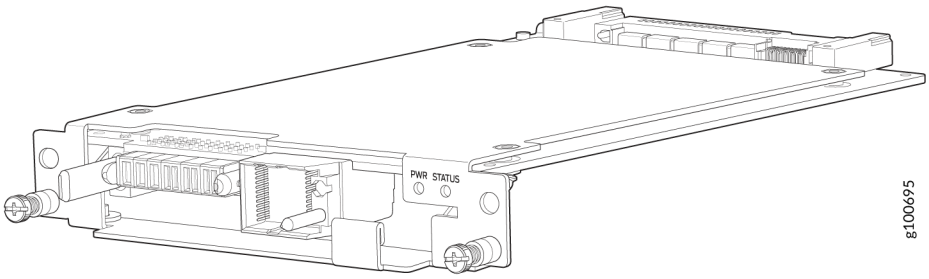
- JNP10008-FAN-CTRL—Supports model JNP10008-FAN; see Figure 22 on page 48.

Figure 22: Fan Tray Controller JNP10008-FAN-CTRL



- JNP10008-FTC2—Supports model JNP10008-FAN2; see Figure 23 on page 48.

Figure 23: Fan Controller JNP10008-FTC2



WARNING: Do not mix the fan tray controller models. Use only the supported fan tray model for each fan tray controller. See Table 10 on page 49.

Table 10: Fan Tray Controller Specifications

Specification	JNP10008-FAN-CTRL	JNP10008-FTC2
Corresponding fan tray model	JNP10008-FAN	JNP10008-FAN2
Switch fabric compatibility	JNP10008-SF	JNP10008-SF or JNP10008-SF3
Introduced in Junos OS Release	15.1X53-D30	19.2R1
Height	1.5 in. (3.81 cm)	1.5 in. (3.81 cm)
Width	6.5 in. (15.24 cm)	6.5 in. (15.24 cm)
Depth	9.3 in. (23.62 cm)	9.4 in. (23.88 cm)
Weight	1.5 lb (0.68 kg)	1.1 lb (0.5 kg)

The system continually monitors the temperature of critical parts across the chassis and adjusts the chassis fan speed according to the temperature.

Junos OS software controls the fan speed. Under normal operating conditions, the fans in the fan tray run at less than full speed. If one fan tray controller fails or appears missing (such as when a SIB is being replaced), the other fan tray controller sets the fans to full speed. This allows the router to continue to operate normally as long as the remaining fans cool the chassis sufficiently. Use the `show chassis fan` command to see the status of individual fans and fan speed. The following examples of the `show chassis fan` command show the fan status for a system running JNP10008-FAN and JNP10008-FAN-CTRL:

1. This example shows the output from a JNP10008-SF fabric system running JNP10008-FAN and JNP10008-FAN-CTRL and standard Junos OS.

```
user@system> show chassis fan
      Item                      Status   RPM     Measurement
      Fan Tray 0 Fan 0          OK       6300    Spinning at normal speed
       Fan Tray 0 Fan 1          OK       6150    Spinning at normal speed
      Fan Tray 0 Fan 2          OK       6300    Spinning at normal speed
      Fan Tray 0 Fan 3          OK       6300    Spinning at normal speed
      Fan Tray 0 Fan 4          OK       6150    Spinning at normal speed
      Fan Tray 0 Fan 5          OK       6000    Spinning at normal speed
```

```
      Fan Tray 0 Fan 6          OK       6150    Spinning at normal speed
      Fan Tray 0 Fan 7          OK       6150    Spinning at normal speed
      Fan Tray 0 Fan 8          OK       6150    Spinning at normal speed
      Fan Tray 0 Fan 9          OK       6300    Spinning at normal speed
      Fan Tray 0 Fan 10         OK       6300    Spinning at normal speed
      Fan Tray 1 Fan 0          OK       6300    Spinning at normal speed
      Fan Tray 1 Fan 1          OK       6150    Spinning at normal speed
      Fan Tray 1 Fan 2          OK       6300    Spinning at normal speed
      Fan Tray 1 Fan 3          OK       6150    Spinning at normal speed
      Fan Tray 1 Fan 4          OK       6300    Spinning at normal speed
      Fan Tray 1 Fan 5          OK       6300    Spinning at normal speed
      Fan Tray 1 Fan 6          OK       6150    Spinning at normal speed
      Fan Tray 1 Fan 7          OK       6150    Spinning at normal speed
      Fan Tray 1 Fan 8          OK       6150    Spinning at normal speed
      Fan Tray 1 Fan 9          OK       6150    Spinning at normal speed
      Fan Tray 1 Fan 10         OK       6300    Spinning at normal speed
```

2. This example shows the output from a JNP10008-SF3 fabric system running JNP10008-FAN2 and JNP10008-FTC2 and standard Junos OS.

```
user@system> show chassis fan
Item                      Status   RPM     Measurement
      Fan Tray 0 Fan 0          OK       6450    Spinning at normal speed
      Fan Tray 0 Fan 1          OK       7950    Spinning at normal speed
      Fan Tray 0 Fan 2          OK       6450    Spinning at normal speed
      Fan Tray 0 Fan 3          OK       7950    Spinning at normal speed
      Fan Tray 0 Fan 4          OK       6450    Spinning at normal speed
      Fan Tray 0 Fan 5          OK       7950    Spinning at normal speed
      Fan Tray 0 Fan 6          OK       6600    Spinning at normal speed
      Fan Tray 0 Fan 7          OK       7950    Spinning at normal speed
      Fan Tray 0 Fan 8          OK       6450    Spinning at normal speed
      Fan Tray 0 Fan 9          OK       7800    Spinning at normal speed
      Fan Tray 0 Fan 10         OK       6450    Spinning at normal speed
      Fan Tray 0 Fan 11         OK       7950    Spinning at normal speed
      Fan Tray 0 Fan 12         OK       6450    Spinning at normal speed
      Fan Tray 0 Fan 13         OK       7800    Spinning at normal speed
      Fan Tray 0 Fan 14         OK       6450    Spinning at normal speed
      Fan Tray 0 Fan 15         OK       7800    Spinning at normal speed
      Fan Tray 0 Fan 16         OK       6450    Spinning at normal speed
      Fan Tray 0 Fan 17         OK       7950    Spinning at normal speed
      Fan Tray 0 Fan 18         OK       6450    Spinning at normal speed
```

```
      Fan Tray 0 Fan 19         OK       7800    Spinning at normal speed
      Fan Tray 0 Fan 20         OK       6300    Spinning at normal speed
      Fan Tray 0 Fan 21         OK       7800    Spinning at normal speed
      Fan Tray 1 Fan 0          OK       6450    Spinning at normal speed
      Fan Tray 1 Fan 1          OK       7950    Spinning at normal speed
      Fan Tray 1 Fan 2          OK       6600    Spinning at normal speed
      Fan Tray 1 Fan 3          OK       7950    Spinning at normal speed
      Fan Tray 1 Fan 4          OK       6600    Spinning at normal speed
      Fan Tray 1 Fan 5          OK       7950    Spinning at normal speed
      Fan Tray 1 Fan 6          OK       6600    Spinning at normal speed
      Fan Tray 1 Fan 7          OK       7950    Spinning at normal speed
      Fan Tray 1 Fan 8          OK       6600    Spinning at normal speed
      Fan Tray 1 Fan 9          OK       7950    Spinning at normal speed
      Fan Tray 1 Fan 10         OK       6450    Spinning at normal speed
      Fan Tray 1 Fan 11         OK       7950    Spinning at normal speed
      Fan Tray 1 Fan 12         OK       6450    Spinning at normal speed
      Fan Tray 1 Fan 13         OK       7800    Spinning at normal speed
      Fan Tray 1 Fan 14         OK       6450    Spinning at normal speed
      Fan Tray 1 Fan 15         OK       7800    Spinning at normal speed
      Fan Tray 1 Fan 16         OK       6450    Spinning at normal speed
      Fan Tray 1 Fan 17         OK       7950    Spinning at normal speed
      Fan Tray 1 Fan 18         OK       6450    Spinning at normal speed
      Fan Tray 1 Fan 19         OK       7800    Spinning at normal speed
      Fan Tray 1 Fan 20         OK       6450    Spinning at normal speed
      Fan Tray 1 Fan 21         OK       7650    Spinning at normal speed
```

3. This example shows the output from a JNP10008-SF3 fabric system running JNP10008-FAN2 and JNP10008-FTC2 and Junos OS Evolved.

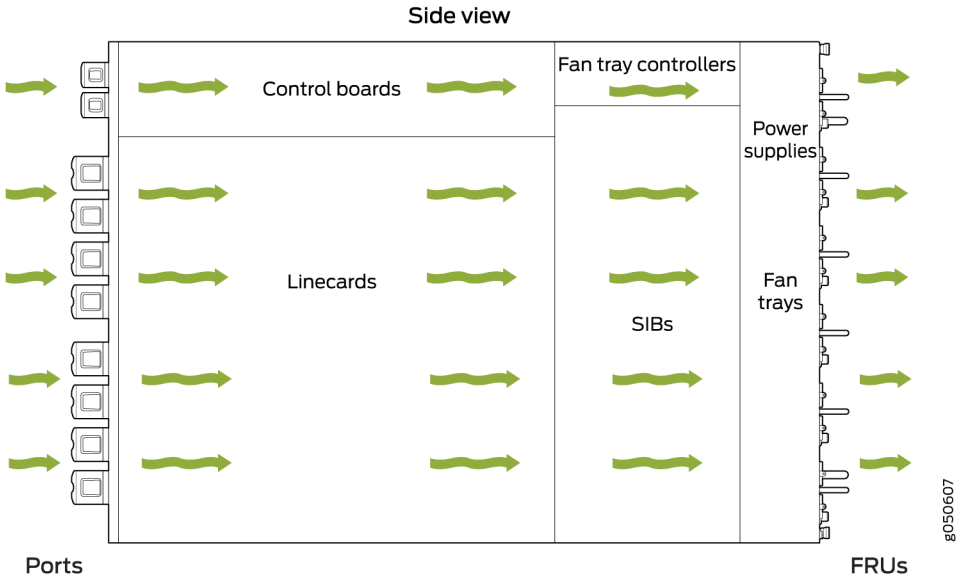
```
user@system> show chassis fan
      Item                      Status   % RPM     Measurement
      Fan Tray 0 Fan 0          Ok       83%       8850 RPM
      Fan Tray 0 Fan 1          Ok       75%       10200 RPM
      Fan Tray 0 Fan 2          Ok       83%       8850 RPM
      Fan Tray 0 Fan 3          Ok       76%       10350 RPM
      Fan Tray 0 Fan 4          Ok       83%       8850 RPM
      Fan Tray 0 Fan 5          Ok       76%       10350 RPM
      Fan Tray 0 Fan 6          Ok       83%       8850 RPM
      Fan Tray 0 Fan 7          Ok       75%       10200 RPM
      Fan Tray 0 Fan 8          Ok       83%       8850 RPM
      Fan Tray 0 Fan 9          Ok       76%       10350 RPM
      Fan Tray 0 Fan 10         Ok       83%       8850 RPM
```

```
Fan Tray 0 Fan 11          Ok        75%       10200 RPM
Fan Tray 0 Fan 12          Ok        84%       9000 RPM
Fan Tray 0 Fan 13          Ok        75%       10200 RPM
Fan Tray 0 Fan 14          Ok        81%       8700 RPM
Fan Tray 0 Fan 15          Ok        75%       10200 RPM
Fan Tray 0 Fan 16          Ok        83%       8850 RPM
Fan Tray 0 Fan 17          Ok        75%       10200 RPM
Fan Tray 0 Fan 18          Ok        83%       8850 RPM
Fan Tray 0 Fan 19          Ok        74%       10050 RPM
Fan Tray 0 Fan 20          Ok        81%       8700 RPM
Fan Tray 0 Fan 21          Ok        75%       10200 RPM
Fan Tray 1 Fan 0           Ok        83%       8850 RPM
Fan Tray 1 Fan 1           Ok        75%       10200 RPM
Fan Tray 1 Fan 2           Ok        83%       8850 RPM
Fan Tray 1 Fan 3           Ok        76%       10350 RPM
Fan Tray 1 Fan 4           Ok        83%       8850 RPM
Fan Tray 1 Fan 5           Ok        76%       10350 RPM
Fan Tray 1 Fan 6           Ok        84%       9000 RPM
Fan Tray 1 Fan 7           Ok        76%       10350 RPM
Fan Tray 1 Fan 8           Ok        83%       8850 RPM
Fan Tray 1 Fan 9           Ok        75%       10200 RPM
Fan Tray 1 Fan 10          Ok        83%       8850 RPM
Fan Tray 1 Fan 11          Ok        75%       10200 RPM
Fan Tray 1 Fan 12          Ok        81%       8700 RPM
Fan Tray 1 Fan 13          Ok        75%       10200 RPM
Fan Tray 1 Fan 14          Ok        83%       8850 RPM
Fan Tray 1 Fan 15          Ok        75%       10200 RPM
Fan Tray 1 Fan 16          Ok        83%       8850 RPM
Fan Tray 1 Fan 17          Ok        75%       10200 RPM
Fan Tray 1 Fan 18          Ok        83%       8850 RPM
Fan Tray 1 Fan 19          Ok        76%       10350 RPM
Fan Tray 1 Fan 20          Ok        81%       8700 RPM
Fan Tray 1 Fan 21          Ok        74%       10050 RPM
```

Airflow Direction in the PTX10008

The air intake to cool the chassis is located on the port (line card) side of the chassis. Air flows into the chassis from the ports in the RCBs and line cards, through the Switch Interface Boards (SIBs), and exits from the fan trays and the power supplies. See Figure 24 on page 53.

Figure 24: Airflow Through a PTX10008



The fan tray continues to operate indefinitely and provide sufficient cooling even when a single fan fails, provided the room temperature is within the operating range. You can check the status of fans by viewing the LEDs on each fan tray. See "PTX10008 Fan Tray LEDs and Fan Tray Controller LEDs" on page 54.

You cannot replace a single fan. If one or more fans fail, you must replace the entire fan tray.

In addition to the fans in the fan trays, there is an internal fan in each power supply that also helps to cool components, such as the line cards.

SEE ALSO

PTX10008 Field-Replaceable Units | **35**

Install a PTX10008 Fan Tray | **295**

Remove a PTX10008 Fan Tray | **298**

PTX10008 Fan Tray LEDs and Fan Tray Controller LEDs

IN THIS SECTION

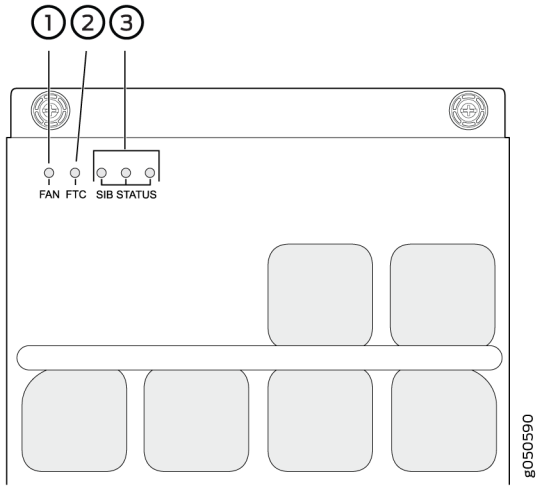
- Fan Tray LEDs | 54
- Fan Tray Controller LEDs | 59

Each fan tray has a set of LEDs, and each corresponding fan tray controller also has a set of LEDs.

Fan Tray LEDs

Each fan tray has a set of LEDs that represent the status of the fans in the fan tray, the fan tray controller, and the three Switch Interface Boards (SIBs). The fan tray LEDs are located in the top left corner of each fan tray. Figure 25 on page 54 shows the location of the LEDs on JNP10008-FAN fan trays. See Figure 26 on page 55 for the location of LEDs on the JNP10008-FAN2 fan trays.

Figure 25: Fan Tray JNP10008-FAN LEDs

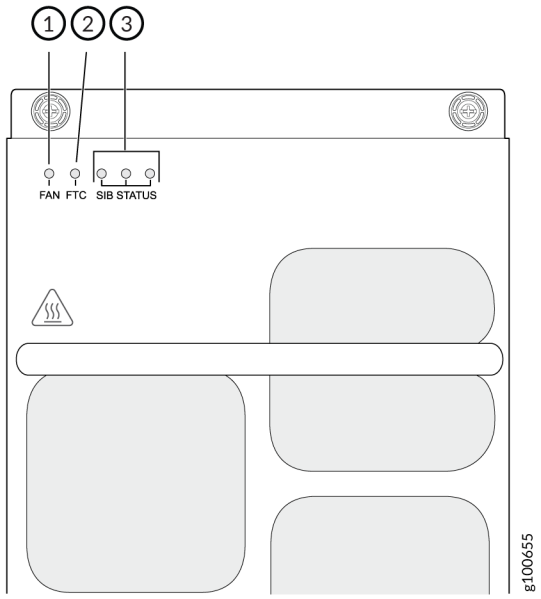


1– Fan status LED

3– SIB status LEDs (SIB 0 through SIB 2 for the left fan tray and SIB 3 through SIB 5 for the right fan tray)

2– Fan tray controller status LED	

Figure 26: Fan Tray JNP10008-FAN2 LEDs



1– Fan status LED	3– SIB status LEDs (SIB 0 through SIB 2 for the left fan tray and SIB 3 through SIB 5 for the right fan tray).
2– Fan tray controller status LED	

Table 11 on page 55 describes the functions of the fan tray LEDs.

Table 11: Fan Tray LEDs on a PTX10008 Router

Name	Color	State	Description
FAN (fan status)	Green	On steadily	All fans are operating normally. The system has verified that the fan tray is engaged, that the airflow is in the correct direction, and that all fans are operating correctly.

Table 11: Fan Tray LEDs on a PTX10008 Router *(Continued)*

Name	Color	State	Description
	Yellow	Blinking	An error has been detected in one or more fans in the fan tray. Replace the fan tray as soon as possible. Either the fan has failed or it has become disconnected. To maintain proper airflow through the chassis, leave the fan tray installed in the chassis until you are ready to replace it.
	None	Off	The fan is not receiving power from the fan tray controller.
FTC (fan tray controller status)	Green	On steadily	The fan tray controller is online and is operating normally.
	Yellow	Blinking	An error has been detected in the fan tray controller. Replace the fan tray controller as soon as possible. The fan tray controller is located behind the fan tray above the SIBs. To maintain proper airflow through the chassis, leave the fan tray installed in the chassis until you are ready to replace the fan tray controller.
	None	Off	The fan tray controller is not receiving power.
SIB Status (SIB 0 status)	Green	On steadily	The left-most SIB in the chassis is online.

Table 11: Fan Tray LEDs on a PTX10008 Router *(Continued)*

Name	Color	State	Description
	Yellow	Blinking	An error has been detected in SIB 0. Replace the SIB as soon as possible. The SIB is located behind the left fan tray and is the left-most SIB in the chassis. To maintain proper airflow through the chassis, leave the fan tray installed in the chassis until you are ready to replace the SIB.
	None	Off	The SIB is offline.
SIB Status (SIB 1 status)	Green	On steadily	The center SIB behind the left fan tray is online.
	Yellow	Blinking	An error has been detected in SIB 1. Replace the SIB as soon as possible. The SIB is located behind the left fan tray and is the middle SIB in the group of 3. To maintain proper airflow through the chassis, leave the fan tray installed in the chassis until you are ready to replace the SIB.
	None	Off	The SIB is offline.
SIB Status (SIB 2 status)	Green	On steadily	The right-most SIB behind the left fan tray is online.
	Yellow	Blinking	An error has been detected in SIB 2. Replace the SIB as soon as possible. The SIB is located behind the left fan tray and is the right-most SIB in the group of 3. To maintain proper airflow through the chassis, leave the fan tray installed in the chassis until you are ready to replace the SIB.

Table 11: Fan Tray LEDs on a PTX10008 Router *(Continued)*

Name	Color	State	Description
	None	Off	The SIB is offline.
SIB Status (SIB 3 status)	Green	On steadily	The left-most SIB behind the right fan tray is online.
	Yellow	Blinking	An error has been detected in SIB 3. Replace the SIB as soon as possible. The SIB is located behind the right fan tray and is the left-most SIB in the group of 3. To maintain proper airflow through the chassis, leave the fan tray installed in the chassis until you are ready to replace the SIB.
	None	Off	The SIB is offline.
SIB Status (SIB 4 status)	Green	On steadily	The center SIB behind the right fan tray is online.
	Yellow	Blinking	An error has been detected in SIB 4. Replace the SIB as soon as possible. The SIB is located behind the right fan tray and is the middle SIB in the group of 3. To maintain proper airflow through the chassis, leave the fan tray installed in the chassis until you are ready to replace the SIB.
	None	Off	The SIB is offline.
SIB Status (SIB 5 status)	Green	On steadily	The right-most SIB behind the right fan tray is online.

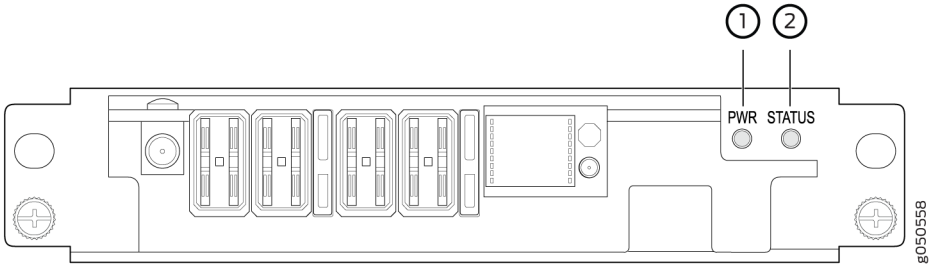
Table 11: Fan Tray LEDs on a PTX10008 Router *(Continued)*

Name	Color	State	Description
	Yellow	Blinking	An error has been detected in SIB 5. Replace the SIB as soon as possible. The SIB is located behind the right fan tray and is the right-most SIB in the group of 3. To maintain proper airflow through the chassis, leave the fan tray installed in the chassis until you are ready to replace the SIB.
	None	Off	The SIB is offline.

Fan Tray Controller LEDs

All models of fan tray controller have the same LEDs. The fan tray controller LEDs are visible only when the associated fan tray is removed. The fan tray controller LEDs are located on the right of the controller panel. Figure 27 on page 59 shows the location of the LEDs on the JNP10008-FAN-CTRL or the JNP10008-FTC2 fan tray controller faceplate.

Figure 27: Fan Tray Controller LEDs on a PTX10008



1– Fan tray controller power

2– Fan tray controller status

Table 12 on page 60 describes the functions of the fan tray controller LEDs.

Table 12: Fan Tray Controller LEDs on a PTX10008

Name	Color	State	Description
PWR (fan tray controller power)	Green	On steadily	The fan tray controller has power and is operating normally.
	Yellow	Blinking	A power error has been detected in the fan tray controller. Replace the fan tray controller as soon as possible. To maintain proper airflow through the chassis, leave the fan tray installed in the chassis until you are ready to replace the fan tray controller.
	None	Off	The fan tray controller is not powered on or is not receiving power.
STATUS (fan tray controller status)	Green	On steadily	The fan tray controller is online and is operating normally.
	Yellow	Blinking	An error has been detected in the fan tray controller. Replace the fan tray controller as soon as possible. To maintain proper airflow through the chassis, leave the fan tray installed in the chassis until you are ready to replace the fan tray controller.
	None	Off	The fan tray controller is not receiving power.

SEE ALSO

Install a PTX10008 Fan Tray | **295**

Remove a PTX10008 Fan Tray | **298**

Install a PTX10008 Fan Tray Controller | **302**

Remove a PTX10008 Fan Tray Controller | **306**

PTX10008 Power System

IN THIS SECTION

- JNP10K-PWR-AC Power Supply | 61
- JNP10K-PWR-AC2 Power Supply | 64
- JNP10K-PWR-DC Power Supply | 67
- JNP10K-PWR-DC2 Power Supply | 69
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- JNP10K-PWR-AC2 Power Supply LEDs | 75
- JNP10K-PWR-DC Power Supply LEDs | 77
- JNP10K-PWR-DC2 Power Supply LEDs | 80

You can install up to six power supplies in a PTX10008 router in the slots labeled **PEM 0** through **PEM 5** (top to bottom) located in the rear of the chassis. All models of the power supply operate in JNP10008-SF fabric systems. The JNP10008-SF3 switch fabric requires the JNP10K-PWR-AC2 or the JNP10K-PWR-DC2 power supply.

The JNP10K-PWR-AC2 and JNP10K-PWR-DC2 power supplies share power. The JNP10K-PWR-AC and JNP10K-PWR-DC power supplies do not share power.

JNP10K-PWR-AC Power Supply

The JNP10K-PWR-AC power supplies are 2700-W and support 200–240 VAC. The output power is 2700 W.



CAUTION: Do not mix AC and DC power supplies in the same chassis. AC and HVAC can coexist in the same chassis during the hot swap of AC for HVAC. Do not mix AC and HVAC power supplies in a running environment.

WARNING: The router is pluggable type A equipment installed in a restricted-access location. It has a separate protective earthing terminal on the chassis that must be connected to earth ground permanently to ground the chassis adequately and protect the operator from electrical hazards.

CAUTION: Before you begin installing the router, ensure that a licensed electrician has attached an appropriate grounding lug to the grounding cable that you supply. Using a grounding cable with an incorrectly attached lug can damage the router.

CAUTION: You can prevent AC power cables from being exposed to hot air exhaust by always routing the power cables away from the fan trays and power supplies.

The number of power supplies furnished as standard varies by configuration model. For details about different router configurations, see "PTX10008 Configurations and Upgrade Options" on page 17.

Each JNP10K-PWR-AC power supply has two independent 16-A rated AC inlets on the faceplate. Although each inlet provides sufficient input power to provide full output, always connect to a dedicated AC power feed to provide redundancy. Only one power feed is operational at a time.

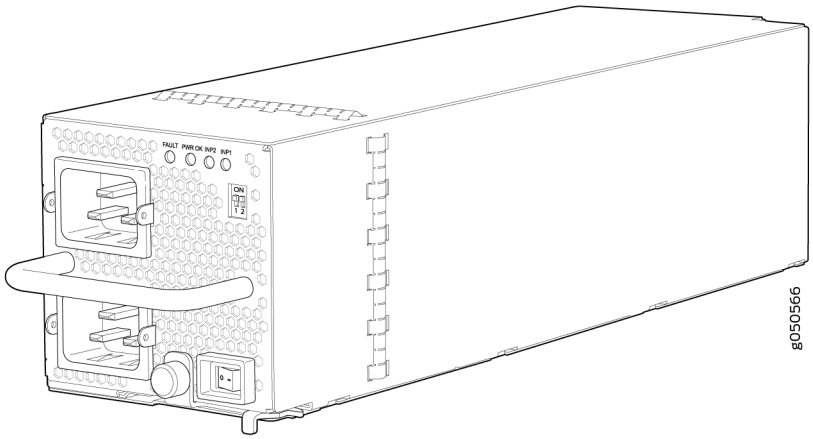
NOTE: For redundancy, always plug the two power cords from each power supply:

- **INP1** into the public electricity supply
- **INP2** into an alternative or independent power source

Each JNP10K-PWR-AC power supply has a power switch with international markings for on (**|**) and off (**O**), a fan, and four LEDs on the faceplate that indicate the status of the power supply. It also has a set

of dual inline package (DIP) switches that enable the source feeds, **INP1** and **INP2**. See Figure 28 on page 63.

Figure 28: JNP10K-PWR-AC Power Supply

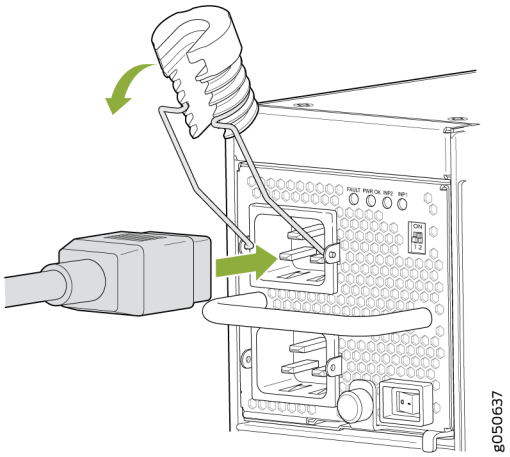


CAUTION: Use a 2-pole circuit breaker rated at 25 A in the building installation and the system, or as per local electrical code.

Each JNP10K-PWR-AC power supply comes with two power cord retainers that hold the power cords in place. See Figure 29 on page 64. Each power cord retainer has a clip and an adjustment nut. The ends of the clip hook into the bracket holes on each side of the AC appliance inlet on the faceplate. The adjustment nut holds the power cord in the correct position. For instructions on installing the power cord retainers, see "Connect AC Power to a PTX10008" on page 271.

NOTE: Route all the AC power supply cords away from the fan trays and power supply vents. Make sure that the power cords do not obstruct the fan trays or power supply vents.

Figure 29: Power Cord Retainer for an JNP10K-PWR-AC Power Supply



Each power supply connects to the power rail in the router. The power rail distributes the output power produced by the power supplies to different router components. Each power supply provides power to all the components in the router.

Each power supply has its own fan and is cooled by its own internal cooling system. Hot air exhausts from the rear of the chassis.

SEE ALSO

JNP10K-PWR-AC Power Specifications | **195**

Install a JNP10K-PWR-AC Power Supply | **310**

Remove a JNP10K-PWR-AC Power Supply | **315**

JNP10K-PWR-AC2 Power Supply

The JNP10K-PWR-AC2 power supply is a high-capacity model that is designed to support AC, high voltage AC (HVAC), or high voltage DC (HVDC) systems in either a 20-A or a 30-A mode. The power supply feeds AC input and provides DC output 5000 W with a single feed and 5500 W with a dual feed.

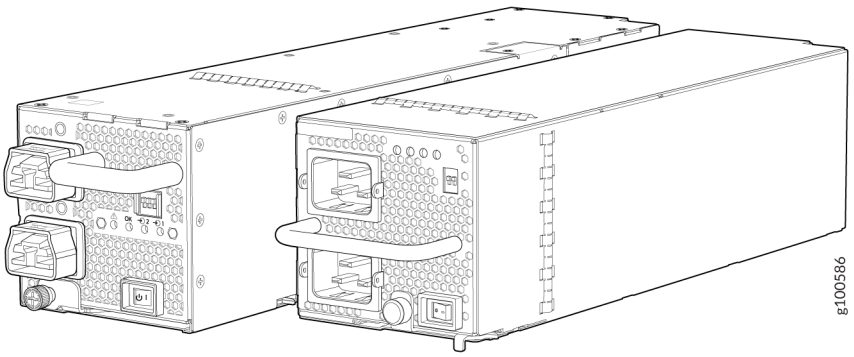
For AC systems, the operating input voltage is 180 to 305 VAC and for DC systems, the operating input voltage is 190 to 410 VDC.

The number of power feeds and whether the power supplies provide high output (30-A) or low output (20-A) power is configured using a set of dual inline package (DIP) switches on the faceplate of the power supply. If one power supply in the chassis is set to low power, the power budget for the chassis is reduced to low power, regardless of their DIP switch settings or the output results in CLI. This design safeguards against accidentally setting the power supply to 30-A in a facility that can only provide 20-A and tripping the facility circuit breaker. We recommend that you do not mix DIP switch settings in your system. See Table 13 on page 66 for information about the input and output voltages when you use the DIP switches.

CAUTION: For each JNP10K-PWR-AC2 power supply set to 20-A mode, use a 2-pole 20-A circuit breaker for each input connected to AC MAINS. For each JNP10K-PWR-AC2 power supply set to 30-A mode, use a 2-pole 32-A circuit breaker for each input connected to AC MAINS.

The JNP10K-PWR-AC2 fits into the standard power supply bay but when compared to the JNP10K-PWR-AC, the JNP10K-PWR-AC2 is longer and protrudes from the bay when fully inserted into the chassis. See Figure 30 on page 65 to see the differences in power supply length.

Figure 30: Comparison Between the JNP10K-PWR-AC2 and the JNP10K-PWR-AC Power Supplies



All models of PTX10008 power supplies have internal fans that contribute to chassis cooling. However, the JNP10K-PWR-AC2 and JNP10K-PWR-DC2 power supplies play a more substantial role in cooling the chassis than the JNP10K-PWR-AC and JNP10K-PWR-DC models. Consequently, all six JNP10K-PWR-AC2 or JNP10K-PWR-DC2 power supplies must be present in a running chassis to have the adequate airflow. While all power supplies are required to be present in the chassis, they do not

necessarily need to be all connected to power. If a power supply is installed in a slot but not connected to a power source, it draws power from the chassis to power the internal fans in the power supplies.

WARNING: Extreme burn danger—Do not handle an HVAC or HVDC power supply running in the chassis without heat protective gloves, such as welder's gloves. The JNP10K-PWR-AC2 can reach temperatures in the range of 158°F to 176°F (70°C to 80°C) under running conditions.

WARNING: The router is pluggable type A equipment installed in a restricted-access location. It has a separate protective earthing terminal on the chassis that must be connected to earth ground permanently to ground the chassis adequately and protect the operator from electrical hazards.

CAUTION: Before you begin installing the router, ensure that a licensed electrician has attached an appropriate grounding lug to the grounding cable that you supply. Using a grounding cable with an incorrectly attached lug can damage the router.

Table 13: Power Input and Output Voltages for JNP10K-PWR-AC2 Power Supplies

IP1	IP2	H/L (High Input 30 A/Low Input 20 A)	Output Power
On	On	On (30 A)	5500 W
On	On	Off (20 A)	3000 W
On	Off	On (30 A)	5000 W
Off	On	On (30 A)	5000 W
On	Off	Off (20 A)	2700 W
Off	On	Off (20 A)	2700 W

NOTE: If one of the DIP switches is in the on position and if the power switch is set to the off position, the system raises an alarm that the input feeds are missing. You can avoid this by setting both the DIP switches to off position.

NOTE:

- IP1
  - INP1 in the CLI output for Junos OS Evolved Release 20.4R2 or later.
  - INP0 in the CLI output for releases earlier than Junos OS Evolved Release 20.4R2.
- IP2
  - INP2 in the CLI output for Junos OS Evolved Release 20.4R2 or later.
  - INP1 in the CLI output for releases earlier than Junos OS Evolved Release 20.4R2.

CAUTION: It is important to connect both input feeds of the JNP10K-PWR-AC2 power supply to AC mains before loading the system with power.

JNP10K-PWR-DC Power Supply

The DC power supply, JNP10K-PWR-DC, is a 2500-W, dual input power supply. The output power is 2500 W.

WARNING: The router is pluggable type A equipment installed in a restricted-access location. It has a separate protective earthing terminal on the chassis that must be connected to earth ground permanently to ground the chassis adequately and protect the operator from electrical hazards.

CAUTION: Before you begin installing the router, ensure that a licensed electrician has attached an appropriate grounding lug to the grounding cable that you supply. Using a grounding cable with an incorrectly attached lug can damage the router.

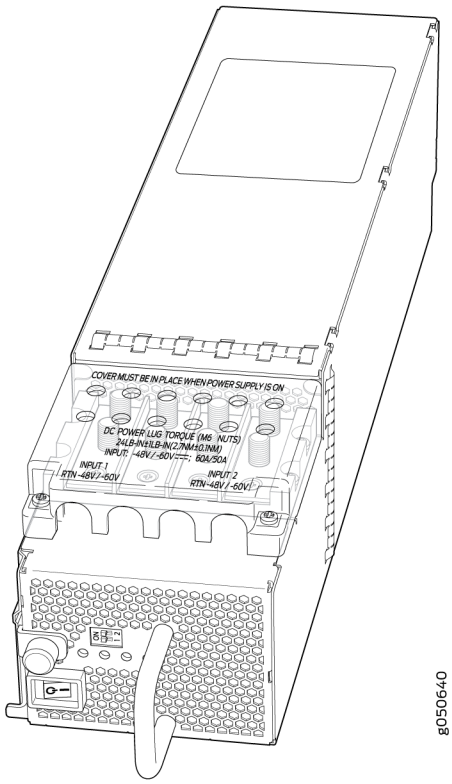
NOTE: DC power supplies are shipped only in the redundant configuration of PTX10008 routers. For details about different chassis configurations, see "PTX10008 Configurations and Upgrade Options" on page 17.

Each JNP10K-PWR-DC power supply has two independent pairs of DC input lugs (**Input 1, RTN, –48V/–60V** and **Input 2, RTN, –48V/–60V**) on the faceplate of the power supply. Each inlet requires a dedicated DC power feed. Although each inlet provides sufficient input power to provide full output, always connect the power supply to a dedicated DC power feed to provide redundancy. Only one power feed is operational at a time.

DC power models employ electronic A-B input selection. Should one power source fail, electronic A-B input selection routes the power supply to the alternate source. The power supply internally balances power between source input A and source input B. The default is to balance 50% to each input.

Each JNP10K-PWR-DC power supply has a power switch with international markings for on (**|**) and off (**O**), a built-in fan, and four LEDs on the faceplate that indicate the status of the power supply. See Figure 31 on page 68.

Figure 31: JNP10K-PWR-DC Power Supply



NOTE: The JNP10K-PWR-DC power supply requires a dedicated circuit breaker for each input DC feed. The chosen breaker should be sized to deliver 60 A of input current.

Each power supply connects to the combined power rail in a PTX10008 router. The power rail distributes the output power produced by the power supplies to different router components. Each DC power supply provides power to all the components in the router.

NOTE: Route all the DC power supply cords away from the fan trays and power supply vents. Make sure that the power cords do not obstruct the fan trays or power cords.

A JNP10K-PWR-DC power supply can operate with only one input DC feed connected.

Each JNP10K-PWR-DC power supply has its own fan and is cooled by its own internal cooling system. The airflow is from the front of the power supply to the back. Hot air exhausts from the rear of the chassis.

SEE ALSO

JNP10K-PWR-DC Power Specifications | **208**

Install a JNP10K-PWR-DC Power Supply | **326**

Remove a JNP10K-PWR-DC Power Supply | **336**

JNP10K-PWR-DC2 Power Supply

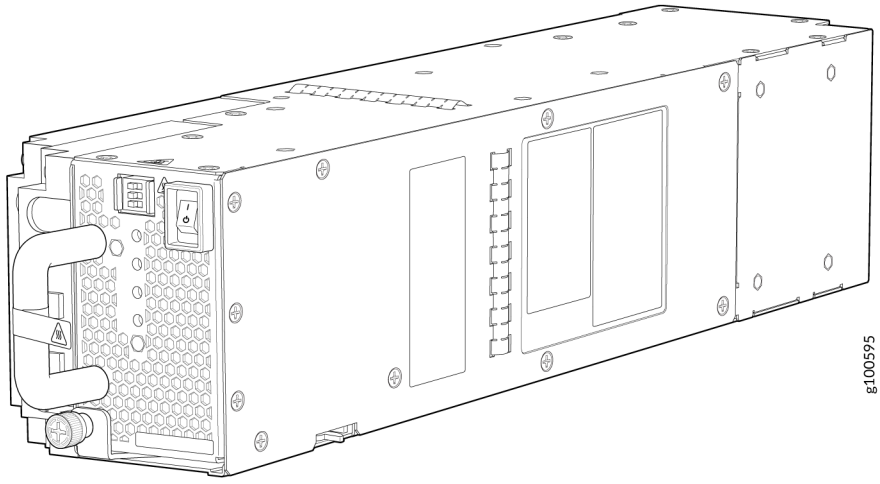
The JNP10K-PWR-DC2 power supply provides two power supplies in a single housing that accepts either 60 A or 80 A using four redundant input power feeds. The two internal power supplies (PS_0 and PS_1) each have redundant input feeds: A0 and/or B0 for PS_0 and A1 and/or B1 for PS_1. You configure the input using a set of three DIP switches on the power supply faceplate that sets the combined output power for both internal power supplies. The output depends on the settings of these DIP switches. See Table 14 on page 70 and Figure 32 on page 70.

Table 14: Power Input and Output Voltages for JNP10K-PWR-DC2 Power Supplies

PS0 (A0 or B0)	PS1 (A1 or B1)	H/L (High Input 80 A/ Low Input 60 A)	Output Power
On	On	On (80 A)	5500 W
On	On	Off (60 A)	4400 W
On	Off	On (80 A)	2750 W
Off	On	On (80 A)	2750 W
On	Off	Off (60 A)	2200 W
Off	On	Off (60 A)	2200 W

CAUTION: The JNP10K-PWR-DC2 power supply requires a dedicated circuit breaker for each input DC feed. Choose a breaker that delivers 72 A of input current.

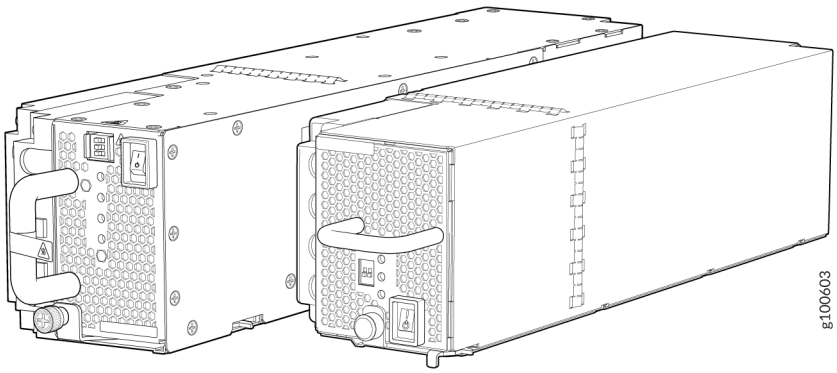
Figure 32: JNP10K-PWR-DC2 Power Supply



The input capacitance value for the front-end EMI capacitor before the pre-charge circuit in the power supply is 12.2 uF. There is a 15,000 uF bulk capacitor after the pre-charge circuit.

The JNP10K-PWR-DC2 fits into the standard power supply bay but when compared to the JNP10K-PWR-DC, the JNP10K-PWR-DC2 is longer and protrudes from the bay when fully inserted into the chassis. See Figure 33 on page 71 to see the differences in power supply length.

Figure 33: Comparison Between the JNP10K-PWR-DC2 and JNP10K-PWR-DC Power Supplies



All models of PTX10008 power supplies have internal fans that contribute to chassis cooling. However, the JNP10K-PWR-AC2 and JNP10K-PWR-DC2 power supplies play a more substantial role in cooling the chassis than the JNP10K-PWR-AC and JNP10K-PWR-DC models. Consequently, all six JNP10K-PWR-AC2 or JNP10K-PWR-DC2 power supplies must be present in a running chassis to have the adequate airflow. While all power supplies are required to be present in the chassis, they do not necessarily need to be all connected to power. If a power supply is installed in a slot but not connected to a power source, it draws power from the chassis to power the internal fans in the power supplies.

CAUTION: Do not mix power supply models in the same chassis in a running environment. JNP10K-PWR-DC and JNP10K-PWR-DC2 can coexist in the same chassis during power supply upgrades.

WARNING: The router is pluggable type A equipment installed in a restricted-access location. It has a separate protective earthing terminal on the chassis that must be

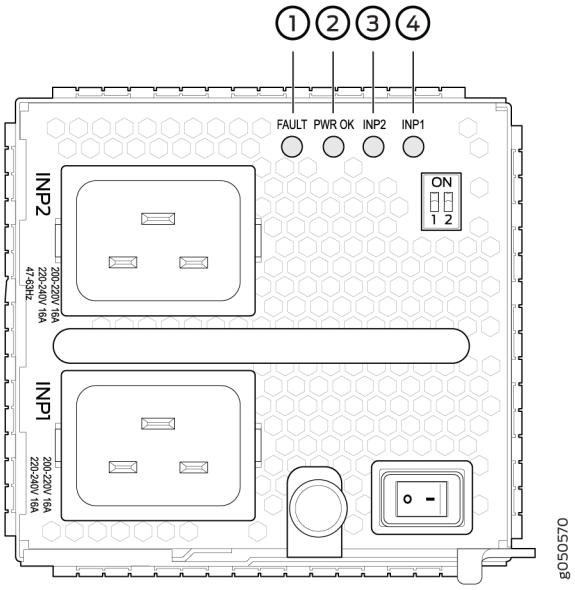
connected to earth ground permanently to ground the chassis adequately and protect the operator from electrical hazards.

CAUTION: Before you begin installing the router, ensure that a licensed electrician has attached an appropriate grounding lug to the grounding cable that you supply. Using a grounding cable with an incorrectly attached lug can damage the router.

JNP10K-PWR-AC Power Supply LEDs

The JNP10K-PWR-AC power supply has four LEDs on its faceplate: **INP1**, **INP2**, **PWR OK**, and **FAULT**. These LEDs display information about the status of the power supply. See Figure 34 on page 72.

Figure 34: LEDs on the JNP10K-PWR-AC Power Supply



1– **FAULT** LED	3– **INP2** LED
2– **PWR OK** LED	4– **INP1** LED

Table 15 on page 73 describes the LEDs on the JNP10K-PWR-AC power supply.

Table 15: LEDs on the JNP10K-PWR-AC Power Supply

LED	Color	State	Description

• INP1
  • INP1 in the CLI output for Junos OS Evolved Release 20.4R2 or later.
  • INP0 in the CLI output for releases earlier than Junos OS Evolved Release 20.4R2.
• INP2
  • INP2 in the CLI output for Junos OS Evolved Release 20.4R2 or later
  • INP1 in the CLI output for releases earlier than Junos OS Evolved Release 20.4R2
	Green	Solid	The power supply is functioning properly.

	Yellow	Blinking	The power supply has detected a power input fault.
	None	Unlit	The power supply is switched off.
PWR OK	Green	Solid	The power supply is functioning properly.
	Yellow	Blinking	The power supply has detected a power output fault.
FAULT	None	Unlit	The power supply is functioning properly.

Table 15: LEDs on the JNP10K-PWR-AC Power Supply *(Continued)*

LED	Color	State	Description
	Red	Solid	The power supply has failed and must be replaced. Or, only one input is powered and the enabled router for the input that is not powered is set to **ON**. See "Install a JNP10K-PWR-AC Power Supply" on page 310 for more information about the enable switches.

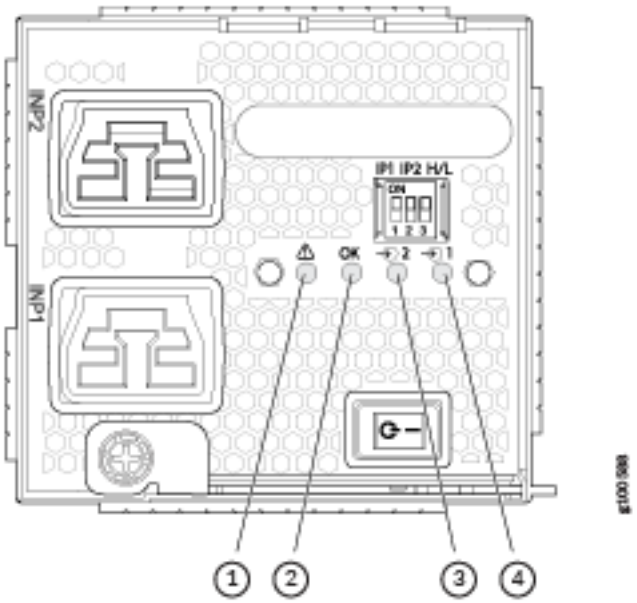
NOTE: If the **INP1** or **INP2** LED and the **PWR OK** LED are unlit, the AC power cable is not installed properly or the power supply has failed.

If the **INP1** or **INP2** LED is lit and the **PWR OK** LED is unlit, the AC power supply is not installed properly or the power supply has an internal failure.

JNP10K-PWR-AC2 Power Supply LEDs

The JNP10K-PWR-AC2 power supply has four LEDs on its faceplate: **!**, **OK**, **2**, and **1**. These LEDs display information about the status of the power supply. See Figure 35 on page 75.

Figure 35: LEDs on a JNP10K-PWR-AC2 Power Supply



1– **!** LED	3– **2** LED
2– **OK** LED	4– **1** LED

Table 16 on page 75 describes the LEDs on a JNP10K-PWR-AC2 power supply.

Table 16: Interpreting JNP10K-PWR-AC2 LEDs

LED	Color	State	Description
1 • INP1 in the CLI output for Junos OS Evolved Release 20.4R2 or later.	Yellow	Blinking	The input voltage is present, but a fault is detected.
	Green	Solid	The power supply is functioning properly.

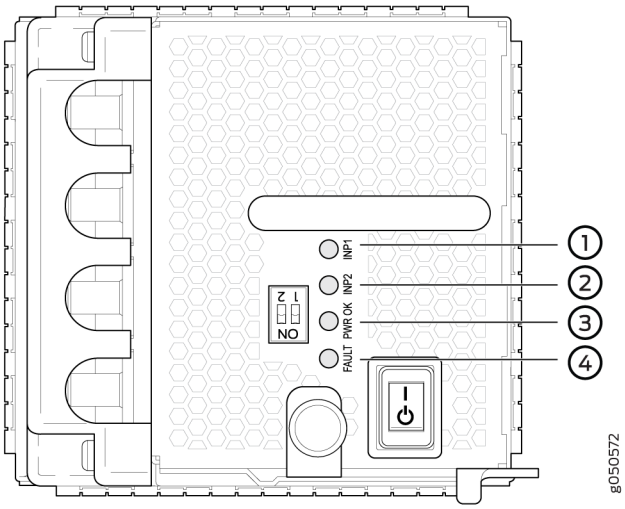
Table 16: Interpreting JNP10K-PWR-AC2 LEDs *(Continued)*

LED	Color	State	Description
• INP0 in the CLI output for releases earlier than Junos OS Evolved Release 20.4R2.	Unlit	Off	The power supply is switched off; voltage is zero.
2 • INP2 in the CLI output for Junos OS Evolved Release 20.4R2 or later. • INP1 in the CLI output for releases earlier than Junos OS Evolved Release 20.4R2.	Yellow	Blinking	The input voltage is present, but a fault is detected.
	Green	Solid	The power supply is functioning properly.
	Unlit	Off	The power supply is switched off; voltage is zero.
OK (Power OK)	Green	Solid	The power supply is functioning properly.
	Yellow	Blinking	The power supply output has detected a fault.
! (Fault)	Red	Solid	The power supply has failed and must be replaced.
	Unlit	Off	The power supply is functioning normally.

JNP10K-PWR-DC Power Supply LEDs

The JNP10K-PWR-DC power supply has four LEDs on its faceplate: **INP1**, **INP2**, **PWR OK**, and **FAULT**. These LEDs display information about the status of the power supply. See Figure 36 on page 77.

Figure 36: LEDs on a JNP10K-PWR-DC Power Supply



1– **INP1** LED	3– **PWR OK** LED
2– **INP2** LED	4– **FAULT** LED

NOTE: Physical markings on the power supply are **INP1** and **INP2**. These markings correspond to PS0, A0, or B0 and PS1, A1, or B1 in the `show chassis power` output (see Table 17 on page 77).

Table 17: Physical Markings on Chassis Versus show chassis power Command

Physical Marking on JNP10K-PWR-DC2	show chassis power Command
INP1	PS0 in the CLI output for releases earlier than Junos OS Release 20.4R2 and Junos OS Evolved Release 20.4R2 A0 or B0 in the CLI output for Junos OS Release 20.4R2 or later and Junos OS Evolved Release 20.4R2 or later

Table 17: Physical Markings on Chassis Versus show chassis power Command *(Continued)*

Physical Marking on JNP10K-PWR-DC2	show chassis power Command
INP2	PS1 in the CLI output for releases earlier than Junos OS Release 20.4R2 and Junos OS Evolved Release 20.4R2 A1 or B1 in the CLI output for Junos OS Release 20.4R2 or later and Junos OS Evolved Release 20.4R2 or later

Table 18 on page 78 describes the LEDs on the JNP10K-PWR-DC power supply.

Table 18: LEDs on a JNP10K-PWR-DC Power Supply

LED	Color	State	Description

• INP1
  • INP1 in the CLI output for Junos OS Evolved Release 20.4R2 or later.
  • INP0 in the CLI output for releases earlier than Junos OS Evolved Release 20.4R2.
• INP2
  • INP2 in the CLI output for Junos OS Evolved Release 20.4R2 or later.
  • INP1 in the CLI output for releases earlier than Junos OS Evolved Release 20.4R2.
	Yellow	Blinking	Indicates that the DC power input voltage is not within normal operating range.

	Green	Solid	DC power is within operating range (–40 VDC to –72 VDC).
	Unlit	Off	The power supply is switched off.

Table 18: LEDs on a JNP10K-PWR-DC Power Supply *(Continued)*

LED	Color	State	Description
PWR OK	Green	Solid	DC power output is within normal operating range.
	Yellow	Blinking	The output is out of the limits.
FAULT	Red	Solid	Power supply has failed and must be replaced.
	Unlit	Off	Power supply is functioning normally. Or, only one input is powered and the enable switch for the input that is not powered is set to **ON**. See "Install a JNP10K-PWR-DC Power Supply" on page 326 for more information on the enable switches.

NOTE: If the **INP1** or **INP2** and the **PWR OK** LED are unlit, the power cables are not installed properly or the power supply has failed.

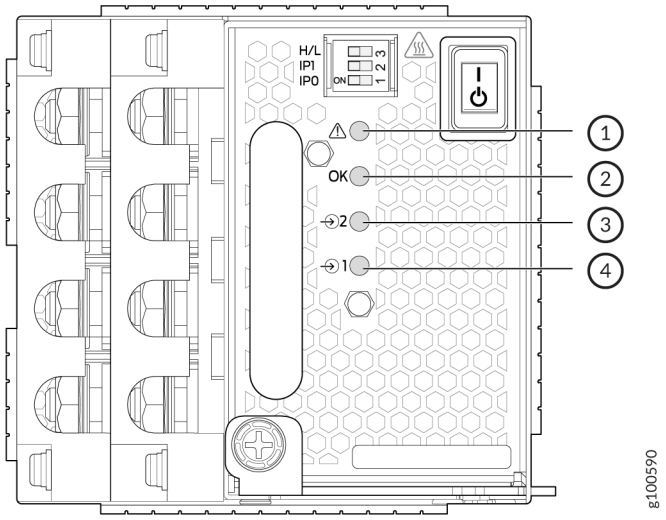
If the **INP1** or **INP2** LED is lit green and the **PWR OK** LED is unlit, the power supply is not installed properly or the power supply has an internal failure.

If the **FAULT** LED is blinking, add a power supply to balance the power demand and supply.

JNP10K-PWR-DC2 Power Supply LEDs

A JNP10K-PWR-DC2 power supply has four LEDs on its faceplate: **!**, **OK**, **2**, and **1**. These LEDs display information about the status of the power supply. See Figure 37 on page 80.

Figure 37: LEDs on a JNP10K-PWR-DC2 Power Supply



1– **!** LED	3– **2** LED
2– **OK** LED	4– **1** LED

You can find out the version of the firmware installed in the power supply from the output of `show system firmware` command. Table 19 on page 80 describes the LEDs on a JNP10K-PWR-DC2 power supply if the firmware installed in the power supply is 300.300.208.208.304 or higher. Table 20 on page 82 describes the LEDs on a JNP10K-PWR-DC2 power supply if the firmware installed in the power supply is lower than 300.300.208.208.304.

Table 19: LEDs on a JNP10K-PWR-DC2 Power Supply (with 300.300.208.208.304 or higher firmware installed in it)

Feed 0	Feed 1	State of the Power Supply Switch	LED **1**	LED **2**	**OK** LED	**!** LED
Off	Off	Off	Orange	Orange	Off	Red

Table 19: LEDs on a JNP10K-PWR-DC2 Power Supply (with 300.300.208.208.304 or higher firmware installed in it) *(Continued)*

Feed 0	Feed 1	State of the Power Supply Switch	LED **1**	LED **2**	**OK** LED	**!** LED
A or B	Off	Off	Green—Blinking	Orange	Off	Red
A and B	Off	Off	Green	Orange	Off	Red
Off	A or B	Off	Orange	Green—Blinking	Off	Red
A or B	A or B	Off	Green—Blinking	Green—Blinking	Off	Red—Blinking
A and B	A or B	Off	Green	Green—Blinking	Off	Red—Blinking
Off	A and B	Off	Orange	Green	Off	Red
A or B	A and B	Off	Green—Blinking	Green	Off	Red—Blinking
A and B	A and B	Off	Green	Green	Off	Off
Off	Off	On	Orange	Orange	Off	Red
A or B	Off	On	Green—Blinking	Orange	Green	Red
A and B	Off	On	Green	Orange	Green	Red
Off	A or B	On	Orange	Green—Blinking	Green	Red

Table 19: LEDs on a JNP10K-PWR-DC2 Power Supply (with 300.300.208.208.304 or higher firmware installed in it) *(Continued)*

Feed 0	Feed 1	State of the Power Supply Switch	LED **1**	LED **2**	**OK** LED	**!** LED
A or B	A or B	On	Green—Blinking	Green—Blinking	Green	Red—Blinking
A and B	A or B	On	Green	Green—Blinking	Green	Red—Blinking
Off	A and B	On	Orange	Green	Green	Red
A or B	A and B	On	Green—Blinking	Green	Green	Red—Blinking
A and B	A and B	On	Green	Green	Green	Off

Table 20: LEDs on a JNP10K-PWR-DC2 Power Supply (with firmware lower than 300.300.208.208.304 installed in it)

LED	Color	State	Description
• 1 • PS0 in the CLI output for releases earlier than Junos OS Release 20.4R2 and Junos OS Evolved Release 20.4R2 • A0 or B0 in the CLI output for Junos OS Release 20.4R2 or later	Green	Solid	The DC power is within operating range (–40 VDC to –72 VDC).
	Yellow	Blinking (if the part number of the power supply is 740-073256 Rev 3 or earlier)	The DC power input voltage is not within normal operating range.

Table 20: LEDs on a JNP10K-PWR-DC2 Power Supply (with firmware lower than 300.300.208.208.304 installed in it) *(Continued)*

LED	Color	State	Description
and Junos OS Evolved Release 20.4R2 or later • 2 • PS1 in the CLI output for releases earlier than Junos OS Release 20.4R2 and Junos OS Evolved Release 20.4R2 • A1 or B1 in the CLI output for Junos OS Release 20.4R2 or later and Junos OS Evolved Release 20.4R2 or later	Orange	On steadily (if the part number of the power supply is 740-073256 Rev 4 or later)	
	Unlit	Off	The power supply is switched off.
OK (Power OK)	Green	Solid	The DC power output is within normal operating range.
	Yellow	Blinking	The power supply output is out of the power limits.
! (Fault)	Red	Solid	The power supply inputs are misconfigured or the power supply has failed and must be replaced.
	Red	Blinking	The power supply feed is missing one of the inputs (A or B).

Table 20: LEDs on a JNP10K-PWR-DC2 Power Supply (with firmware lower than 300.300.208.208.304 installed in it) *(Continued)*

LED	Color	State	Description
	Unlit	Off	The power supply is functioning normally. Or, only one input is powered and the enable switch for the input that is not powered is set to **ON**. See "Connect DC Power to a PTX10008" on page 271 for more information about the enable switches.

NOTE: If the **1** or **2** and the **OK** LED are unlit, the power cables are not installed properly or the power supply has failed.

If the **1** or **2** LED is lit green and the **OK** LED is unlit, the power supply is not installed properly or the power supply has an internal failure.

If the **!** LED is blinking, add a power supply to balance the power demand and supply.

PTX10008 Routing and Control Board Components and Descriptions

IN THIS SECTION

- PTX10008 Routing and Control Board Description | **85**
- PTX10008 Routing and Control Board LEDs | **88**

The Routing and Control Board (RCB) is an integrated board and a single FRU that provides Routing Engine and Control Board (CB) functionality. The Routing Engine performs all route-processing functions, whereas the CB performs chassis control and management plane functionality. The RCB provides control plane functions. You can install one or two RCBs on the router. Each RCB functions as a unit.

PTX10008 Routing and Control Board Description

IN THIS SECTION

- Routing and Control Board Functions | 86
- Routing and Control Board Components | 87

The PTX10008 Routing and Control Board (RCB) is responsible for system management in a PTX10008 (see Figure 38 on page 86). The chassis can run with one or two RCBs. We ship the base configurations with one RCB; and you can expand the configuration with a second RCB for a fully-redundant system. When two RCBs are installed, one functions as the primary RCB and the second as a backup. If the primary RCB is removed, the backup RCB becomes the primary if GRES is configured.

PTX10008 routers support the following Routing Engines for systems running standard Junos OS:

- JNP10K-RE0
- JNP10K-RE1
- JNP10K-RE1-LT
- JNP10K-RE1-128G

Starting in Junos OS Evolved 19.4R1-S1, the following RCBs are available that run in JNP10008-SF3 compatible systems:

- JNP10K-RE1-E (64 GB, standard on new PTX10008 systems)
- JNP10K-RE1-ELT (64 GB, runs limited Junos OS Evolved Release 20.3R1 and later, spare)
- JNP10K-RE1-E128 (128 GB, spare)

- JNP10K-RE2-E128 (128 GB, runs Junos OS Evolved Release 22.4R1 and later, spare)

Figure 38: JNP10K-RE0

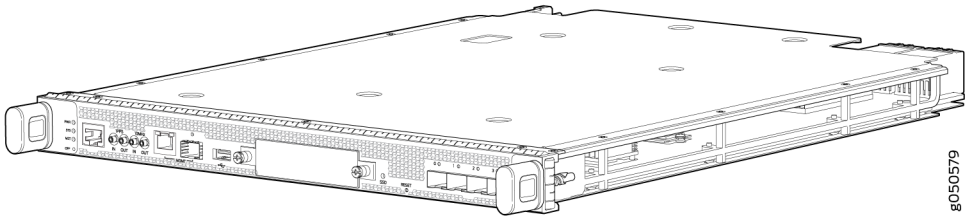
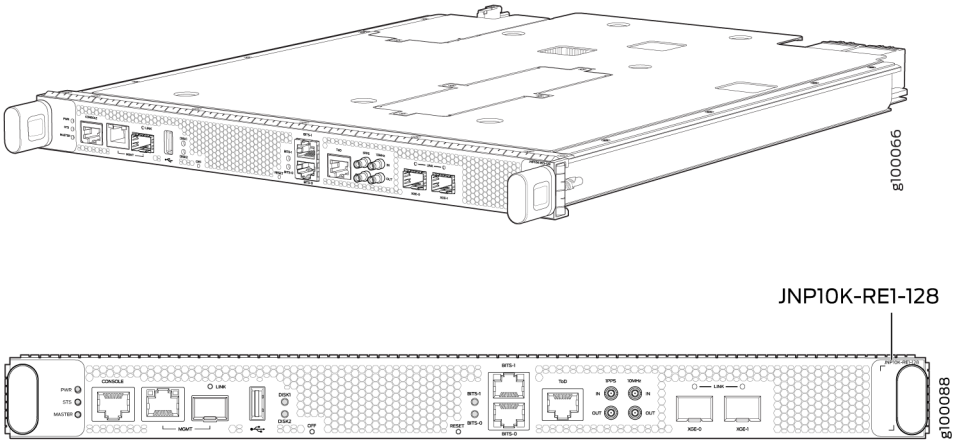


Figure 39: JNP10K-RE1, JNP10K-RE1-E, JNP10K-RE1-128G, JNP10K-RE1-ELT, JNP10K-RE1-E128, and JNP10K-RE2-E128



Routing and Control Board Functions

The Routing and Control Board integrates the control plane and Routing Engine functions into a single management unit. Each RCB provides all the functions needed to manage the operation of the modular chassis:

- System control functions such as environmental monitoring
- Routing Layer 2 and Layer 3 protocols
- Communication to all components such as line cards, Switch Interface Boards (SIBs), and power and cooling
- Transparent clocking

- Alarm and logging functions

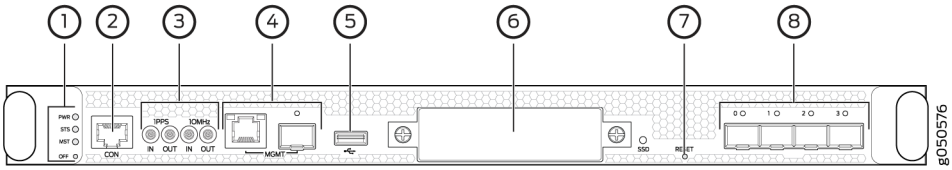
Routing and Control Board Components

Each RCB consists of the following internal components:

- Quad-core 2.5-GHz CPU
- 32 GB SDRAM
- SATA SSD

Other standard features are shown in Figure 40 on page 87.

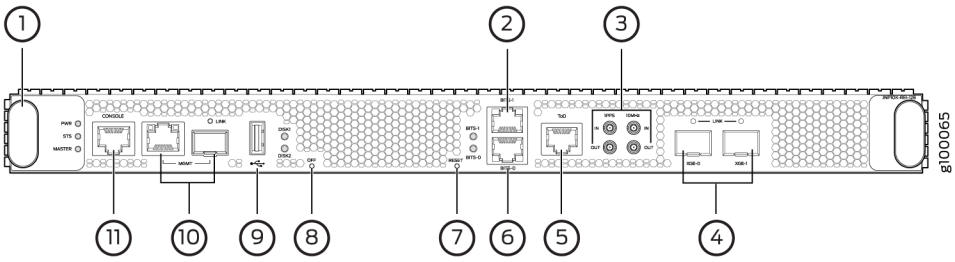
Figure 40: Routing and Control Board Faceplate (JNP10K-RE0)



1– RCB status LEDs	5– USB 2.0 port
2– Console (**CON**) port	6– Secondary 50-GB SATA SSD slot
3– PTP-capable connections: SMB In, SMB Out, 10 MHz In, 10 MHz Out	7– Reset (**RESET**) button
4– Ethernet management (**MGMT**) ports: RJ-45 port for 10/100/1000 BASE-T (em0) and small-form factor pluggable (SFP) for port fiber (em1). If both copper and fiber cables are installed, the RJ-45 is the default.	8– Four SFP+ ports (reserved for future use)

NOTE: You can use either management interface, em0 or em1 when the RCB is running as the primary RE. Use only em1 when the RCB is running as the backup RE.

Figure 41: Routing and Control Board Faceplate (JNP10K-RE1 and JNP10K-RE1-E, JNP10K-RE1-LT and JNP10K-RE1-ELT)



1– Handles	7– Reset button
2– **BITS-1** clock port	8– Online/Offline button
3– GPS clock ports (**1PPS** and **10MHz**)	9– USB port
4– **XGE-0** and **XGE-1** not used (reserved ports)	10– Management (**MGMT**) ports
5– **ToD**—Time-of-day (TOD) port	11– Console (**CONSOLE**) port
6– **BITS-0** clock port	

SEE ALSO

How to Handle and Store PTX10008 Line Cards, RCBs, and SIBs | **354**

Install a PTX10008 Routing and Control Board | **290**

PTX10008 Routing and Control Board LEDs

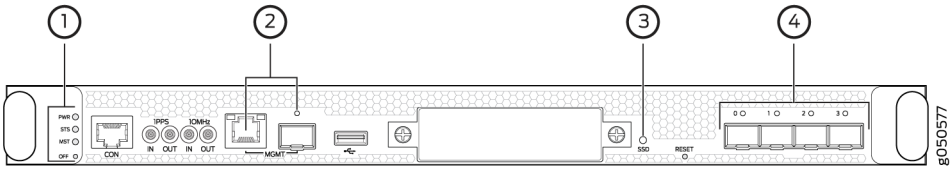
IN THIS SECTION

- Routing and Control Board Status Panel LEDs | **90**
- PTX10008 Management Port LEDs | **91**

- SATA SSD LEDs | **92**
- Clock LEDs (JNP10K-RE1, JNP10K-RE1-LT, and JNP10K-RE1-128) | **93**

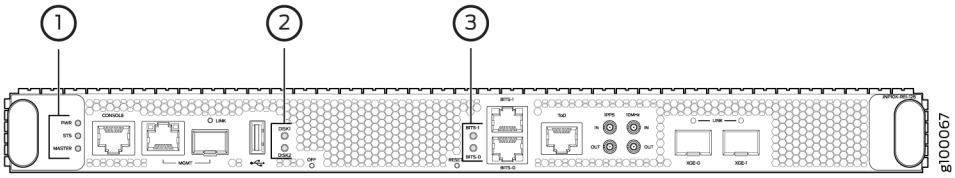
The PTX10008 Routing and Control Boards (RCBs) have various types of LED indicators (see Figure 42 on page 89).

Figure 42: PTX10008 Routing and Control Board (JNP10K-RE0) LEDs



1– RCB status panel LEDs	3– SATA **SSD**
2– Management ports and LED	4– Virtual port connection

Figure 43: PTX10008 Routing and Control Board (JNP10K-RE1 and JNP10K-RE1-E) LEDs

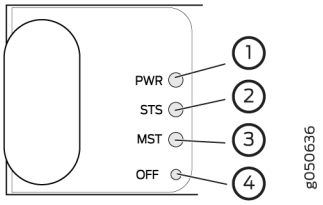


1– RCB status panel LEDs	3– Clock LEDs—**BITS-0** and **BITS-1**
2– SSD LEDs—**DISK1** and **DISK2**	

Routing and Control Board Status Panel LEDs

The RCB status panel LEDs indicate the state of the RCB (see Figure 44 on page 90).

Figure 44: Routing and Control Board Status Panel LEDs and Button



1– Power (**PWR**) LED	3– Primary (**MST**) LED
2– Status (**STS**) LED	4– Offline (**OFF**) button

Table 21 on page 90 describes the LEDs on the RCB status panel.

Table 21: Routing and Control Board Status LEDs

LED	Color	State	Description
PWR (Power)	Green	On steadily	The RCB is receiving adequate power.
	Yellow	Blinking	The RCB has detected an error.
	None	Unlit	The RCB is not powered up.
STS (Status)	Green	On steadily	The RCB is online and functioning correctly.
	Green	Blinking	The beacon feature is enabled.
	Yellow	On steadily	The RCB is booting.
	Yellow	Blinking	The RCB has detected an error.
	None	Unlit	The RCB is not receiving power.

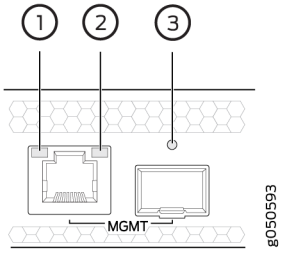
Table 21: Routing and Control Board Status LEDs *(Continued)*

LED	Color	State	Description
MST (Primary)	Green	On steadily	The RCB is the primary RCB.
	None	Unlit	The RCB is the backup RCB.

PTX10008 Management Port LEDs

The two management ports on the RCB of a PTX10008 router have LEDs that indicate link status and link activity. These two ports, located on the RCB panel between the clocking connections and the USB port, are both labeled **MGMT**. The left management port (RJ-45) is for 10/100/1000 BASE-T connections, and the right port (SFP) is for 10/100/1000 BASE-T and small form-factor pluggable (SFP) 1000 BASE-X connections (see Figure 45 on page 91). The copper (RJ-45) port has separate LEDs for status and activity. The fiber (SFP) port has a combination link and activity LED.

Figure 45: Management Port LEDs on a PTX10008



1– Status LED (RJ-45)	3– Link/activity/status LED (SFP))
2– Activity LED (RJ-45)	

Table 22 on page 91 describes the RJ-45 management port LEDs, and Table 23 on page 92 describes the SFP status LEDs.

Table 22: RJ-45 Management Port LEDs on a PTX10008 Routing and Control Board

LED	Color	State	Description
Port speed	Unlit	Off	The port speed is 10 MB.

Table 22: RJ-45 Management Port LEDs on a PTX10008 Routing and Control Board *(Continued)*

LED	Color	State	Description
	Green	Blinking	The port speed is 100 MB.
	Green	On steadily	The port speed is 1000 MB.
Link/Activity/Status	Unlit	Off	No link is established, there is a fault, or the link is down.
	Green	On steadily	A link is established.
		Blinking	There is link activity.
	Yellow	Blinking or flickering	The beacon feature is enabled.

Table 23: SFP Management Port LEDs on a PTX10008 Routing and Control Board

LED	Color	State	Description
Link/Activity/Status	Unlit	Off	No transceiver is present.
	Green	On steadily	A link is established. The interface is up.
	Green	Blinking or flickering	The beacon feature is enabled.
	Yellow	Blinking	An error has occurred.

XGE0 and **XGE1** are not used.

SATA SSD LEDs

The Serial Advanced Technology Attachment (SATA) solid-state drive (SSD) LEDs indicate the status of the secondary drive.

Table 24 on page 93 describes the LEDs for the secondary SATA drive.

Table 24: Routing and Control Board SSD Status LEDs

LED	Color	State	Description
SSD on JNP10K-RE0 **DISK1** and **DISK2** on JNP10K-RE1	Green	On steadily	A SATA drive is present.
	Green	Blinking	The drive is active.
	Yellow	On steadily	The drive is active.
	Dark	Unlit	A drive is not installed.

Clock LEDs (JNP10K-RE1, JNP10K-RE1-LT, and JNP10K-RE1-128)

The clock LEDs indicate whether clocking is active.

Table 25 on page 93 describes the BITS LEDs starting in Junos Evolved 21.4 R1.

Table 26 on page 94 describes the clock LEDs in releases earlier than Junos Evolved 21.4 R1.

Table 25: Description of BITS LEDs

LEDs	Color/State	Description
Clock LEDs—**BITS-0** and **BITS-1**	Green	The clock synchronization source is configured and qualified, the clock synchronization output is configured, and the output is active.
		The clock synchronization source is not configured but the clock synchronization output is configured and active.
		The clock synchronization source is configured and qualified but the clock synchronization output is not configured.
	Red	The clock synchronization source is configured and qualified, and the output is active and is in holdover state.

Table 25: Description of BITS LEDs *(Continued)*

LEDs	Color/State	Description
		The clock synchronization source is not configured, but the output is active and is in holdover state.
		The clock synchronization source is configured, but has failed.
		The TX status is in squelched mode.
	Off	Both the clock synchronization source and the clock synchronization output are not configured.

Table 26: Routing and Control Board Clock Status LED

LEDs	Color	State	Description
Clock LEDs—**BITS-0** and **BITS-1**	Red	Off	Clock is active.
		On steadily	Clock is not working.

SEE ALSO

Install a PTX10008 Routing and Control Board | **290**

Remove a PTX10008 Routing and Control Board | **293**

PTX10008 Switch Fabric

IN THIS SECTION

- PTX10008 Switch Interface Board Description | 95
- PTX10008 Switch Interface Board LEDs | 100

The PTX10008 Switch Interface Boards (SIBs) form the switch fabric for the router.

PTX10008 Switch Interface Board Description

Switch Interface Boards (SIBs) create the switch fabric for the PTX10008. Each PTX10008 contains between five and six SIBs that are installed vertically, mid-chassis, between the line cards and the RCBs in the front and the fan trays in the rear.

The SIBs make up the PTX10008 switching plane. There are two models of SIBs: the JNP10008-SF (see Figure 46 on page 96) and the JNP10008-SF3 (see Figure 47 on page 97). SIBs must all be of the same model type in a running chassis. On both models, the SIB has eight connectors that match and connect to a connector on one of the eight line cards. The JNP10008-SF SIB supports five standard line

cards and operates in standard Junos OS. The JNP10008-SF3 SIB supports the 14.4 Tbps line card and operates in Junos OS Evolved systems. See Table 27 on page 97 for a comparison of the two models.

Figure 46: JNP10008-SF for Standard Line Cards

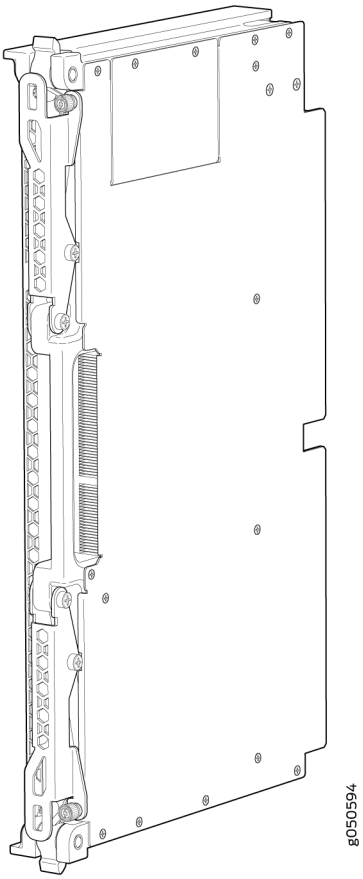


Figure 47: JNP10008-SF3 for 14.4-Terabyte Line Cards

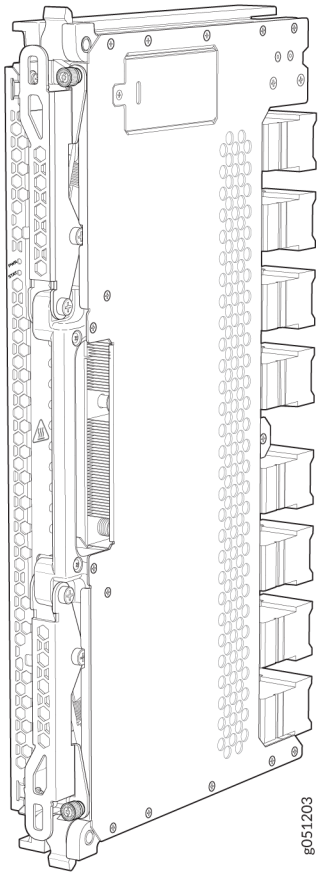


Table 27: SIB Specifications

Specification	JNP10008-SF	JNP10008-SF3
Operating system	Junos OS Release 17.2R1 and later	Junos OS Evolved Release 19.4R1S1 and later
Supported line cards	1. PTX10K-LC1101 2. PTX10K-LC1102 3. PTX10K-LC1104 4. PTX10K-LC1105 5. QFX10000-60S-6Q	PTX10K-LC1201-36CD PTX10K-LC1202-36MR

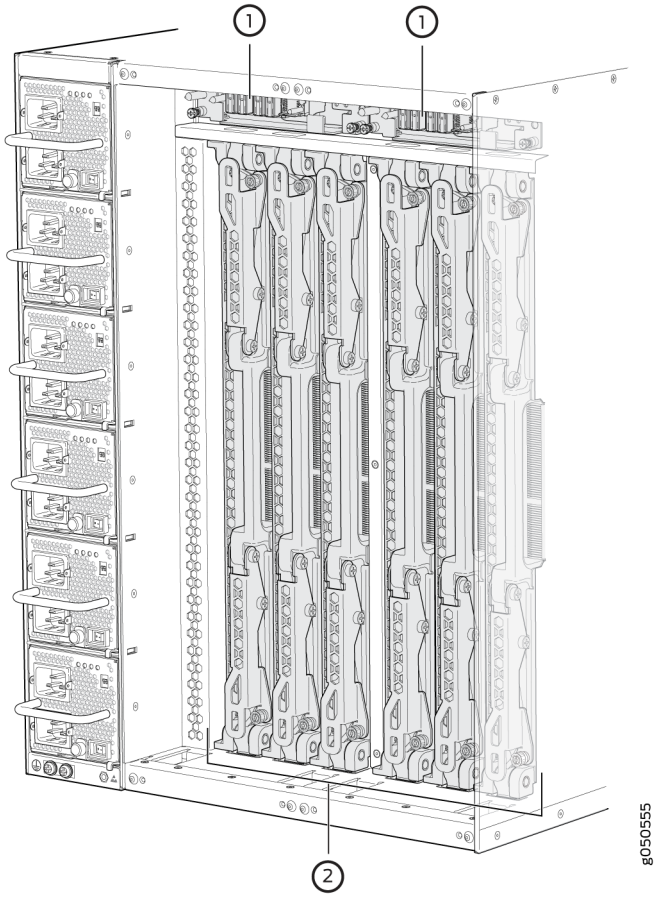
Table 27: SIB Specifications *(Continued)*

Specification	JNP10008-SF	JNP10008-SF3
Number of SIBs required for operation	Base systems require five SIBs; redundant systems require six SIBs	Base systems require three SIBs; partial bandwidth PREM2 systems require four SIBs; and full bandwidth redundant systems require six SIBs
Height	19.7 in. (50.04 cm)	19.7 in. (50.04 cm)
Width	1.8 in. (4.57 cm)	1.8 in. (4.57 cm)
Depth	10.4 in. (26.42 cm)	10.29 in. (26.14 cm)
Weight	14.8 lb (6.71 kg)	15.2 lb (6.89 kg)

SIBs are hot-removable and hot-insertable field-replaceable units (FRUs). They are not visible from the outside of the router chassis. If you don't know which switch fabric you have installed, you can use the CLI command `show chassis hardware models`. Otherwise, you must remove one of the fan trays in order to

view the SIBs. For instructions on removing the fan trays, see "Remove a PTX10008 Fan Tray" on page 298. The SIBs are numbered **SIB0** to **SIB5** from left to right. See Figure 48 on page 99.

Figure 48: SIBs Installed in a PTX10008



1– Fan tray controllers	2– SIBs

SEE ALSO

Install a PTX10008 Switch Interface Board | **358**

Remove a PTX10008 Switch Interface Board | **363**

PTX10008 Switch Interface Board LEDs

The Switch Interface Board (SIB) has two status LEDs at the top of each board. See Figure 49 on page 100.

Figure 49: SIB LEDs

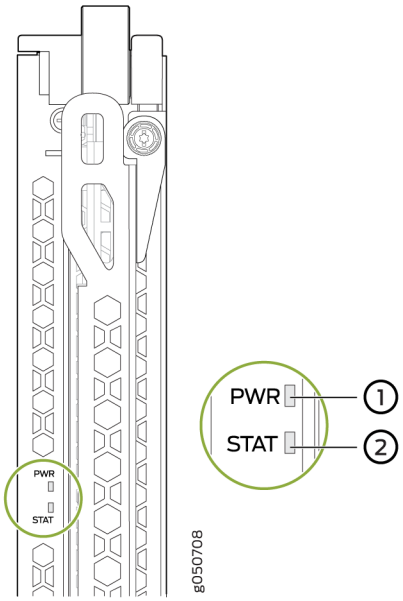


Table 28 on page 100 describes the functions of these LEDs.

Table 28: SIB LEDs

Label	Color	State	Description
PWR (Power)	Green	On steadily	The SIB is receiving power.
	Yellow	Blinking	Power fault.
	Unlit	Off	The SIB is either offline or not receiving power.
STAT (Status)	Green	On steadily	The SIB is online and functioning normally.

Table 28: SIB LEDs *(Continued)*

Label	Color	State	Description
	Green	Blinking	The beacon feature is enabled.
	Yellow	On steadily	The SIB has failed.
	Unlit	Off	The SIB is offline.

SEE ALSO

- How to Handle and Store PTX10008 Line Cards, RCBs, and SIBs | **354**

PTX10008 Line Card Components and Descriptions

IN THIS SECTION

- PTX10K-LC1101 Line Card | **103**
- PTX10K-LC1102 Line Card | **106**
- PTX10K-LC1104 Line Card | **114**
- 1.2-Terabyte Per Second DWDM OTN Module Wavelengths | **125**
- PTX10K-LC1105 Line Card | **150**
- PTX10K-LC1201-36CD Line Card | **155**
- PTX10K-LC1202-36MR Line Card | **161**
- QFX10000-60S-6Q Line Card | **166**
- PTX10008 Line Card LEDs | **173**

The line cards in PTX10008 routers combine a Packet Forwarding Engine and Ethernet interfaces in a single assembly. Line cards are field-replaceable units (FRUs) that can be installed in the line card slots on the front of the router chassis. The PTX10008 chassis supports up to eight line cards. Line cards are

associated to the switch fabric for their system. See Table 29 on page 102 for line cards that operate with the JNP10008-SF switch fabric and Table 30 on page 103 for information about the 14.4 Tbps line card that operates with the JNP10008-SF3 switch fabric. The JNP10008-SF line cards are hot-insertable and hot-removable—you can remove and replace them without powering off the router or disrupting router functions.

Table 29: Compatible Line Cards for the JNP10008-SF Switch Fabric

Line Card	Description	Supported Switch Fabric	Dimensions	Net Shipping Weight
PTX10K-LC1101	30-port 100-Gigabit or 40-Gigabit Ethernet	JNP10008-SF	17.2 in. x 1.89 in x 20.5 in 43.68 cm x 4.8 cm x 52.07 cm	27 lbs 12.2 kg
PTX10K-LC1102	36-port 40-Gigabit Ethernet; 12 ports support either 100-Gigabit or 40-Gigabit Ethernet	JNP10008-SF	17.2 in. x 1.89 in x 20.5 in 43.68 cm x 4.8 cm x 52.07 cm	22.6 lbs 10.25 kg
PTX10K-LC1104	6-port DWDM with MACsec with flexible modulation at 100-Gbps, 150-Gbps, and 200-Gbps	JNP10008-SF	17.2 in. x 1.89 in x 20.5 in 43.68 cm x 4.8 cm x 52.07 cm	32 lbs 14.5 kg
PTX10K-LC1105	30-port 100-Gigabit or 40-Gigabit Ethernet with MACsec	JNP10008-SF	17.2 in. x 1.89 in x 20.5 in 43.68 cm x 4.8 cm x 52.07 cm	28.5 lbs 12.93 kg
QFX10000-60S-6Q	60-port 10-Gigabit or 1-Gigabit Ethernet; 2-port of 40-Gigabit or 100-Gigabit Ethernet; 4 port of 40-Gigabit	JNP10008-SF	17.2 in. x 1.89 in x 20.5 in 43.68 cm x 4.8 cm x 52.07 cm	9.7 lb 4.39 kg

Table 30: Compatible Line Card for JNP10008-SF3 Switch Fabric Systems

Line Card	Description	Dimensions	Net Shipping Weight
PTX10K-LC1201-36CD	14.4 Tbps—36-port 400-Gigabit, 200-Gigabit, 100-Gigabit, 50-Gigabit, 25-Gigabit, or 10-Gigabit Ethernet This line card is only compatible with the JNP10008-SF3 switch fabric.	17.2 in. x 1.89 in. x 21.3 in. (43.68 cm x 4.8 cm x 54.1 cm)	35 lb (15.88 kg)
PTX10K-LC1202-36MR	4.8 Tbps—32 ports capable of supporting 100-Gbps, 4 ports capable of supporting 400-Gbps speed. This line card is compatible only with the JNP10008-SF3 switch fabric.	17.2 in. x 1.9 in. x 21.3 in. (43.68 cm x 4.8 cm x 54.1 cm)	21 lb (9.5 kg)

PTX10K-LC1101 Line Card

IN THIS SECTION

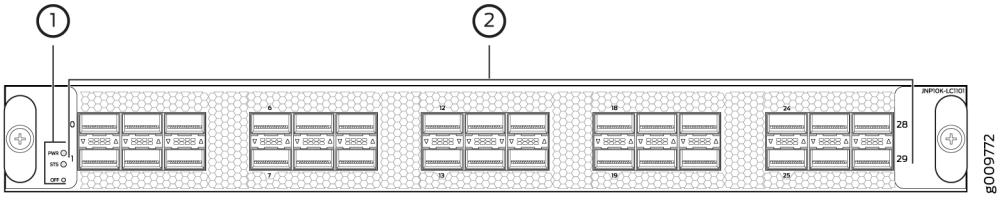
- Overview | **103**
- Channelizing 40GbE Ports | **104**
- Network Ports | **106**

Overview

The PTX10K-LC1101 line card consists of 30 quad small form-factor pluggable (QSFP28) cages that support either 40GbE or 100GbE Ethernet optical transceivers; see Figure 50 on page 104. The line cards also support 10GbE interfaces. For 10GbE, you must configure the port using the `channelization-speed` command. By default, the interfaces are created with 100-Gbps port speed. If the user plugs in a 40GbE or 4x10GbE transceiver, you must configure the appropriate port speed manually using the CLI.

Juniper Networks® PTX10008 Packet Transport Router and the PTX10016 that run Junos OS Release 17.2R1 and later support the PTX10K-LC1101 line card.

Figure 50: PTX10K-LC1101 Port Panel



1– Power LED (**PWR**), status :LED (**STS**), and offline/online button (**OFF**)	2– Network ports

Each network port can operate as a:

- 100GbE port when you use QSFP28 optical transceivers.
- 40GbE port when you use QSFP+ optical transceivers.

To change from the default mode (100GbE) to 40GbE channelized mode, use the Junos OS operational command **set chassis fpc slot *slot-number* pic 0 port *port number* channelization-speed *10g***.

Channelizing 40GbE Ports

You can configure each of the 40GbE ports on the PTX10K-LC1101 line card into four 10GbE channels. When ports are in channelization mode, the fourth port on each Packet Forwarding Engine is disabled, and the remaining four ports that are mapped to the same Packet Forwarding Engine can be used as either 4x10GbE, 40GbE, or 100GbE ports. The channelization mode works independently for each of the Packet Forwarding Engines on the PTX10K-LC1101 line card. See Figure 51 on page 104 to see which ports are disabled and see Table 31 on page 105 for the maximum port configurations.

Figure 51: Disabled Ports in Channelization Mode

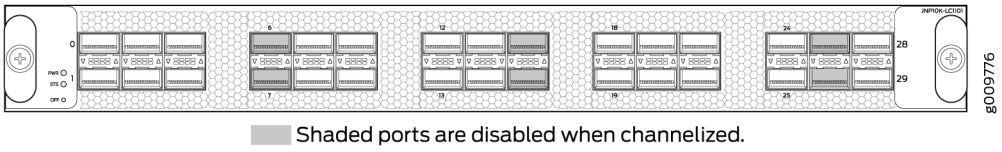


Table 31: Maximum Port Configuration

Port Speed	Nonchannelized Mode (Mode D)	Channelized Mode (Mode A)
100 Gbps	30 or	24 or
40 Gbps	30	24 or
10 Gbps	0	96

Unlike the PTX10K-LC1102 line card, the PTX10K-LC1101 line card does not have port groups; instead, port behavior is tied to the ASIC associated with the port. To channelize a 40GbE port to 4 independent 10GbE ports, you must configure each port individually. For example, ASIC PE0 maps to ports 0, 2, 4, 6, and 8. The fourth port, port 6, is disabled. See Table 32 on page 105 for the list of available ports and the associated ASIC mapping in Figure 51 on page 104 to locate the available and disabled ports.

NOTE: If you change the channelization mode (mode D to mode A or mode A to mode D), the new port speed configuration does not cause an FPC to reboot automatically. Instead, it triggers an `FPC need bounce` alarm. To ensure that the new port speed configuration takes effect, you must manually reboot the FPC. The alarm is cleared when you manually reboot the FPC or delete the new port speed configuration.

NOTE: When you manually change the port speed from one setting to another, or when the you deactivate the interface, the `show interface` *`interface-name`* command shows the error `Device` *`interface-name`* `not found` for a brief interval. Ensure that the transceiver is in a working condition. The interface comes up subsequently.

Table 32: Port Mapping for Channelization

ASIC	Available Ports	Disabled Port
PE0	0, 2, 4, 8	6
PE1	1, 3, 5, 9	7

Table 32: Port Mapping for Channelization *(Continued)*

ASIC	Available Ports	Disabled Port
PE2	10, 12, 14, 18	16
PE3	11, 13, 15, 19	17
PE4	20, 22, 24, 28	26
PE5	21, 23, 25, 29	27

Network Ports

Each of the 30 QSFP28 ports supports:

- 100GbE using QSFP28 optical transceivers.
- 40GbE using QSFP+ optical transceivers.
- 40GbE to 10GbE or 1GbE QSFP-to-SFP adapter (QSA) (Junos OS Release 18.4R1 and later).

PTX10K-LC1102 Line Card

IN THIS SECTION

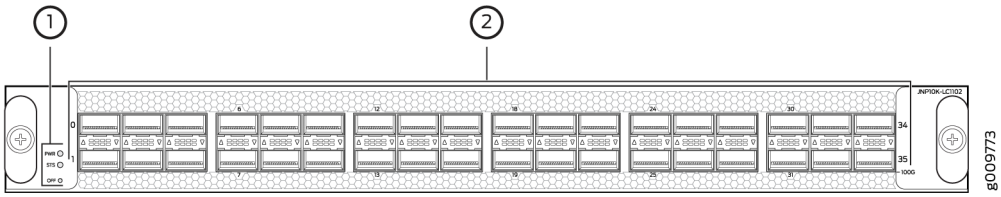
- Overview | **107**
- Network Ports | **107**
- Channelization | **108**
- Port Status and Activity LEDs | **113**

Overview

The PTX10K-LC1102 line card consists of 36 quad small form-factor pluggable plus (QSFP+) ports that support 40GbE optical transceivers. Out of these 36 ports, 12 ports also support 100GbE QSFP28 transceivers. The PTX10K-LC1102 line cards also support 10GbE interfaces. You can channelize 40GbE ports to four independent 10GbE interfaces by configuring the port speed and cabling the port using fiber breakout cables. See Figure 52 on page 107.

PTX10008 and PTX10016 routers that run Junos OS Release 17.2R1 and later support the PTX10K-LC1102 line card.

Figure 52: PTX10K-LC1102 Port Panel



1– Power LED (**PWR**), status LED (**STS**), and offline/online button (**OFF**)	2– Network ports

You can configure each QSFP28 port as a:

- 100GbE port using QSFP28 optical transceivers. Only the ports with a fine black line underneath the port support 100GbE. When a QSFP28 transceiver is inserted into such a port and you configure the port for 100GbE, the two adjacent ports are disabled and the QSFP28 port is enabled for 100GbE.
- 40GbE port using QSFP+ optical transceivers.
- 10GbE port using breakout cabling and attached optical transceivers. When configured for channelization, the system converts the 40GbE port into four independent 10GbE channels.

Network Ports

Each of the 12 QSFP28 ports supports:

- 100GbE QSFP28 transceivers
- 40GbE QSFP+ transceivers
- 40GbE to 10GbE or 1GbE QSA (Junos OS Release 18.4R1 and later)

Each of the 36 QSFP+ ports supports:

- 40GbE QSFP+ transceivers
- 40GbE to 10GbE or 1GbE QSA (Junos OS Release 18.4R1 and later)

Channelization

Every second and sixth port in a 6xQSFP cage on a PTX10K-LC1102 line card supports 100GbE using QSFP28 transceivers. These 100GbE ports operate either as 100GbE ports or as 40GbE, but are recognized as channelized 4x10GbE by default. See Figure 53 on page 109 for a closeup view of a 6xQSFP+ cage. When you insert a 40GbE transceiver into a 100GbE port, the port recognizes the 40 Gbps port speed. When you insert a 100GbE transceiver into the port and enable it in the CLI, the port recognizes the 100-Gbps speed and disables two adjacent 40GbE ports. See Figure 54 on page 109 and Figure 55 on page 109. You can also use a 100GbE transceiver and run it at 40GbE by using the CLI to set the port speed to 40GbE.

Figure 53 on page 109 shows the default configuration of a cage of ports on the PTX10K-LC1102.

Figure 53: All Ports Are Enabled for Channelized 4x10GbE by Default

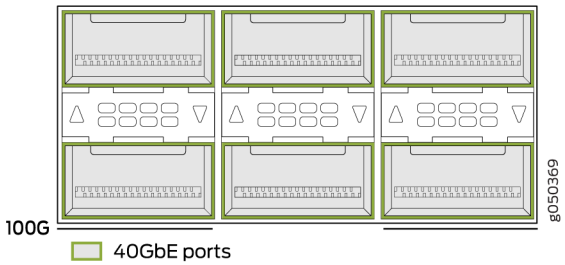


Figure 54: 100GbE Ports Can Operate at Either 100 Gbps or 4x10 Gbps Speed

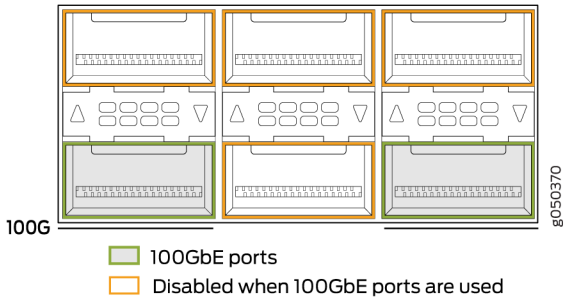
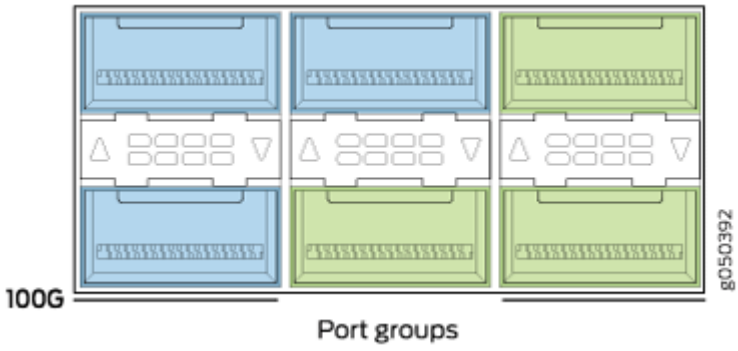


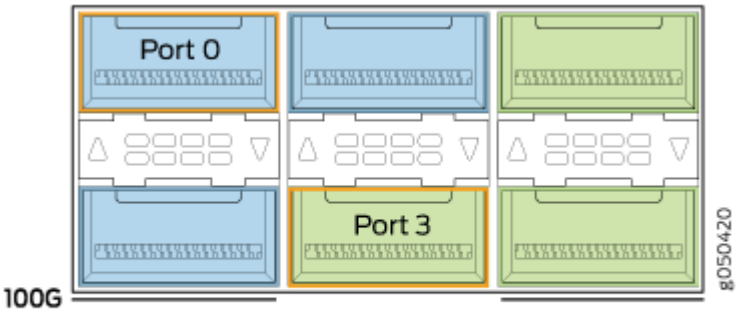
Figure 55: Enabled 100GbE Port Creates a Port Group and Disables the Associated 40GbE Port



The 40GbE ports can operate independently, be channelized into four 10GbE ports, or bundled with the next two consecutive ports and channelized into twelve 10GbE ports as a port range. Only the first and fourth port in each 6xQSFP cage are available to channelize a port range (see Figure 56 on page 110).

You must configure the port speed using the `set chassis fpc slot slot-number pic slot-number port port-number speed speed` command. For example, to set the first router port as 40GbE (not channelized), use the `set chassis fpc slot 0 pic 0 port 0 speed 40g` command.

Figure 56: Use the First and Fourth Ports in Each 6xQSFP Cage to Channelize a Port Range



Use every third port to create a port range for 40-Gigabit Channelization.

Table 33 on page 110 shows the available combinations for the ports. On the PTX10K-LC1102, the ports are enabled by default.

Table 33: PTX10K-LC1102 Port Mapping

Port Number	4x10GbE	4x10GbE Channelized Port Group	40GbE	100GbE	100GbE Disables
0	✓	✓	✓	–	–
1	✓		✓	✓	0, 2
2	✓		✓	–	–
3	✓	✓	✓	–	–
4	✓		✓	–	–
5	✓		✓	✓	3, 4

Table 33: PTX10K-LC1102 Port Mapping *(Continued)*

Port Number	4x10GbE	4x10GbE Channelized Port Group	40GbE	100GbE	100GbE Disables
6	✓	✓	✓	–	–
7	✓		✓	✓	6, 8
8	✓		✓	–	–
9	✓	✓	✓	–	–
10	✓		✓	–	–
11	✓		✓	✓	9, 10
12	✓	✓	✓	–	–
13	✓		✓	✓	12, 14
14	✓		✓	–	–
15	✓	✓	✓	–	–
16	✓		✓	–	–
17	✓		✓	✓	15, 16
18	✓	✓	✓	–	–
19	✓		✓	✓	18, 20
20	✓		✓	–	–

Table 33: PTX10K-LC1102 Port Mapping *(Continued)*

Port Number	4x10GbE	4x10GbE Channelized Port Group	40GbE	100GbE	100GbE Disables
21	✓	✓	✓	–	–
22	✓		✓	–	–
23	✓		✓	✓	21, 22
24	✓	✓	✓	–	–
25	✓		✓	✓	24, 26
26	✓		✓	–	–
27	✓	✓	✓	–	–
28	✓		✓	–	–
29	✓		✓	✓	27, 28
30	✓	✓	✓	–	–
31	✓		✓	✓	30, 32
32	✓		✓	–	–
33	✓	✓	✓	–	–
34	✓		✓	–	–
35	✓		✓	✓	33, 34

Port Status and Activity LEDs

Each network port has a bicolored up or down LED indicator that shows port status and link activity based on whether or not the port is configured for channelization. See Figure 57 on page 113, Table 34 on page 113, and Table 35 on page 113.

Figure 57: Link and Activity Indicators for Network Ports on PTX10K-LC1102 Line Cards

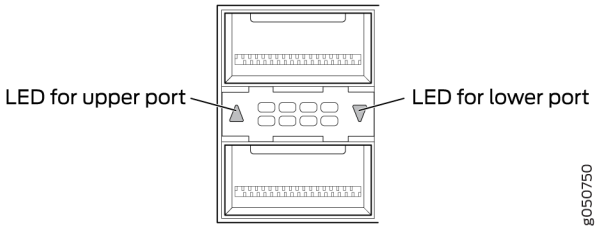


Table 34: Unchannelized Network Port Link and Activity LEDs on a PTX10K-LC1102 Line Card

Color	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 but there is no activity.
	Blinking	A link is up and there is activity.
Yellow or Amber	Slow blink or blip	The beacon function was enabled on the port.
	Blinking	A single LED blinking indicates an interface fault.

Table 35: Channelized Network Port Link and Activity LEDs on a PTX10K-LC1102 Line Card

Color	State	Description
Unlit	Off	The port is administratively disabled, there is no power, the link is down, or a transceiver is not present. All sub-channels are disabled.

Table 35: Channelized Network Port Link and Activity LEDs on a PTX10K-LC1102 Line Card *(Continued)*

Color	State	Description
Green	On steadily	A link is established. When channelized, all sub-channels are up. When not channelized, it indicates no activity.
	Blinking	A link is up and there is activity. When not channelized, it indicates the port is up and active in either 40GbE or 100GbE mode. When channelized, all four channels are up and active.
Yellow or Amber (channelized)	On steadily	At least one channel link is up, but not all channels are up. There is no activity on the channel link.
	Flashing	At least one channel link is up, but not all channels are up. There is activity on the channel link.
	Slow blink, or blip	The beacon function is enabled on one or more sub-channels.
	Blinking	One or more sub-channels has a fault condition.
Yellow or Amber	Blinking	A single LED blinking indicates an interface fault. All four LEDs blink to indicate the beacon function was enabled on the port.

PTX10K-LC1104 Line Card

IN THIS SECTION

- Hardware Features | **115**
- Compatibility | **117**
- Optical Transmit Specifications | **118**
- Optical Receive Specifications | **119**

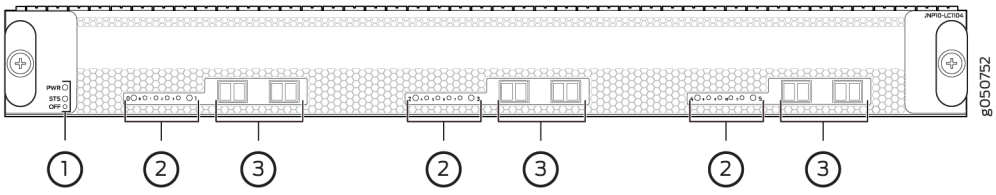
Status and Activity LEDs | 120
Optical and Ethernet Interface Alarms and Defects | 121

Hardware Features

The PTX10K-LC1104 line card provides up to 1.2 Tbps of packet forwarding for cloud providers, service providers, and enterprises that need coherent dense wavelength-division multiplexing (DWDM) with Media Access Control Security (MACsec) features. The 6-port line card, with built-in optics, supports flexible rate modulation at 100-Gbps, 150-Gbps, and 200-Gbps speeds. The PTX10008 and PTX10016 routers support a maximum of four PTX10K-LC1104 coherent line cardss. See Figure 58 on page 115.

PTX10008 routers that run Junos OS Release 17.4R1-S1 and later support the PTX10K-LC1104 line card. PTX10016 routers that run Junos OS Release 18.3R1 and later support the PTX10K-LC1104 line card.

Figure 58: PTX10K-LC1104 Port Panel

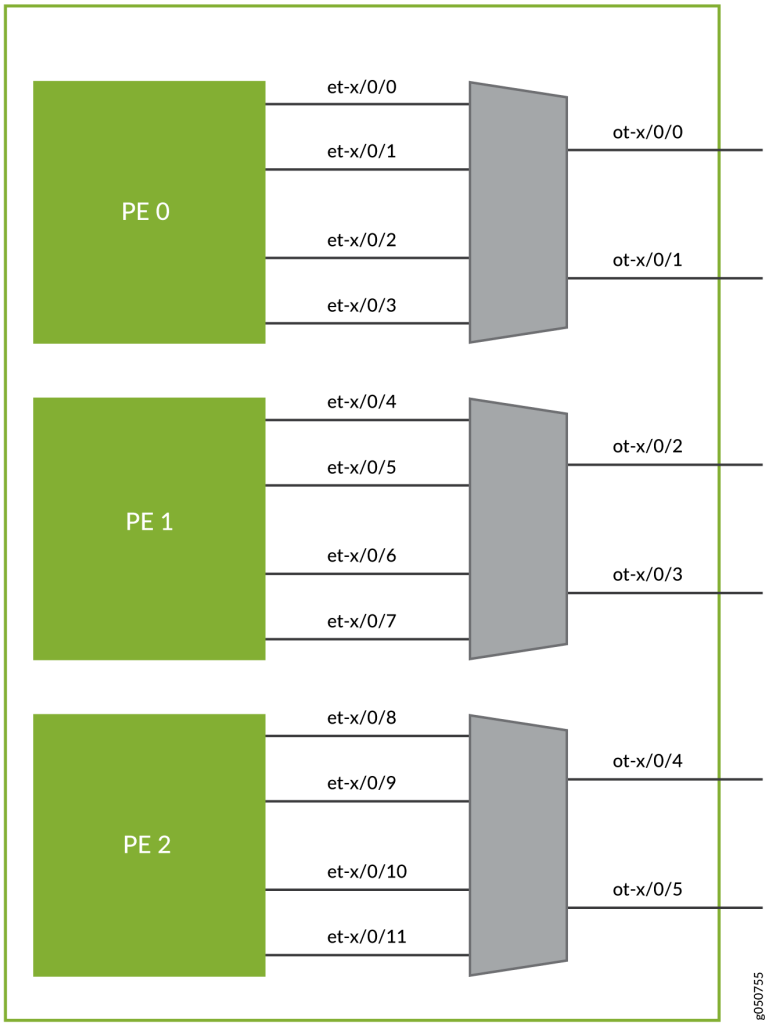


1– Power LED (**PWR**), status LED (**STS**), and offline/online button (**OFF**)	3– Ports with embedded optics
2– Network link and Ethernet link LEDs	

Each PTX10K-LC1104 has six physical interfaces (ot-*x*/*x*/*x*) that connect to one of three built-in flexible rate optical transponders for a maximum of 24 physical interfaces on a PTX10008 or PTX10016 system. Each transponder connects four 100GbE logical interfaces (et-*x*/*x*/*x*) to one of three forwarding ASICs.

These forwarding ASICs are responsible for optional MACsec encryption on each 100GbE interface. See Figure 59 on page 116.

Figure 59: PTX10K-LC1104 Interfaces



NOTE: All optical properties are configured under the `ot` interface. Use the **set interfaces ot-*x/x/x* optics-options** CLI command to set these options. Perform MACsec configuration on the `et` interface using the **set security macsec connectivity-association *ca-name* encryption-algorithm**. Optical transport network (OTN)-related configurations are also done on the et- interface.

Each of the six network ports can operate in one of three modulation formats; see Table 36 on page 117.

Table 36: PTX10K-LC1104 Modulation Formats

Speed (Gbps)	Modulation	Distance
100	DP-QPSK	long haul–4000 km
150	DP-8QAM	regional or metro–2000 km
200	DP-16QAM	metro DCI–1000 km

Compatibility

The Juniper Networks integrated DWDM solution includes integrated 100GbE coherent optics on Juniper Networks QFX Series Switches, MX Series 5G Universal Routing Platforms, PTX Series Packet Transport Routers, and Juniper Networks® BTI Series Packet Optical Platforms optimized for Data Center Interconnect (DCI). As part of the Open Cloud Interconnect (OCI) solution, the PTX10K-LC1104 coherent line card is compatible with many third-party optical products as well as Juniper Networks optical solutions and offerings. The line card is interoperable with the BTI Series Packet Optical Transport UFM6 in 100-Gbps and 200-Gbps modes. It is also compatible with the MX Series MICs and PTX Series PICs in 100-Gbps mode. See Table 37 on page 117.

Table 37: Juniper Networks Compatible Products in 100-Gbps Mode

Platform	Product	Model Information
PTX Series	PTX-5-100-WDM	See the Hardware Compatibility Tool, PTX-5-100-WDM.
MX Series	MIC3-100G-DWDM	See the Hardware Compatibility Tool, MIC3-100G-DWDM.
QFX Series	QFX10K-12C-DWDM	See the Hardware Compatibility Tool, QFX10K-12C-DWDM.

Optical Transmit Specifications

You can connect the line card using single-mode fiber-optic (SMF) and LC connectors. See Table 38 on page 118 and Table 39 on page 119 for the optical transponder specifications.

Table 38: PTX10K-LC1104 Optical Transmit Specifications

Specification	Value
Standards compliance	IEEE 802.3 IEC 60825-1 Class 1
Modulation format	DP-QPSK, DP-8QAM, DP-16QAM
Line rate	DP-QPSK = 136.66 Gbps DP-8QAM = 205 Gbps DP-16QAM= 273.33 Gbps
FEC types	15% or 25% SD-FEC
Channel-plan wavelength range	Extended C-band, 1528.77 nm to 1566.72 nm
Channel-plan frequency range	196.1 THz to 191.35 THz
Channel spacing	37.5 GHz, 50 GHz, and 100 GHz
Channel tunability	12.5 GHz grid. See "1.2-Terabyte Per Second DWDM OTN Module Wavelengths" on page 125.
Optical transmitter output power (on)	–12 to 1.5 dBm, 0.1 dB steps, +/--1 dB accuracy
Optical transmitter output power (off)	≤ –40 dBM
Optical transmitter wavelength accuracy	+/--1.8 GHz

Table 38: PTX10K-LC1104 Optical Transmit Specifications *(Continued)*

Specification	Value
Optical transmitter channel tuning time	≤ 90 seconds across C-band
TX output optical signal-to-noise ratio (OSNR)	≥ 36 dB

Optical Receive Specifications

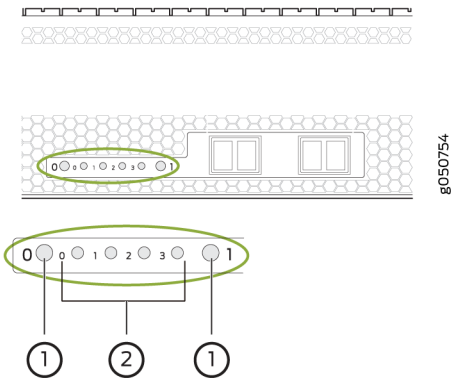
Table 39: PTX10K-LC1104 Optical Receive Specifications

Specification	100G DP-PSK	150G DP-8QAM	200G DP-16QAM
Optical receiver input power range (low Rx OSNR)	−18 dBm to 0 dBm	−18 dBm to 0 dBm	−18 dBm to 0 dBm
Optical receiver input power range (unamplified/dark fiber applications)	−32 dBm to 0 dBm	−27 dBm to 0 dBm	−25 dBm to 0 dBm
Optical receiver damage input power threshold	+17 dBm	+17 dBm	+17 dBm
Optical receiver minimum OSNR (back-to-back), typical	10.3 dB	14.7 dB	17.6 dB
Optical receiver minimum OSNR (back-to-back), worst-case, EOL	11.5 dB	16.0 dB	19.0 dB
Optical receiver chromatic dispersion tolerance	+/− 70,000 ps/nm	+/− 45,000 ps/nm	+/−30,000 ps/nm
Optical receiver PMD tolerance	30 ps mean DGD	20 ps mean DGD	15 ps mean DGD
Optical receiver polarization tracking	100 krad/s	50 krad/s	50 krad/s

Status and Activity LEDs

There are two types of LEDs for the network ports: port LEDs and Ethernet link LEDs. The LEDs for the six physical ports indicate the link state of an ot- interface. There are four LEDs between each port pair that indicate the link state of the associated et- interfaces, (see Figure 60 on page 120). To determine the link state of the ot- interface, see Table 40 on page 120.

Figure 60: DWDM Port and Ethernet Link State LEDs



1– Port LEDs (ot- interfaces)	2– Ethernet LEDs (et- link interfaces)

Table 40: Network Port Status LEDs (ot Interfaces)

Color	Description
Unlit	The port is not configured.
Solid green	A link is established on the ot interface.
Solid amber	The optical module associated with the port has a fault condition, or the port is configured but the link is down.

You can also determine the configuration of the et interfaces by examining the pattern of the four Ethernet LEDs. See Table 41 on page 121. To determine the link status and of those et interfaces, see Table 42 on page 121.

Table 41: Valid et Interface Link Combinations of Every Two ot Ports

Modulation Format	Aggregate Data Rate	ot Interface Data Rate		et Interface	Configuration
		Ports 0, 2, 4	1, 3, 5		
16-QAM (x2)	4 x 100GbE	200 Gbps	200 Gbps	0, 1, 2, 3	2 independent 200 Gbps 16-QAM
QPSK and 16-QAM	3 x 100GbE	100 Gbps	200 Gbps	0, 2, 3	Independent QPSK and 16-QAM
16-QAM and QPSK	3 x 100GbE	200 Gbps	100 Gbps	0, 1, 2	Independent QPSK and 16-QAM
8-QAM	3 x 100GbE	150 Gbps	150 Gbps	0, 1, 2	2 Coupled 150 Gbps 8-QAM
QPSK and QPSK	2 x 100GbE	100 Gbps	100 Gbps	0,2	Independent 100 Gbps QPSK

Table 42: Ethernet Link LEDs (et Interfaces)

Color	Description
Unlit	The et- interface is down.
Solid green	The et- interface is up, but there is no activity.
Blinking green	The link is up on the et- interface, and there is activity.

Optical and Ethernet Interface Alarms and Defects

Table 43 on page 122 and Table 44 on page 123 describe the ot and et interface alarms and defects that can occur on the line card and the link status when the alarm or defect occurs.

TIP: You can view optical and Ethernet alarms and defects by using the `show interfaces` *`interface-name`* `extensive` operational-mode CLI command.

Table 43: OT Interface Alarms and Defects

Category	Alarm	Description	Link Status
OTN	Network lane LOS	Loss of signal	Link down
	Network lane LOF	Loss of frame	Link down
	Network lane LOM	Loss of multiframe	Link down
	Network lane OTU-BDI	Backward defect identification	Link down
OTN FEC	FEC degrade (OTU-FEC-DEG)	Forward error correction degraded	Link down if signal degrade or backward FRR thresholds are met
	FEC excessive (OTU-FEC-EXE)	There are uncorrected words and there are errors in the frame header.	Possible link down
Optics and Optical Channel	Module fault	Module fault state	Link down
	Rx modem synch fault	Modem sync detect fault	Link down
	Rx modem loss of lock OTU-BDI	Modem lock fault	Link down
	Rx loss of alignment	Loss of alignment fault	Link down
	Network lane LOS	Lane Rx loss of signal	Alarm

Table 43: OT Interface Alarms and Defects *(Continued)*

Category	Alarm	Description	Link Status
	Modulator bias control loop fail	Modulator bias control loop failed to converge.	Alarm
	ITLA fault	ITLA operation failure	Alarm
	DAC calibration fault	DAC calibration fault	Alarm
	ADC calibration fault	ACD calibration fault	Alarm

Table 44: et Interface Alarms and Defects

Category	Alarm	Description	Link Status
OTN	LOS	Loss of signal	Alarm
	LOF	Loss of frame	Alarm
	LOM	Loss of multiframe	Alarm
OTN OTU	OTU-AIS	Alarm indication signal or all ones signal	Alarm
	OTU-BDI	Backward defect identification	Alarm
	OTU-IAE	Incoming alignment error	Warning
	OTU-TTIM	Destination access point identifier (DAPI), source access point identifier (SAPI), or both mismatch from expected to received	Warning
	OTU-BIAE	Backward incoming alignment error	Warning
	OTU-TSF	OTU trail signal fail	Warning

Table 44: et Interface Alarms and Defects *(Continued)*

Category	Alarm	Description	Link Status
	OTU-SSF	OTU server signal fail	Warning
OTN ODU	ODU-AIS	Alarm indication signal or all one signal	Alarm
	ODU-OCI	Open connection error	Alarm
	ODU-LCK	ODU lock triggers for path monitoring and TCM levels 1 through 6	Alarm
	ODU-BDI	Backward defect indication	Alarm
	ODU-TTIM	DAPI or SAPI mismatch from expected to received	Warning
	ODU-IAE	Incoming alignment error	Warning
	ODU-LTC	Loss of tandem connection	Warning
	ODU-CSF	Client signal failure	Warning
	ODU-TSF	Trail signal failure	Warning
	ODU-SSF	Server signal failure	Warning
	ODU-PTIM	Payload type mismatch	Alarm

SEE ALSO

No Link Title

Understanding the PTX10K-LC1104 Line Card

1.2-Terabyte Per Second DWDM OTN Module Wavelengths

The PTX10K-LC1104 coherent line card and the QFX10000-12C-DWDM line card provide six 200-Gbps coherent MACsec ports with built-in long-reach optics. DWDM channel frequency offsets are 0.02 THz. The QFX10000-12C-DWDM line card is available for the QFX10008 and QFX10016 switch chassis running Junos OS Release 17.3R1 and later. The PTX10K-LC1104 coherent line card is available for the PTX10008 and PTX10016 routers. See Table 45 on page 125 for the available channel frequencies and wavelengths.

Table 45: DWDM Module Wavelengths

Frequency (THz)	Wavelength (nm)	Offset (GHz)
191.35	1566.72	12.5/50
191.36	1566.62	12.5
191.38	1566.52	12.5
191.39	1566.42	12.5
191.4	1566.31	12.5/50/100
191.41	1566.21	12.5
191.43	1566.11	12.5
191.44	1566.01	12.5
191.45	1565.91	12.5/50
191.46	1565.8	12.5
191.48	1565.7	12.5
191.49	1565.6	12.5

Table 45: DWDM Module Wavelengths *(Continued)*

Frequency (THz)	Wavelength (nm)	Offset (GHz)
191.5	1565.5	12.5/50/100
191.51	1565.39	12.5
191.53	1565.29	12.5
191.54	1565.19	12.5
191.55	1565.09	12.5/50
191.56	1564.99	12.5
191.58	1564.88	12.5
191.59	1564.78	12.5
191.6	1564.68	12.5/50/100
191.61	1564.58	12.5
191.63	1564.48	12.5
191.64	1564.37	12.5
191.65	1564.27	12.5/50
191.66	1564.17	12.5
191.68	1564.07	12.5

Table 45: DWDM Module Wavelengths *(Continued)*

Frequency (THz)	Wavelength (nm)	Offset (GHz)
191.69	1563.97	12.5
191.7	1563.86	12.5/50/100
191.71	1563.76	12.5
191.73	1563.66	12.5
191.74	1563.56	12.5
191.75	1563.46	12.5/50
191.76	1563.35	12.5
191.78	1563.25	12.5
191.79	1563.15	12.5
191.8	1563.05	12.5/50/100
191.81	1562.95	12.5
191.83	1562.84	12.5
191.84	1562.74	12.5
191.85	1562.64	12.5/50
191.86	1562.54	12.5

Table 45: DWDM Module Wavelengths *(Continued)*

Frequency (THz)	Wavelength (nm)	Offset (GHz)
191.88	1562.44	12.5
191.89	1562.33	12.5
191.9	1562.23	12.5/50/100
191.91	1562.13	12.5
191.93	1562.03	12.5
191.94	1561.93	12.5
191.95	1561.83	12.5/50
191.96	1561.72	12.5
191.98	1561.62	12.5
191.99	1561.52	12.5
192	1561.42	12.5/50/100
192.01	1561.32	12.5
192.03	1561.22	12.5
192.04	1561.11	12.5
192.05	1561.01	12.5/50

Table 45: DWDM Module Wavelengths *(Continued)*

Frequency (THz)	Wavelength (nm)	Offset (GHz)
192.06	1560.91	12.5
192.08	1560.81	12.5
192.09	1560.71	12.5
192.1	1560.61	12.5/50/100
192.11	1560.51	12.5
192.13	1560.4	12.5
192.14	1560.3	12.5
192.15	1560.2	12.5/50
192.16	1560.1	12.5
192.18	1560	12.5
192.188	1559.9	12.5
192.2	1559.79	12.5/50/100
192.21	1559.69	12.5
192.23	1559.59	12.5
192.24	1559.49	12.5

Table 45: DWDM Module Wavelengths *(Continued)*

Frequency (THz)	Wavelength (nm)	Offset (GHz)
192.25	1559.39	12.5/50
192.26	1559.29	12.5
192.28	1559.19	12.5
192.29	1559.08	12.5
192.3	1558.98	12.5/50/100
192.31	1558.88	12.5
192.33	1558.78	12.5
192.34	1558.68	12.5
192.35	1558.58	12.5/50
192.36	1558.48	12.5
192.38	1558.38	12.5
192.39	1558.27	12.5
192.4	1558.17	12.5/50/100
192.41	1558.07	12.5
192.43	1557.97	12.5

Table 45: DWDM Module Wavelengths *(Continued)*

Frequency (THz)	Wavelength (nm)	Offset (GHz)
192.44	1557.87	12.5
192.45	1557.77	12.5/50
192.46	1557.67	12.5
192.48	1557.57	12.5
192.49	1557.47	12.5
192.5	1557.36	12.5/50/100
192.51	1557.26	12.5
192.53	1557.16	12.5
192.54	1557.06	12.5
192.55	1556.96	12.5/50
192.56	1556.86	12.5
192.58	1556.76	12.5
192.59	1556.66	12.5
192.6	1556.56	12.5/50/100
192.61	1556.45	12.5

Table 45: DWDM Module Wavelengths *(Continued)*

Frequency (THz)	Wavelength (nm)	Offset (GHz)
192.63	1556.35	12.5
192.64	1556.25	12.5
192.65	1556.15	12.5/50
192.66	1556.05	12.5
192.68	1555.95	12.5
192.69	1555.85	12.5
192.7	1555.75	12.5/50/100
192.71	1555.65	12.5
192.73	1555.55	12.5
192.74	1555.44	12.5
192.75	1555.34	12.5/50
192.76	1555.24	12.5
192.78	1555.14	12.5
192.79	1555.04	12.5
192.8	1554.94	12.5/50/100

Table 45: DWDM Module Wavelengths *(Continued)*

Frequency (THz)	Wavelength (nm)	Offset (GHz)
192.81	1554.84	12.5
192.83	1554.74	12.5
192.84	1554.64	12.5
192.85	1554.54	12.5/50
192.86	1554.44	12.5
192.88	1554.34	12.5
192.89	1554.24	12.5
192.9	1554.13	1554.134
192.91	1554.03	12.5
192.93	1553.93	12.5
192.94	1553.83	12.5
192.95	1553.73	12.5/50
192.96	1553.63	12.5
192.98	1553.53	12.5
192.99	1553.43	12.5

Table 45: DWDM Module Wavelengths *(Continued)*

Frequency (THz)	Wavelength (nm)	Offset (GHz)
193	1553.33	12.5/50/100
193.01	1553.23	12.5
193.03	1553.13	12.5
193.04	1553.03	12.5
193.05	1552.93	12.5/50
193.06	1552.83	12.5
193.08	1552.73	12.5
193.09	1552.63	12.5
193.1	1552.52	12.5/50/100
193.11	1552.42	12.5
193.13	1552.32	12.5
193.14	1552.22	12.5
193.15	1552.12	12.5/50
193.16	1552.02	12.5
193.18	1551.92	12.5

Table 45: DWDM Module Wavelengths *(Continued)*

Frequency (THz)	Wavelength (nm)	Offset (GHz)
193.19	1551.82	12.5
193.2	1551.72	12.5/50/100
193.21	1551.62	12.5
193.23	1551.52	12.5
193.24	1551.42	12.5
193.25	1551.32	12.5/50
193.26	1551.22	12.5
193.28	1551.12	12.5
193.29	1551.02	12.5
193.3	1550.92	12.5/50/100
193.31	1550.82	12.5
193.33	1550.72	12.5
193.34	1550.62	12.5
193.35	1550.52	12.5/50
193.36	1550.42	12.5

Table 45: DWDM Module Wavelengths *(Continued)*

Frequency (THz)	Wavelength (nm)	Offset (GHz)
193.38	1550.32	12.5
193.39	1550.22	12.5
193.4	1550.12	12.5/50/100
193.41	1550.02	12.5
193.43	1549.92	12.5
193.44	1549.82	12.5
193.45	1549.72	12.5/50
193.46	1549.62	12.5
193.48	1549.52	12.5
193.49	1549.42	12.5
193.5	1549.32	12.5/50/100
193.51	1549.22	12.5
193.53	1549.12	12.5
193.54	1549.02	12.5
193.55	1548.92	12.5/50

Table 45: DWDM Module Wavelengths *(Continued)*

Frequency (THz)	Wavelength (nm)	Offset (GHz)
193.56	1548.82	12.5
193.58	1548.72	12.5
193.59	1548.62	12.5
193.6	1548.52	12.5/50/100
193.61	1548.42	12.5
193.63	1548.32	12.5
193.64	1548.22	12.5
193.65	1548.12	12.5/50
193.66	1548.02	12.5
193.68	1547.92	12.5
193.69	1547.82	12.5
193.7	1547.72	12.5/50/100
193.71	1547.62	12.5
193.73	1547.52	12.5
193.74	1547.42	12.5

Table 45: DWDM Module Wavelengths *(Continued)*

Frequency (THz)	Wavelength (nm)	Offset (GHz)
193.75	1547.32	12.5/50
193.76	1547.22	12.5
193.78	1547.12	12.5
193.79	1547.02	12.5
193.8	1546.92	12.5/50/100
193.81	1546.82	12.5
193.83	1546.72	12.5
193.84	1546.62	12.5
193.85	1546.52	12.5/50
193.86	1546.42	12.5
193.88	1546.32	12.5
193.89	1546.22	12.5
193.9	1546.12	12.5/50/100
193.91	1546.02	12.5
193.93	1545.92	12.5

Table 45: DWDM Module Wavelengths *(Continued)*

Frequency (THz)	Wavelength (nm)	Offset (GHz)
193.94	1545.82	12.5
193.95	1545.72	12.5/50
193.96	1545.62	12.5
193.98	1545.52	12.5
193.99	1545.42	12.5
194	1545.32	12.5/50/100
194.01	1545.22	12.5
194.03	1545.12	12.5
194.04	1545.02	12.5
194.05	1544.92	12.5/50
194.06	1544.82	12.5
194.08	1544.73	12.5
194.09	1544.63	12.5
194.1	1544.53	12.5/50/100
194.11	1544.43	12.5

Table 45: DWDM Module Wavelengths *(Continued)*

Frequency (THz)	Wavelength (nm)	Offset (GHz)
194.13	1544.33	12.5
194.14	1544.23	12.5
194.15	1544.13	12.5/50
194.16	1544.03	12.5
194.18	1543.93	12.5
194.19	1543.83	12.5
194.2	1543.73	12.5/50/100
194.21	1543.63	12.5
194.23	1543.53	12.5
194.24	1543.43	12.5
194.25	1543.33	12.5/50
194.26	1543.23	12.5
194.28	1543.14	12.5
194.29	1543.04	12.5
194.3	1542.94	12.5/50/100

Table 45: DWDM Module Wavelengths *(Continued)*

Frequency (THz)	Wavelength (nm)	Offset (GHz)
194.31	1542.84	12.5
194.33	1542.74	12.5
194.34	1542.64	12.5
194.35	1542.54	12.5/50
194.36	1542.44	12.5
194.38	1542.34	12.5
194.39	1542.24	12.5
194.4	1542.14	12.5/50/100
194.41	1542.04	12.5
194.43	1541.94	12.5
194.44	1541.85	12.5
194.45	1541.75	12.5/50
194.46	1541.65	12.5
194.48	1541.55	12.5
194.49	1541.45	12.5

Table 45: DWDM Module Wavelengths *(Continued)*

Frequency (THz)	Wavelength (nm)	Offset (GHz)
194.5	1541.35	12.5/50/100
194.51	1541.25	12.5
194.53	1541.15	12.5
194.54	1541.05	12.5
194.55	1540.95	12.5/50
194.56	1540.85	12.5
194.58	1540.76	12.5
194.59	1540.66	12.5
194.6	1540.56	12.5/50/100
194.61	1540.46	12.5
194.63	1540.36	12.5
194.64	1540.26	12.5
194.65	1540.16	12.5/50
194.66	1540.06	12.5
194.68	1539.96	12.5

Table 45: DWDM Module Wavelengths *(Continued)*

Frequency (THz)	Wavelength (nm)	Offset (GHz)
194.69	1539.87	12.5
194.7	1539.77	12.5/50/100
194.71	1539.67	12.5
194.73	1539.57	12.5
194.74	1539.47	12.5
194.75	1539.37	12.5/50
194.76	1539.27	12.5
194.78	1539.17	12.5
194.79	1539.07	12.5
194.8	1538.98	12.5/50/100
194.81	1538.88	12.5
194.83	1538.78	12.5
194.84	1538.68	12.5
194.85	1538.58	12.5/50
194.86	1538.48	12.5

Table 45: DWDM Module Wavelengths *(Continued)*

Frequency (THz)	Wavelength (nm)	Offset (GHz)
194.88	1538.38	12.5
194.89	1538.29	12.5
194.9	1538.19	12.5/50/100
194.91	1538.09	12.5
194.93	1537.99	12.5
194.94	1537.89	12.5
194.95	1537.79	12.5/50
194.96	1537.69	12.5
194.98	1537.59	12.5
194.99	1537.5	12.5
195	1537.4	12.5/50/100
195.01	1537.3	12.5
195.03	1537.2	12.5
195.04	1537.1	12.5
195.05	1537	12.5/50

Table 45: DWDM Module Wavelengths *(Continued)*

Frequency (THz)	Wavelength (nm)	Offset (GHz)
195.06	1536.9	12.5
195.08	1536.8	12.5
195.09	1536.7	12.5
195.1	1536.6	12.5/50/100
195.11	1536.51	12.5
195.13	1536.41	12.5
195.14	1536.31	12.5
195.15	1536.22	12.5/50
195.16	1536.12	12.5
195.18	1536.02	12.5
195.19	1535.92	12.5
195.2	1535.82	12.5/50/100
195.21	1535.72	12.5
195.23	1535.63	12.5
195.24	1535.53	12.5

Table 45: DWDM Module Wavelengths *(Continued)*

Frequency (THz)	Wavelength (nm)	Offset (GHz)
195.25	1535.43	12.5/50
195.26	1535.33	12.5
195.28	1535.23	12.5
195.29	1535.13	12.5
195.3	1535.03	12.5/50/100
195.31	1534.94	12.5
195.33	1534.84	12.5
195.34	1534.74	12.5
195.35	1564.64	12.5/50
195.36	1534.55	12.5
195.38	1534.45	12.5
195.39	1534.35	12.5
195.4	1534.25	12.5/50/100
195.41	1534.15	12.5
195.43	1534.05	12.5

Table 45: DWDM Module Wavelengths *(Continued)*

Frequency (THz)	Wavelength (nm)	Offset (GHz)
195.44	1533.96	12.5
195.45	1533.86	12.5/50
195.46	1533.76	12.5
195.48	1533.66	12.5
195.49	1533.56	12.5
195.5	1533.47	12.5/50/100
195.51	1533.37	12.5
195.53	1533.27	12.5
195.54	1533.17	12.5
195.55	1533.07	12.5/50
195.56	1532.98	12.5
195.58	1532.88	12.5
195.59	1532.78	12.5
195.6	1532.68	12.5/50/100
195.61	1532.58	12.5

Table 45: DWDM Module Wavelengths *(Continued)*

Frequency (THz)	Wavelength (nm)	Offset (GHz)
195.63	1532.49	12.5
195.64	1532.39	12.5
195.65	1532.29	12.5/50
195.66	1532.19	12.5
195.68	1532.09	12.5
195.69	1532	12.5
195.7	1531.9	12.5/50/100
195.71	1531.8	12.5
195.73	1531.7	12.5
195.74	1531.61	12.5
185.75	1531.51	12.5/50
185.76	1531.41	12.5
195.78	1531.31	12.5
195.79	1531.21	12.5
195.8	1531.12	12.5/50/100

Table 45: DWDM Module Wavelengths *(Continued)*

Frequency (THz)	Wavelength (nm)	Offset (GHz)
195.81	1531.02	12.5
195.83	1530.92	12.5
195.84	1530.82	12.5
195.85	1530.73	12.5/50
195.86	1530.63	12.5
195.88	1530.53	12.5
195.89	1530.43	12.5
195.9	1530.33	12.5/50/100
195.91	1530.34	12.5
195.93	1530.24	12.5
195.94	1530.04	12.5
195.95	1529.94	12.5/50
195.96	1529.85	12.5
195.98	1529.75	12.5
195.99	1529.65	12.5

Table 45: DWDM Module Wavelengths *(Continued)*

Frequency (THz)	Wavelength (nm)	Offset (GHz)
196	1529.55	12.5/50/100
196.01	1529.46	12.5
196.03	1529.36	12.5
196.04	1529.26	12.5
196.05	1529.16	12.5/50
196.06	1529.07	12.5
196.08	1528.97	12.5
196.09	1528.87	12.5
196.1	1528.77	12.5/50/100

PTX10K-LC1105 Line Card

IN THIS SECTION

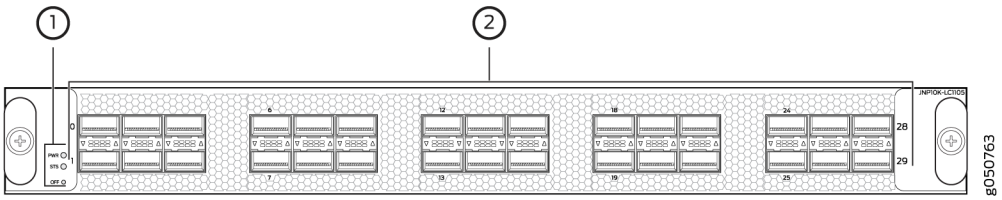
- Overview | **151**
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- Channelizing 40-Gigabit Ethernet Ports | **151**
- Power and Status LEDs | **153**
- Port Status and Activity LEDs | **154**

Overview

The PTX10K-LC1105 line card is designed to provide secure Ethernet communication across high-speed links. The card consists of thirty 28-Gbps QSFP+ Pluggable Solution (QSFP28) ports that are MACsec capable. The ports support speeds of 100 Gbps or 40 Gbps and you can configure the port speed through the CLI. See Figure 61 on page 151.

The PTX10008 and PTX10016 routers that run Junos OS Release 17.4R1-S1 and later support the PTX10K-LC1105 line card.

Figure 61: PTX10K-LC1105 Port Panel



1– Power LED (**PWR**), status LED (**STS**), and offline/online (**OFF**) button	2– Network ports

Network Ports

Each of the 30 QSFP28 ports can operate as:

- 100GbE ports when you use QSFP28 optical transceivers.
- 40GbE ports when you use QSFP+ optical transceivers.

On the PTX10K-LC1105, the ports are enabled by default.

To change the mode, use the Junos OS operational command **set chassis fpc *slot-number* pic 0 port *port number* channelization-speed *speed***.

Channelizing 40-Gigabit Ethernet Ports

Each of the 40-Gigabit Ethernet ports on the PTX10K-LC1105 line card can be channelized into four 10-Gigabit Ethernet, or channels. When ports are in channelization mode, the fourth port on each Packet Forwarding Engine is disabled, and the remaining four ports that are mapped to the same Packet Forwarding Engine can be used as either 4x10-Gigabit Ethernet, 40-Gigabit Ethernet, or 100-Gigabit Ethernet ports. The channelization mode works independently for each of the Packet Forwarding

Engines on the PTX10K-LC1105 line card. See Table 46 on page 152 for the maximum port configurations.

Table 46: Maximum Port Configuration

Port Speed	Nonchannelized Mode (Mode D)	Channelized Mode (Mode A)
100 Gbps	30 or	24 or
40 Gbps	30	24 or
10 Gbps	0	96

The port behavior in the PTX10K-LC1105 line card is tied to the ASIC associated with the port. You must configure each port individually, in order to channelize a 40-Gigabit Ethernet port to four independent 10-Gigabit Ethernet ports. For example, ASIC PE0 maps to ports 0, 2, 4, 6, and 8. The fourth port, port 6, is disabled. See Table 47 on page 152 for the list of available ports and the associated ASIC mapping in Figure 61 on page 151 to locate the available and disabled ports.

NOTE: If you change the channelization mode (mode D to mode A or mode A to mode D), the new port speed configuration does not cause an FPC to reboot automatically, but it triggers an `FPC need bounce` alarm. To ensure that the new port speed configuration takes effect, you must manually reboot the FPC. The alarm is cleared when you manually reboot the FPC or delete the new port speed configuration.

NOTE: When port speeds are changed manually from one setting to another, or when the interface is deactivated, the `show interface` *`interface-name`* command shows the error `Device` *`interface-name`* `not found` for a brief interval. Ensure that the transceiver is in a working condition. The interface comes up subsequently.

Table 47: Port Mapping for Channelization

ASIC	Available Ports	Disabled Port
PE0	0, 2, 4, 8	6

Table 47: Port Mapping for Channelization *(Continued)*

ASIC	Available Ports	Disabled Port
PE1	1, 3, 5, 9	7
PE2	10, 12, 14, 18	16
PE3	11, 13, 15, 19	17
PE4	20, 22, 24, 28	26
PE5	21, 23, 25, 29	27

Power and Status LEDs

The two LEDs to the left of the network ports indicate the power (**PWR**) and status (**STS**) for the line card. See Table 48 on page 153 and Table 49 on page 153.

Table 48: Power LED

Color	State	Description
Unlit	Off	There is no power to the line card.
Green	On steadily	The line card has power.
Yellow or amber	Blinking	The line card has a power fault.

Table 49: Status LED

Color	State	Description
Unlit	Off	The line card is offline or disabled.

Table 49: Status LED *(Continued)*

Color	State	Description
Green	On steadily	The line card is online.
Yellow or amber	On steadily	The line card is booting.
	Blinking	The line card has a fault condition or alarm.
	Slow blink or blip	The beacon function is enabled.

Port Status and Activity LEDs

Each QSFP28 port has a bicolored up or down LED indicator that shows port status and link activity. See Figure 62 on page 154 and Table 50 on page 154.

Figure 62: Indicators for QSFP28 Ports on PTX10K-LC1105 Line Cards

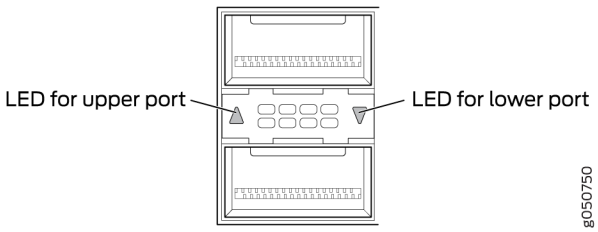


Table 50: Network Port Status and Activity LEDs on a PTX10K-LC1105 Line Card

Color	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 but there is no activity.

Table 50: Network Port Status and Activity LEDs on a PTX10K-LC1105 Line Card *(Continued)*

Color	State	Description
	Blinking	A link is up and there is activity.
Yellow or amber	Slow blink or blip	The beacon function is enabled on the port.
	Blinking	A single LED blinking indicates an interface fault.

PTX10K-LC1201-36CD Line Card

IN THIS SECTION

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- Channelization | **157**
- Network LEDs | **159**
- Line Card Status LEDs | **160**

The PTX10K-LC1201-36CD line card is a 36-port line card that provides a line rate throughput of 14.4 Tbps. The line card has 36 QSFP56-DD ports capable of supporting 400-Gbps speed (see Figure 63 on page 156). You can channelize the ports to operate at 200-Gbps, 100-Gbps, 50-Gbps, 25-Gbps, or 10-Gbps speed by using breakout cables.

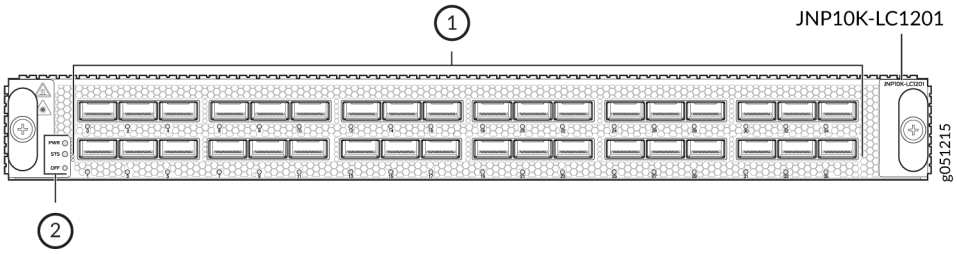
The line card is designed to operate using the newer Routing Engines, the JNP10004-SF3 switch fabric, the JNP10008-SF3 switch fabric, or the JNP10016-SF3 switch fabric; the JNP10K-PWR-AC2 or JNP10K-PWR-DC2 power supply; the JNP10004-FAN2, the JNP10008-FAN2, or the JNP10016-FAN fan tray; and the JNP10004-FTC2, the JNP10008-FTC2, or the JNP10016-FTC2 fan tray controller. These components require Junos OS Evolved.

Overview

The PTX10K-LC1201-36CD line card houses Packet Forwarding Engine based on Juniper Networks' custom ASICs to deliver a 400GbE solution for data centers.

You can install the PTX10K-LC1201-36CD line card in the PTX10004, PTX10008, and PTX10016 chassis horizontally at the front of the chassis.

Figure 63: PTX10K-LC1201-36CD Port Panel



1– Network ports and LEDs	2– Power LED (PWR), status LED (STS), and offline button (OFF)

PTX10004 routers running Junos OS Evolved Release 20.3R1 with Junos Continuity and later support the PTX10K-LC1201-36CD line card. PTX10008 routers running Junos OS Evolved Release 19.4R1-S1 and later support the PTX10K-LC1201-36CD line card. PTX10016 routers running Junos OS Evolved Release 21.2R2 and later support the PTX10K-LC1201-36CD line card. The PTX10K-LC1201-36CD line card interoperates with the PTX10K-LC1202-36MR line card on a PTX10004, PTX10008, or PTX10016 router (see Table 51 on page 156).

Table 51: Components Required for the PTX10K-LC1202-36CD Line Cards

Component (Field Replaceable Unit)	Part Number for the PTX10004	Part Number for the PTX10008	**Part Number for the PTX10016**
Switch fabric	JNP10004-SF3	JNP10008-SF3	JNP10016-SF3
RCB	JNP10K-RE1-E, JNP10K-RE1-128G-E, or JNP10K-RE1-ELT	JNP10K-RE1-E, JNP10K-RE1-ELT, JNP10K-RE1-E128, or JNP10K-RE2-E128	JNP10K-RE1-E, JNP10K-RE1-ELT or JNP10K-RE1-E128
Fan tray	JNP10004-FAN2	JNP10008-FAN2	JNP10016-FAN2

Table 51: Components Required for the PTX10K-LC1202-36CD Line Cards *(Continued)*

Component (Field Replaceable Unit)	Part Number for the PTX10004	Part Number for the PTX10008	**Part Number for the PTX10016**
Fan tray controller	JNP10004-FTC2	JNP10008-FTC2	JNP10016-FTC2
Power supply	JNP10K-PWR-AC2 or JNP10K-PWR-DC2	JNP10K-PWR-AC2 or JNP10K-PWR-DC2	JNP10K-PWR-AC2 or JNP10K-PWR-DC2

Network Ports

The QSFP56-DD ports support:

- 400GbE transceivers (QSFP56-DD)
- 400GbE active optic cables (QSFP56-DD AOCs)
- 4 x 100GbE transceivers (QSFP56-DD)
- 2 x 100GbE transceivers (QSFP28-DD)
- 100GbE transceivers (QSFP28)
- 100GbE AOCs (QSFP28)
- 40GbE transceivers (QSFP+)
- 40GbE to 10GbE QSA (Junos OS Release 20.2R1 and later)

Channelization

All 36 ports of the PTX10K-LC1201-36CD line card default to 400GbE. You can either set all the ports to a specific speed and channelization or you can channelize each port individually. The CLI syntax to channelize a port on the PTX10K-LC1201-36CD is release dependent.

For software releases from Junos OS Evolved Release 19.4R1-S1 to Junos OS Evolved Release 20.1R2:

1. Use the `pic-mode` and `speed` options on the Junos OS Evolved operational `set chassis` command:

```
user@host>set chassis fpc slot slot-number pic 0 pic-mode speed 400g|200g|100g|50g|40g|25g|10g
```

In this example, `fpc slot` represents the line card slots. There is a single PIC in the PTX10K-LC1201-36CD; it is always numbered zero. The `pic-mode` option indicates you are configuring all of ports on the PIC and not an individual port. With the `speed` options, you can configure 100-Gbps or 40-Gbps speed on all 36 ports, or you can configure four 10-Gbps channels on each of the 36 ports.

For example, to set 100-Gbps speed on all ports in slot 2:

```
user@host> set chassis fpc 2 pic 0 pic-mode speed 100g
```

To individually configure a port, you need to specify both the speed and number of subports (channels).

```
user@host> set chassis fpc 0-7 pic 0 port 0-35 speed 400g|200g|100g|50g|40g|25g|10g number-of-subports 1-8
```

For example, to channelize port 15 in slot 0 to 4 downstream 100GbE interfaces:

```
user@host> set chassis fpc 0 pic 0 port 15 speed 100g number-of-subports 4
```

The resulting interfaces would be:

```
et-0/0/15:0
et-0/0/15:1
et-0/0/15:2
et-0/0/15:3
```

NOTE: If you do not specify the `number-of-subports` when configuring an individual port, the system will default to a value of 1. The same example, without the `number-of-subports` option, would then result in one downstream 100GbE interface.

For software releases Junos OS Evolved Release 20.1R2 and later, the `speed` and `number-of-subports` options are in the `interfaces` hierarchy. For example, to channelize port 15 in slot 0 to 4 downstream 100GbE interfaces:

```
[edit-interfaces]
user@host> et-0/0/15
 {speed 100g;
```

```
number-of-subports 4;
}
et-0/0/15:0 {unit 0}
et-0/0/15:1 {unit 0}
et-0/0/15:2 {unit 0}
et-0/0/15:3 {unit 0}
```

After saving and committing the changes, the resulting interfaces would be:

```
et-0/0/15:0
et-0/0/15:1
et-0/0/15:2
et-0/0/15:3
```

Network LEDs

Each network port has a single tricolored LED that indicates link activity and status. The red, amber, or green LED has different interpretations depending on whether the port is channelized, not channelized, or whether the beacon is activated (see Table 52 on page 159). If the beacon feature is activated on the port, the port blinks.

Table 52: PTX10K-LC1201-36CD Network LEDs

Port Status	Normal State	Description
Nonchannelized	Unlit, off	A transceiver is not present in the port or the link is down because of a loss of signal.
	Green, on steadily	A link is established.
	Amber, on steadily	The link is down because of a remote error or because the port was disabled through the CLI.
	Red, on steadily	The link is down because of a hardware failure or a local error.
Channelized	Unlit, off	All channels are down because of loss of signal.

Table 52: PTX10K-LC1201-36CD Network LEDs *(Continued)*

Port Status	Normal State	Description
	Green, on steadily	A link is established and all channels are up.
	Amber, on steadily	Applies to all other cases.
	Red, on steadily	The port has a hardware failure.

Line Card Status LEDs

The line card has a power (**PWR**) LED and a status (**STS**) LED (see Table 53 on page 160).

Table 53: Line Card Status LEDs

LED	State	LED Indication	Beacon/Port Location On
Power **PWR**	Power is not present.	Off	Off
	The line card has power and is operating correctly.	Green, on steadily	Green, on steadily
	The line card has a fault condition.	Red, on steadily	Red, on steadily
Status **STS**	The line card is disabled or offline.	Off	Off
	The line card is online and operating correctly.	Green, on steadily	Green, blinking
	The line card is booting.	Green, blinking	Green, blinking
	The line card has a fault condition.	Red, on steadily	Red, blinking

PTX10K-LC1202-36MR Line Card

IN THIS SECTION

- Overview | 161
- Components Required for PTX10K-LC1202-36MR | 162
- Network Ports and Channelization | 163
- Bandwidth Support | 164
- Network LEDs | 164
- Line Card Status LEDs | 165

Overview

The PTX10K-LC1202-36MR is a 36-port line card that provides a line rate throughput of 4.8 Tbps. The line card has thirty-two QSFP28 ports, each capable of supporting a maximum speed of 100 Gbps, and four QSFP56-DD ports, each capable of supporting a maximum speed of 400 Gbps (see Figure 64 on page 162).

In a pure 100-Gbps port speed configuration, the line card supports a throughput of 3.6 Tbps (each of the 36 ports runs at 100-Gbps speed).

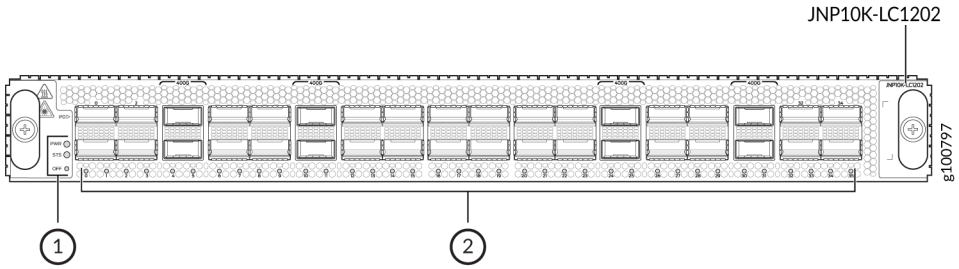
In a mixed-speed configuration of 100 Gbps and 400 Gbps, the line card supports a line rate throughput of 4.8 Tbps (thirty-two 100-Gbps ports and four 400-Gbps ports).

The line card is designed to operate using the newer Routing Engines, the JNP10004-SF3 switch fabric, the JNP10008-SF3 switch fabric, or the JNP10016-SF3 switch fabric; the JNP10K-PWR-AC2 or JNP10K-PWR-DC2 power supply; the JNP10004-FAN2, the JNP10008-FAN2, or JNP10016-FAN fan tray; and the JNP10004-FTC2, the JNP10008-FTC2, or the JNP10016-FTC2 fan tray controller. These components require Junos OS Evolved.

The PTX10K-LC1202-36MR line card houses Packet Forwarding Engines based on Juniper Networks' custom ASICs. The line card has two custom ASICs, each hosting two Packet Forwarding Engines. The line card supports a maximum throughput of 1.2 Tbps per Packet Forwarding Engine.

You can install the PTX10K-LC1202-36MR line card in the PTX10004, PTX10008, and PTX10016 chassis horizontally at the front of the chassis.

Figure 64: PTX10K-LC1202-36MR Port Panel



1– Power LED (PWR), status LED (STS), and offline button (OFF)	2– Network ports and LEDs

Components Required for PTX10K-LC1202-36MR

PTX10004 routers running Junos OS Evolved Release 20.3R1 with Junos Continuity and later support the PTX10K-LC1202-36MR line card. PTX10008 routers running Junos OS Evolved Release 20.3R1 and later (with Junos Continuity) support the PTX10K-LC1202-36MR line card. PTX10016 routers running Junos OS Evolved Release 21.2R2 and later support the PTX10K-LC1202-36MR line card. The PTX10K-LC1202-36MR line card interoperates with the PTX10K-LC1201-36CD line card on a PTX10004, PTX10008, or PTX10016 router.

See Table 54 on page 162 for the required hardware components for PTX10K-LC1202-36MR line cards.

Table 54: Components Required for the PTX10K-LC1202-36MR Line Cards

Component (FRU)	Part Number for the PTX10004	Part Number for the PTX10008	Part Number for the PTX10016
Switch fabric	JNP10004-SF3	JNP10008-SF3	JNP10016-SF3
RCB	JNP10K-RE1-E, JNP10K-RE1-E128, or JNP10K-RE1-ELT	JNP10K-RE1-E, JNP10K-RE1-ELT, JNP10K-RE1-E128, or JNP10K-RE2-E128	JNP10K-RE1-E, JNP10K-RE1-ELT, or JNP10K-RE1-E128
Fan tray	JNP10004-FAN2	JNP10008-FAN2	JNP10016-FAN2

Table 54: Components Required for the PTX10K-LC1202-36MR Line Cards *(Continued)*

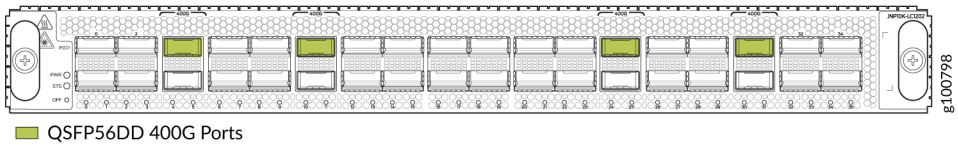
Component (FRU)	Part Number for the PTX10004	Part Number for the PTX10008	Part Number for the PTX10016
Fan tray controller	JNP10004-FTC2	JNP10008-FTC2	JNP10016-FTC2
Power supply	JNP10K-PWR-AC2 or JNP10K-PWR-DC2	JNP10K-PWR-AC2 or JNP10K-PWR-DC2	JNP10K-PWR-AC2 or JNP10K-PWR-DC2

Network Ports and Channelization

On the PTX10K-LC1202-36MR line card, the ports 4, 10, 24, and 30 are 400GbE (QSFP56-DD) ports, while the rest are 100GbE (QSFP28) ports.

Figure 65 on page 163 shows the 400GbE ports highlighted.

Figure 65: PTX10K-LC1202-36MR—Network Ports



By using breakout cables, you can channelize the PTX10K-LC1202-36MR ports.

The QSFP56-DD ports (ports 4, 10, 24, and 30) on the line card support the following transceivers:

- 1x400GbE transceivers (QSFP56-DD)
- 4x100GbE transceivers (QSFP56-DD)
- 2x100GbE transceivers (QSFP28-DD)
- 8x25GbE transceivers (QSFP28-DD)
- 1x100GbE transceivers (QSFP28)
- 4x25GbE transceivers (QSFP28)
- 4x10GbE transceivers (QSFP+)
- 40GbE to 10GbE QSA, starting in Junos OS Evolved Release 20.4R1 and later.

The QSFP28 ports (ports 0 through 3, 5 through 9, 11 through 23, 25 through 29, and 31 through 35) on the line card support the following transceivers:

- 1x100GbE transceivers (QSFP28)
- 4x25GbE transceivers (QSFP28)
- 4x10GbE transceivers (QSFP+)

> **NOTE**: The ports 1, 3, 19, and 21 are disabled if the preceding ports (0, 2, 18, and 20) are not in 100-Gbps mode. This means, of the 36 ports on the PTX10K-LC1202-36MR line card, only 32 ports are available to be configured as 4x25 Gbps and 4x10 Gbps ports.

You can configure port speeds at the interface level using the CLI command `set interfaces` *`interface-name`* `number-of-sub-ports` *`number-of-sub-ports`* .

Bandwidth Support

Table 55 on page 164 explains the bandwidth supported by a PTX10K-LC1202-36MR line card.

Table 55: PTX10K-LC1202-36MR Bandwidth

Router Configuration	Number of Switch Fabric Cards Used	Bandwidth per Slot Without Fabric Redundancy	Bandwidth per Slot with *N*+1 Fabric Redundancy
PREM3 configuration	6	–	4.8 Tbps
PREM2 configuration	4	3.6 Tbps	2.8 Tbps
BASE3 configuration	3	2.8 Tbps	1.6 Tbps

Network LEDs

Each network port has a single tricolored LED that indicates link activity and status. The red, amber, or green LED has different interpretations depending on whether the port is channelized or not channelized, or whether the beacon feature is activated (see Table 56 on page 165.) If the beacon feature is activated on the port, the port blinks.

Table 56: PTX10K-LC1202-36MR Network LEDs

Port Status	State	Description
Nonchannelized	Unlit, off	A transceiver is not present in the port, or the link is down because of a loss of signal.
	Green, on steadily	A link is established.
	Amber, on steadily	The link is down because of a remote error or because the port was disabled through the CLI.
	Red, on steadily	The link is down because of a hardware failure or a local error.
Channelized	Unlit, off	All channels are down because of loss of signal.
	Green, on steadily	A link is established and all channels are up.
	Amber, on steadily	Applies to all other cases.
	Red, on steadily	The port has a hardware failure.

Line Card Status LEDs

The line card has a power (**PWR**) LED and a status (**STS**) LED (see Table 57 on page 165).

Table 57: Line Card Status LEDs

LED	State	LED Indication	Beacon/Port Location On
Power **PWR**	Power is not present.	Off	Off
	The line card has power and is operating correctly.	Green, on steadily	Green, on steadily

Table 57: Line Card Status LEDs *(Continued)*

LED	State	LED Indication	Beacon/Port Location On
	The line card has a fault condition.	Red, on steadily	Red, on steadily
Status **STS**	The line card is disabled or offline.	Off	Off
	The line card is online and operating correctly.	Green, on steadily	Green, blinking
	The line card is booting.	Green, blinking	Green, blinking
	The line card has a fault condition.	Red, on steadily	Red, blinking

QFX10000-60S-6Q Line Card

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- Using Copper and Fiber SFP Transceivers | **170**
- SFP+ Status and Activity LEDs | **171**
- QSFP+ and QSFP28 Status and Activity LEDs | **172**

Hardware Features

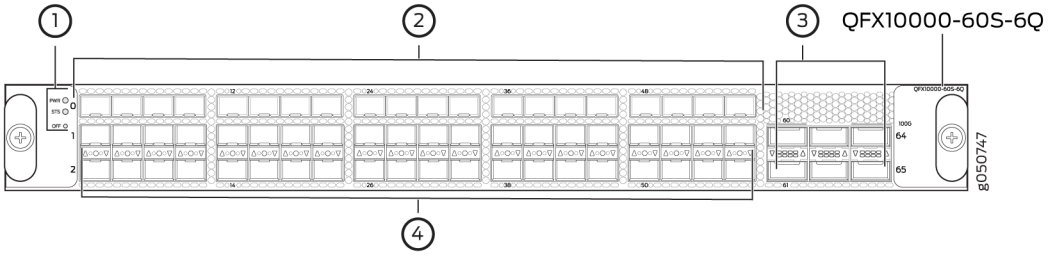
The QFX10000-60S-6Q line card consists of 60 small form-factor pluggable plus (SFP+) ports that support 10-Gbps or 1-Gbps port speed, 2 dual-speed QSFP28 ports that support either 40-Gbps or 100-Gbps port speed, and 4 QSFP+ ports that support 40-Gbps port speed. All of the QSFP and SFP+ ports are configured to 10 Gbps by default. The QSFP28 ports are configured as 40-Gbps speed ports by default, but port **60** and port **64** are dual-speed ports and can be configured to support either 10GbE

or 40GbE optical transceivers. Ports **60** and **64** can also be configured to support 100GbE optical transceivers. See the Hardware Compatibility Tool for details of supported optical transceivers. See Figure 66 on page 167.

The QFX10000-60S-6Q line card is supported on Junos OS Release 19.1R1 and later.

NOTE: Junos OS Release 19.1R1 does not support 1GbE on the 10GbE SFP+ ports.

Figure 66: QFX10000-60S-6Q Port Panel



1– Power LED (**PWR**), status LED (**STS**), and offline/online (**OFF**) button	3– QSFP28 ports, QSFP+ ports, and port groups
2– SFP+ ports	

Each QSFP28 port (**60** and **64**) controls a port group and can be configured as a:

- 100GbE port by using QSFP28 optical transceivers. The interface speeds are configured by port group. When a QSFP28 transceiver is inserted into one of the QSFP28 ports marked with a fine black line above the port (**60** or **64**) and the port is configured for 100GbE, the two adjacent ports are disabled and the QSFP28 port is enabled for 100GbE. When you configure port **60** for 100 Gbps, ports **61** and **62** are disabled; when you configure port **64** for 100 Gbps, ports **63** and **65** are disabled.
- 40GbE port by using QSFP+ optical transceivers. The default speed is 10 Gbps.
- 10GbE port by using breakout cables and attached optical transceivers. When configured for channelization, the system converts the 40GbE port into four independent 10GbE ports (or channels). Use the `set chassis fpc slot` *`slot-number`* `pic slot` *`slot-number`* `port` *`port-number`* `speed` *`speed`* command to change the port speed.

Each QSFP+ port (**61, 62, 63,** and **65**) is part of a port group and is controlled by one of the associated QSFP28 ports (**60** or **64**). If a QSFP28 port operates at 40-Gbps speed, then each of the QSFP+ ports can be configured as a:

- 40GbE port by using QSFP+ optical transceivers. The default speed is 10 Gbps.

- 10GbE port by using breakout cables with attached optical transceivers. When configured for channelization, the system converts the 40GbE port into four independent 10GbE ports (or channels). Use the `set chassis fpc slot` *`slot-number`* `pic slot` *`slot-number`* `port` *`port-number`* `speed` *`speed`* command to change the port speed.

You can configure each SFP+ port (**0** through **59**) as a 10GbE port by using SFP+ optical transceivers. The default speed is 10 Gbps.

You can install copper SFP transceivers only on ports located in the lower two SFP+ port rows (at the bottom). Copper SFP transceivers are supported only on the bottom two SFP+ rows. The copper SFP transceivers (1000BASE-T) are limited to these rows because they are physically larger than optical SFP transceivers (1000BASE-X). Stacking copper SFP transceivers in all three rows causes internal damage to the line card. Optical SFP transceivers can be stacked and used in all SFP+ ports, **0** through **59**.

You can configure any of the 66 ports **0** through **65** as either uplink or access ports. The ports are enabled by default, and the default configuration adds the ports to the default VLAN.

Port Groups

The six combination ports of QSFP28 and QSFP+ can operate either as six independent 40GbE ports or as two port groups. The first port group is controlled by QSFP28 port **60** and administratively bundled with QSFP+ ports **61** and **62**. The second port group is controlled by QSFP28 port **64** and administratively bundled with QSFP+ ports **63** and **65**. To enable the port group, insert a 100GbE transceiver into the QSFP28 port and configure the port as a 100-Gbps port. Junos OS enables the QSFP28 port at 100-Gbps speed and disables the two QSFP+ ports bundled in the port group. Figure 67 on page 168 shows the location of QSFP28 ports and port groups for the QFX10000-60S-6Q. Table 58 on page 169 shows the available combinations for the ports.

Figure 67: QFX10000-60S-6Q Port Groups

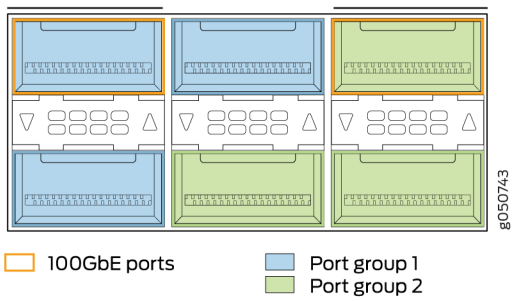


Table 58: QFX10000-60S-6Q Port Mapping

Port Number	4X10GbE	4X10GbE Channelized Port Group	40GbE	100GbE	100GbE Disables
60	✓	✓	✓	✓	61, 62
61	✓		✓	–	–
62	✓		✓	–	–
63	✓	✓	✓	–	–
64	✓		✓	✓	63, 65
65	✓		✓	–	–

Channelization of 40GbE Ports

Channelization from a 40GbE port into four independent 10GbE ports is supported on the QSFP28 and QSFP+ ports. Channelization to 50-Gbps or 25-Gbps speed is not supported on the 100GbE QSFP28 port. All ports in the port group are channelized when port **60** or port **64** is channelized. Ports cannot be channelized individually.

To channelize a 40-Gbps port to four independent 10-Gbps ports (or channels), use the `set chassis fpc slot` *`slot-number`* `pic slot` *`slot-number`* `port` *`port-number`* `channel-speed` *`speed`* command. For example, to channelize ports **60** through **62** for a line card in slot **6**:

```
[edit chassis fpc 6 pic 1]
user@router# set port 60 speed 10g
```

Review your configuration and issue the `commit` command.

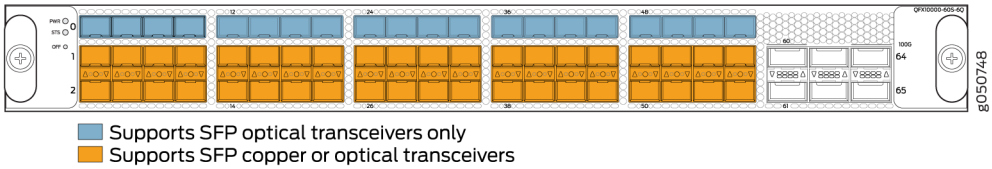
If you want to return the port to the default, delete the `speed` statement from the configuration at the `[chassis fpc 6 pic 1 port port-number]` hierarchy level and commit the configuration. The network port is reset to the default 40GbE interface.

```
[edit chassis fpc 6 pic 1]
user@router# delete port 60 speed 10g
```

Using Copper and Fiber SFP Transceivers

When you configure the 10GbE ports **0** to **59** as 1GbE ports, you can use optical fiber SFP transceivers in any of the ports. However, copper SFP transceivers are restricted to the lower two rows. See Figure 68 on page 170.

Figure 68: Supported Placement for Copper and Fiber SFP+ Transceivers

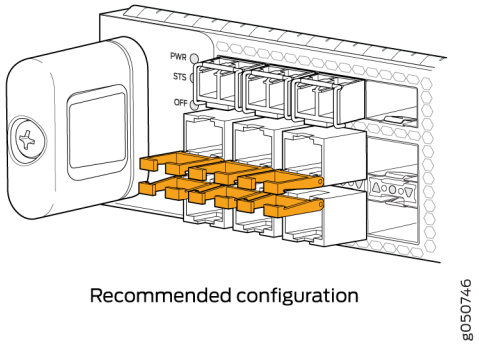


CAUTION: Stacking three copper SFP transceivers in a column can cause damage to the line card.

Because 1-Gbps copper SFP transceivers are physically larger than optical SFP transceivers, there is insufficient room for three copper SFP transceivers to be stacked. Use the top row only for optical SFP transceivers. You can stack copper transceivers in the bottom two rows. Ports are arranged belly-to-

belly. Stacking three SFP transceivers in a column can damage the line card. For the recommended configuration, see Figure 69 on page 171.

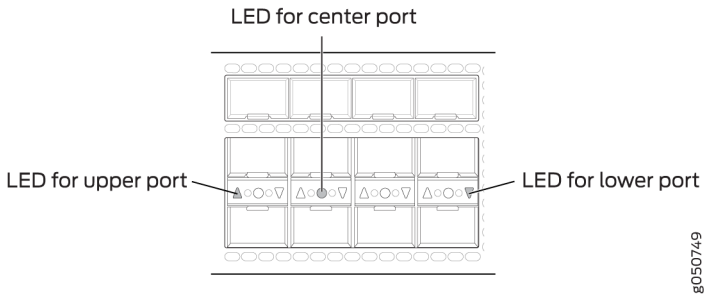
Figure 69: Belly-to-Belly SFP Transceivers



SFP+ Status and Activity LEDs

All status and activity LEDs for the SFP+ ports are located between the second and third rows of SFP+. The up arrow, circle, and down arrow indicate the row of the status. A bicolor LED indicates the status and activity. See Figure 70 on page 171 and Table 59 on page 172.

Figure 70: SFP+ Port Indicators and Status LEDs on a QFX10000-60S-6Q Line Card



- An up arrow indicates the first row.
- A circle indicates the second row.
- A down arrow indicates the third row.

Table 59: Network Port Status and Activity LEDs for SFP+ Ports on a QFX10000-60S-6Q Line Card

Color	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.
Yellow or amber	Slow blink, or blip	The beacon function is enabled on one or more sub-channels.
	Blinking	The interface has a fault condition.

QSFP+ and QSFP28 Status and Activity LEDs

All QSFP+ and QSFP28 ports have an up or down indicator for each port and four bicolored LEDs that show port status and link activity based on whether or not the port is configured for channelization. See Table 60 on page 172.

Figure 71: LED Indicators on QSFP+ and QSFP28 Ports on a QFX10000-60S-6Q Line Card

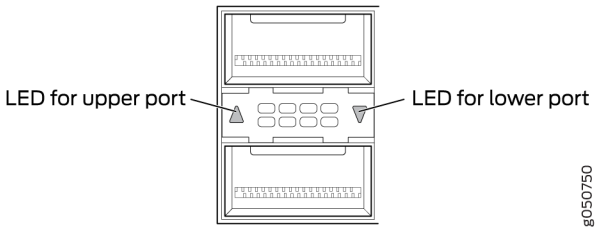


Table 60: QSFP+ and QSFP28 Network Port Status and Activity LEDs

Color	State	Description
Unlit	Off	The port is administratively disabled, there is no power, the link is down, or a transceiver is not present. All sub-channels are disabled.

Table 60: QSFP+ and QSFP28 Network Port Status and Activity LEDs *(Continued)*

Color	State	Description
Green	On steadily	A link is established. When channelized, all sub-channels are up. When not channelized, it indicates no activity.
Yellow or amber	On steadily	At least one channel link is up, but not all channels are up.
	Slow blink, or blip	The beacon function is enabled on one or more sub-channels.
	Blinking	One or more sub-channels has a fault condition.

PTX10008 Line Card LEDs

All PTX10008 line cards have two bicolored LEDs. The PTX10K-LC1201-36CD LEDs are green and red, while the other line card LEDs are green and amber. See Figure 72 on page 173.

Figure 72: Line Card LEDs

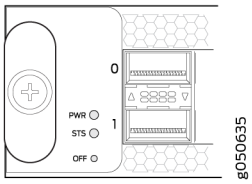


Table 61 on page 173 describes the functions of the line card LEDs other than PTX10K-LC1201-36CD. See Table 62 on page 174 for PTX10K-LC1201-36CD behavior.

Table 61: Line Card LEDs

Label	Color	State	Description
PWR	Unlit	Off	The line card is not receiving power.

Table 61: Line Card LEDs *(Continued)*

Label	Color	State	Description
	Green	On steadily	The line card is receiving power.
	Yellow	Blinking	The line card has a power error, such as insufficient power.
STS	Unlit	Off	The line card is offline.
	Green	On steadily	The line card is online and functioning normally.
	Green	Blinking	The beacon feature is enabled on the line card.
	Yellow	On steadily	The line card is booting.
	Yellow	Blinking	The line card is detecting an error.

Table 62: PTX10K-LC1201-36CD LEDs

Label	Color	Normal State	Beacon Active State	Description
PWR	Green	On steadily	On steadily	The line card is receiving power.
	Red	On steadily	On steadily	The line card is detecting an error.
	Unlit	Off	Off	The line card is not receiving power.
STS	Green	On steadily	Blinking	The line card is online.
	Green	Blinking	Blinking	The line card is booting.

Table 62: PTX10K-LC1201-36CD LEDs *(Continued)*

Label	Color	Normal State	Beacon Active State	Description
	Red	On steadily	Blinking	The line card is detecting an error.

RELATED DOCUMENTATION

PTX10008 Field-Replaceable Units | **35**

Install a PTX10008 Line Card | **368**

2

CHAPTER

Site Planning, Preparation, and Specifications

PTX10008 Site Preparation Overview | 177

PTX10008 Power Planning for JNP10008-SF Switch Fabric | 187

PTX10008 Power Planning for JNP10008-SF3 Switch Fabric | 210

PTX10008 Grounding Cable and Lug Specifications | 221

PTX10008 Transceiver and Cable Specifications | 222

PTX10008 Console and Management Cable Specifications and Pinouts | 229

PTX10008 Site Preparation Overview

IN THIS SECTION

- PTX10008 Site Preparation Checklist | 177
- PTX10008 Environmental Requirements and Specifications | 179
- PTX10008 General Site Guidelines | 180
- PTX10008 Site Electrical Wiring Guidelines | 181
- PTX10008 Rack Requirements | 182
- PTX10008 Clearance Requirements for Airflow and Hardware Maintenance | 185

The following sections describe the guidelines, the specifications, and the requirements to prepare the site for installing a PTX10008 router.

PTX10008 Site Preparation Checklist

The checklist in Table 63 on page 177 summarizes the tasks you need to perform when preparing a site for a PTX10008 installation.

Table 63: Site Preparation Checklist

✓	Item or Task	For More Information
	Environment	
☐	Verify that environmental factors such as temperature and humidity do not exceed router tolerances.	"PTX10008 Environmental Requirements and Specifications" on page 179
	Power	
☐	Measure the distance between external power sources and the router installation site.	

Table 63: Site Preparation Checklist *(Continued)*

✓	Item or Task	For More Information
☐	Calculate the power consumption and requirements.	"PTX10008 Power Planning for JNP10008-SF Switch Fabric" on page 187 or "PTX10008 Power Planning for JNP10008-SF3 Switch Fabric" on page 210
	Rack	
☐	Verify that your rack meets the minimum requirements for the installation of the router.	"PTX10008 Rack Requirements" on page 182
☐	Plan rack location, including required space clearances.	"PTX10008 Clearance Requirements for Airflow and Hardware Maintenance" on page 185
☐	Secure the rack to the floor and building structure.	
	Cables	
☐	Acquire cables and connectors: • Determine the number of cables needed based on your planned configuration. • Review the maximum distance allowed for each cable. Choose the length of cable based on the distance between the hardware components being connected.	The list of supported transceivers for the PTX10008 line cards is located at https://apps.juniper.net/hct/product/#prd=PTX10008.
☐	Plan the cable routing and management.	
☐	**Hardware Upgrades**	Order upgrade kits or individual components. See "PTX10008 Configurations and Upgrade Options" on page 17.

PTX10008 Environmental Requirements and Specifications

The PTX10008 router must be installed in a four-post rack. 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 router cooling system.
- Maintain ambient airflow for normal router operation. If the airflow is blocked or restricted, or if the intake air is too warm, the router might overheat, leading to the router temperature monitor shutting down the device to protect the hardware components.

Table 64 on page 179 provides the required environmental conditions for normal router operation.

Table 64: PTX10008 Environmental Tolerances

Description	Tolerance
Altitude	No performance degradation up to 6562 feet (2000 meters).
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.

Table 64: PTX10008 Environmental Tolerances *(Continued)*

Description	Tolerance
Temperature	• Normal operation ensured in temperature range of 32° F through 104° F (0° C through 40° C). **NOTE**: The maximum supported temperature for normal operation must be lower by 3° C when the air filter is new and lower by 6° C when the air filter is at the end of its life. • Nonoperating storage temperature in shipping container: —40° F through 158° F (—40° C through 70° C). • Short-term operation: 23° F to 155° F (—5° C to +50° C). **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.
Seismic	Designed to comply with Zone 4 earthquake requirements according to NEBS GR-63-CORE, Issue 3.

NOTE: Install PTX10008 routers only in restricted-access areas, such as dedicated equipment rooms and equipment closets, in accordance with Articles 110-16, 110-17, and 110-18 of the National Electrical Code, ANSI/NFPA 70.

PTX10008 General Site Guidelines

Efficient device operation requires proper site planning and maintenance and proper layout of the equipment, rack or cabinet (if used), 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 and 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.

SEE ALSO

Prevention of Electrostatic Discharge Damage | 446

PTX10008 Environmental Requirements and Specifications

PTX10008 Site Electrical Wiring Guidelines

Table 65 on page 181 describes the factors you must consider while planning the electrical wiring at your site.

CAUTION: It is particularly important to provide a properly grounded and shielded environment and to use electrical surge-suppression devices.

Table 65: Site Electrical Wiring Guidelines

Site Wiring Factor	Guideline
Signaling limitations	To ensure that signaling functions optimally: • Install wires correctly. Improperly installed wires can emit radio interference. • Do not exceed the recommended distances or pass wires between buildings. The potential for damage from lightning strikes increases if wires exceed recommended distances or if wires pass between buildings. • Shield all conductors. The electromagnetic pulse (EMP) caused by lightning can damage unshielded conductors and destroy electronic devices.

Table 65: Site Electrical Wiring Guidelines *(Continued)*

Site Wiring Factor	Guideline
Radio frequency interference (RFI)	To reduce or eliminate the emission of RFI from your site wiring: • Use twisted-pair cable with a good distribution of grounding conductors. • Use a high-quality twisted-pair cable with one ground conductor for each data signal when applicable, if you must exceed the recommended distances.
Electromagnetic compatibility (EMC)	Provide a properly grounded and shielded environment and use electrical surge-suppression devices. Strong sources of electromagnetic interference (EMI) can cause the following damage: • 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. **TIP**: If your site is susceptible to problems with EMC, particularly from lightning or radio transmitters, you might want to seek expert advice.



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

PTX10008 Rack Requirements

The PTX10008 router chassis are designed to be installed in four-post racks.

Rack requirements consist of:

- Rack type

- Rack mount kit hole spacing
- Rack size and strength
- Rack connection to the building structure

Table 66 on page 183 provides the rack requirements and specifications for the PTX10008 router.

Table 66: Rack Requirements for the PTX10008

Rack Requirement	Guidelines
Rack type: four-post	Use a four-post rack that provides bracket holes or hole patterns spaced at 1 U (1.75 in. or 4.45 cm) increments and that meets the size and strength requirements to support the weight. A U is the standard rack unit defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310–D) published by the Electronics Industry Association. You can stack three PTX10008 routers at the bottom of the four-post rack if: • The rack is 42 U or greater. • The rack meets the strength requirements to support the weight. • The facility can provide adequate power and cooling.
Rack mount kit hole spacing	The holes in the rack mount kit are spaced at 1 U (1.75 in. or 4.45 cm), so that the router can be mounted in any rack that provides holes spaced at that distance.

Table 66: Rack Requirements for the PTX10008 *(Continued)*

Rack Requirement	Guidelines

Rack size and strength	• Ensure that the rack complies with the standards for a 19-in. wide rack as defined in *Cabinets, Racks, Panels, and Associated Equipment* (document number EIA-310–D) published by the Electronics Industry Association.
	• Use one of the standard rack lengths 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).
	  • 23.62 in. (600 mm)
	  • 30.0 in. (762 mm)
	  • 31.5 in. (800 mm)
	• Ensure that the rack rails are spaced widely enough to accommodate the router chassis' external dimensions. The outer edges of the flange extend the chassis width to 19 in. (48.26 cm).
	• Ensure that the rack is strong enough to support the weight of the router and cabling.
	• Ensure that the spacing of rails and adjacent racks allows for proper clearance around the router and rack. See "PTX10008 Clearance Requirements for Airflow and Hardware Maintenance" on page 185.

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 as well as wall or floor for maximum stability.

PTX10008 Clearance Requirements for Airflow and Hardware Maintenance

When planning the site for a PTX10008 router installation, you must allow sufficient clearance around the installed chassis for cooling and maintenance. See Figure 73 on page 185 and Figure 74 on page 186 for a top view of clearance for the PTX10008.

Figure 73: Clearance Requirements for Airflow and Hardware Maintenance for a PTX10008 Chassis with JNP10008-FAN

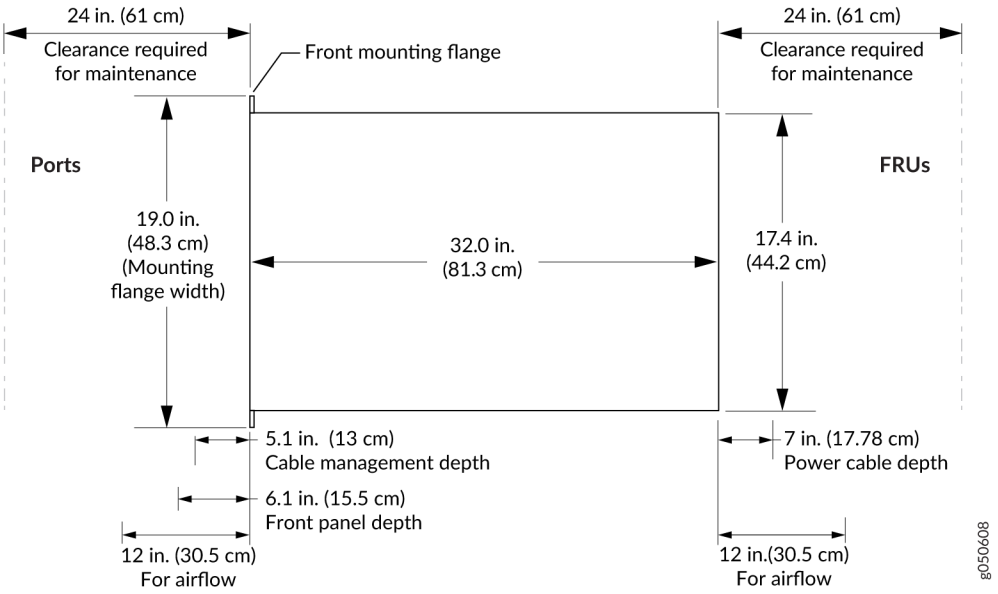
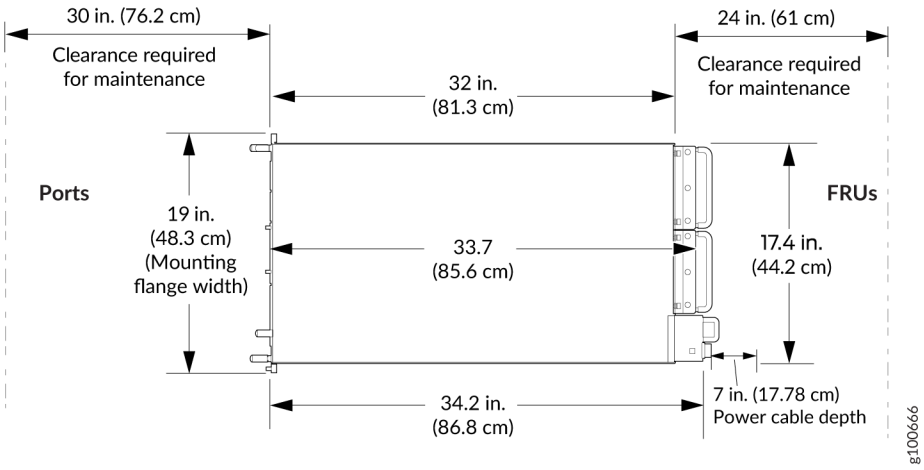


Figure 74: Clearance Requirements for Airflow and Hardware Maintenance for a PTX10008 with JNP10008-FAN2



Follow these guidelines:

- For the cooling system to function properly, the airflow around the chassis must be unrestricted. See "PTX10008 Cooling System and Airflow" on page 44 for more information about the airflow through the chassis.
- If you are mounting a PTX10008 in a rack with other equipment, ensure that the exhaust from other equipment does not blow into the intake vents of the chassis.
- Leave at least 24 in. (61 cm) both in front of and behind the PTX10008 for service personnel to remove and install hardware components. To be NEBS GR-63 compliant, allow at least 30 in. (76.2 cm) in front of the rack and 24 in. (61 cm) behind the rack.

SEE ALSO

PTX10008 Rack Requirements

General Safety Guidelines and Warnings | 421

Rack-Mounting and Cabinet-Mounting Warnings | 429

RELATED DOCUMENTATION

General Safety Guidelines and Warnings

Rack-Mounting and Cabinet-Mounting Warnings

PTX10008 Clearance Requirements for Airflow and Hardware Maintenance | 185

Mount the PTX10008 by Using the JNP10004-RMK-4POST Rack Mount Kit | 245
Mount the PTX10008 by Using the EX-MOD-RMK-4POST Rack Mount Kit | 253

PTX10008 Power Planning for JNP10008-SF Switch Fabric

IN THIS SECTION

- Power Requirements for PTX10008 Components in a JNP10008-SF Fabric | 187
- Calculate Power Requirements for a PTX10008 | 189
- JNP10K-PWR-AC Power Specifications | 195
- JNP10K-PWR-AC2 Power Specifications | 197
- PTX10008 Power Cables Specifications | 198
- JNP10K-PWR-DC Power Specifications | 208
- JNP10K-PWR-DC2 Power Specifications | 209

Use this information to calculate the power consumption for the PTX10008 in a JNP10008-SF switch fabric and plan your configuration's power requirements.

Power Requirements for PTX10008 Components in a JNP10008-SF Fabric

Table 67 on page 188 lists the power requirements for the PTX10008 router running the JNP10008-SF switch fabric under typical voltage conditions and optics.

Table 67: Power Consumption JNP10008-SF Fabric Systems

Component	Description	At 25° C	At 55° C
JNP10008-SF	PTX10008 Switch Interface Board	170 W	235 W
JNP10008-FAN	PTX10008 fan tray	225 W	475 W
JNP10008-FAN2	PTX10008 enhanced fan tray	600 W	1280 W at maximum fan speed
JNP10K-RE0	PTX10008 standard Routing Control Board	50 W	100 W
JNP10K-RE1 or JNP10K-RE1-LT	PTX10008 enhanced Routing Control Board	150 W	175 W
PTX10K-LC1101	PTX10008 30-port QSFP28 line card	890 W	1750 W
PTX10K-LC1102	PTX10008 36-port QSFP+ line card	520 W	675 W
PTX10K-LC1104	PTX10008 coherent DWDM line card	900 W	1050 W
PTX10K-LC1105	PTX10008 30-port MACsec QSFP28 line card	950 W	1250 W
QFX10000-60S-60Q	QFX10000 60-port SFP+ and 6-port QSFP+ line card	365 W	465 W

CAUTION: To ensure adequate power and to avoid raising a power alarm, we recommend that you maintain *n* +1 power supplies in your router at all times. Replace failed power supplies immediately to prevent unexpected failures.

If a new line card is installed in an operational router, power management does not power on the line card if the increased power demand exceeds the total available power, including redundant power. If redundant power is used to power on the line card, a minor alarm is raised, which becomes a major alarm in five minutes if the condition is not corrected.

You can view the total power provided to the chassis, the power required to operate the chassis and the components installed in it, and the balance power available in the chassis by using the show chassis power detail command.

Calculate Power Requirements for a PTX10008

IN THIS SECTION

- Calculate the Power Consumption of Your PTX10008 Configuration | **190**
- Calculate the Number of Power Supplies Required for Your PTX10008 Configuration | **192**

Use the information in this topic to calculate power requirements of your PTX10008 configuration and the number of power supplies required for different PTX10008 router configurations.

CAUTION: To ensure adequate power and to avoid raising a power alarm, we recommend that you maintain *n* +1 power supplies in JNP10008-SF configurations at all times. Replace failed power supplies immediately to prevent unexpected failures.

If a new line card is installed in an operational router, power management does not power on the line card if the increased power demand exceeds the total available power, including redundant power. If redundant power is used to power on the line card, a minor alarm is raised, which becomes a major alarm in five minutes if the condition is not corrected.

NOTE: The calculations in this topic represent the maximum power requirements that you need to budget for your PTX10008 router configuration. The actual power consumption of your router will be less than the calculated results shown here and will vary based on the hardware and

software configuration of your router, the amount of traffic passing through the line cards, and environmental variables such as room temperature.

Before you begin these calculations:

- Ensure you understand the different router configurations. See "PTX10008 Configurations and Upgrade Options" on page 17.
- Ensure that you know the power requirements of different router components. See "Power Requirements for PTX10008 Components in a JNP10008-SF Fabric" on page 187.

This topic describes these tasks:

Calculate the Power Consumption of Your PTX10008 Configuration

Use the following procedure to determine the maximum power you need to supply to the router. To calculate maximum system power consumption, you first determine the combined maximum internal power requirements of all the router components and then divide this result by the power supply output power.

To calculate maximum system power consumption:

1. Determine the maximum power consumption of the base chassis components (that is, the components other than the line cards). Use Table 2 if your router is configured as either the standard base or redundant configuration.

   Table 68: Chassis Power Consumption for Standard Configurations

Chassis Component	Base Configuration	Premium Configuration
JNP10008-FAN	950 W	950 W
JNP10008-FAN2 *	—	—
JNP10K-RE0, or JNP10K-RE1	175 W	350 W
JNP10008-SF	1175 W (5 SIBs)	1410 W (6 SIBs)
Total	**2300 W**	**2710 W**

Table 68: Chassis Power Consumption for Standard Configurations *(Continued)*

Chassis Component	Base Configuration	Premium Configuration

* JNP10008-FAN2 is an optional upgrade that replaces JNP10008-FAN. Use 2,560 W for JNP10008-FAN2 configurations. JNP10008-FAN2 systems require JNP10K-PWR-AC2 or JNP10K-PWR-DC2 power supplies.

2. Calculate the maximum internal power consumption of the entire router by adding in the power requirements of each line card. See Table 3 for a chart of the power needed for line cards.

Table 69: Line Card Power Consumption

Line Cards	PTX10K-LC1101	PTX10K-LC1102	PTX10K-LC1104	PTX10K-LC1105	QFX10000-60S-6Q
1	1150 W	675 W	1050 W	1250 W	455 W
2	2300 W	1350 W	2100 W	2500 W	910 W
3	3450 W	2025 W	3150 W	3750 W	1365 W
4	4600 W	2700 W	4200 W	5000 W	1820 W
5	5750 W	3375 W	—	6250 W	2275 W
6	6900 W	4050 W	—	7500 W	2730 W
7	8050 W	4725 W	—	8750 W	3185 W
8	9200 W	5400 W	—	10,000 W	3640 W

NOTE: * The PTX10K-LC1201-36CD power numbers do not include the power draw of optical transceivers. See the Hardware Compatibility Tool for further information.

> **NOTE**: The PTX10K-LC1104 line card is designed to comply with NEBS regulations on the PTX10008 Packet Transport Router when these routers are used in typical configurations. In a typical configuration, a PTX10008 router supports up to eight line cards, with up to four PTX10K-LC1104 line cards in any of the eight slots.

For example, for a PTX10008 with five PTX10K-LC1102 line cards and three PTX10K-LC1101 line cards, the maximum power consumption is:

= 5 (power consumed by PTX10K-LC1102 in watts) + 3 (power consumed by PTX10K-LC1101 line cards in watts)

= 5 (675 W) + 3 (1150 W)

= (3375 W + 3450 W)

= 6825 W

3. Add the power consumption from Step 1 and the total line card consumption from Step 2.

   To continue from the previous example, add the wattage from five PTX10K-LC1102 and three PTX10K-LC1101 cards to a premium configuration.

   (6825 W) + (2710 W)

   = 9535 W required

Calculate the Number of Power Supplies Required for Your PTX10008 Configuration

Use this procedure to calculate the number of power supplies required by your router configuration. The minimum power configuration for PTX10008 routers is three power supplies. However, using the calculated minimum power configuration does not prevent the system from raising a power alarm. If you are running the router in a JNP10008-SF switch fabric configuration, you must configure your router for *n*+1 power supplies to ensure you do not log power alarms.

To calculate the number of power supplies required for your minimum router configuration:

1. Determine the power available from the power supplies. Table 70 on page 193 shows the power available for installed power supplies.

> **NOTE**: DC systems are supported only in the redundant configuration.

Table 70: Total Power Available

Power Supply Module Models	With Three Power Supplies	With Four Power Supplies	With Five Power Supplies
JNP10K-PWR-AC	8,100 W	10,800 W	13,500 W
JNP10K-PWR-AC2 dual feed, high power (30-A) setting	16,500 W	22,000 W	27,500 W
JNP10K-PWR-AC2 single feed, high power (30-A) setting	15,000 W	20,000 W	25,000 W
JNP10K-PWR-AC2, dual feed, low power (20-A) setting	9,000 W	12,000 W	15,000 W
JNP10K-PWR-AC2, single feed, low power (20-A) setting	8,100 W	10,800 W	13,500 W
JNP10K-PWR-DC	7,500 W	10,000 W	12,500 W
JNP10K-PWR-DC2 dual feed, high power (80-A) setting	16,500 W	22,000 W	27,500 W
JNP10K-PWR-DC2 dual feed, low power (60-A) setting	13,200 W	17,600 W	22,000 W
JNP10K-PWR-DC2 single feed, high power (80-A) setting	8,250 W	11,000 W	13,750 W

Table 70: Total Power Available *(Continued)*

Power Supply Module Models	With Three Power Supplies	With Four Power Supplies	With Five Power Supplies
JNP10K-PWR-DC2 single feed, low power (60-A) setting	6,600 W	8,800 W	11,000 W

NOTE: The JNP10K-PWR-AC2 power supply has a set of DIP switches on the faceplate that allows you to configure the power supply for either high power (30 A) or low power (20 A) input mode. If any JNP10K-PWR-AC2 power supply is set to 20 A, then the power budget for all power supplies installed in the system becomes 20 A, regardless of whether other power supplies are set at 30 A. This design helps prevent overloading of the power supply that is set to 20 A. See Table 71 on page 194 for details about setting the DIP switches and available power.

Table 71: Power Input and Output Voltages for JNP10K-PWR-AC2 Power Supplies

INP0 (Switch 1)	INP1 (Switch 2)	H/L (High Input 30 A/ Low Input 20A)	Output Power
On	On	On (30 A)	5500 W
On	On	Off (20 A)	3000 W
On	Off	On (30 A)	5000 W
Off	On	On (30 A)	5000 W
On	Off	Off (20 A)	2700 W
Off	On	Off (20 A)	2700 W

2. Determine the total power required for your configuration with line cards installed. The total power available to the chassis is calculated by dividing the wattage needed by the power rating, and then rounding up.

   In the previous examples, we calculated that a premium PTX10008 AC system would require 9535 W with five PTX10K-LC1102 and three PTX10K-LC1101 line cards. In this example, we calculate the total power available for the 2700 W JNP10K-PWR-AC power supplies:

   = (9535 W) / (2700 W)

   = 3.5

   Round up the result to 4 AC power supplies to determine the minimum power level.

   > **CAUTION**: The minimum power level does not prevent the system from raising a power alarm. Add an additional power supply for redundancy (*n+1*) to ensure you have covered the maximum power budget for your specific configuration.

   In our example, a basic configuration (3 power supplies, standard) would require two additional power supplies, one for the minimum power level and second as the redundant power supply. In a redundant AC system (6 power supplies, standard), the system would have sufficient power supplies for both minimum and *n+1* redundancy.

3. Calculate how much power the power supplies need. To determine the power required, multiply the number of power supplies by the power supply wattage and divide by the efficiency of the power supply. The efficiency rate accounts for the loss of energy within the power supply and is 89 percent for PTX10008 power supplies.

   For example, if you have an AC system with four power supplies:

   = 4 (2700 W) / (efficiency rating)

   = (10800 W) / (0.89)

   = 12135 W

JNP10K-PWR-AC Power Specifications

PTX10008 and PTX10016 redundant-configuration routers can use either AC or DC power supplies; base-configuration routers are AC only. You can run the JNP10K-PWR-AC power supply only in routers in which you have installed the JNP10008-SF or JNP10016-SF switch fabric.

Table 72 on page 196 lists the power specifications for the AC power supply (JNP10K-PWR-AC) used in a PTX10008 or PTX10016 chassis.

Table 72: Power Specifications for a JNP10K-PWR-AC Power Supply

Item	Specification
AC input voltage	Operating range: 200–240 VAC
AC input line frequency	50–60 Hz
AC input current rating	16 A
AC output power	2700 W



CAUTION: Use a 2-pole circuit breaker rated at 25 A in the building installation and the system, or as per local electrical code.

Table 73 on page 196 shows the physical specifications for an AC power supply.

Table 73: Physical Specifications for a JNP10K-PWR-AC Power Supply

Specification	Value
Height	3.4 in. (8.64 cm)
Width	3.6 in. (9.14 cm)
Depth	14.4 in. (36.58 cm)
Weight	6.8 lb (3.08 kg)

JNP10K-PWR-AC2 Power Specifications

The JNP10K-PWR-AC2 power supply supports AC, HVAC, and HVDC. You can run JNP10K-PWR-AC2 power supplies in either a JNP10008-SF or a JNP10008-SF3 system. If you are upgrading a JNP10008-SF system to use JNP10K-PWR-AC2 power supplies, also upgrade your fans and fan tray controllers to ensure the proper airflow. JNP10K-PWR-AC2 power supplies require JNP10008-FAN2 and JNP10008-FTC2 cooling systems.

Table 74 on page 197 lists the power specifications for the AC power supply (JNP10K-PWR-AC2) used in a PTX10008 or PTX10016 chassis.

Table 74: Power Specifications for a JNP10K-PWR-AC2 Power Supply

Item	Specifications
AC input voltage	180–305 VAC
DC input voltage	190–410 VDC
Input current rating	28.5 A
DC output power	5500 W with dual feed and 5000 W with single feed

Table 75 on page 197 shows the physical specifications for a JNP10K-PWR-AC2 power supply.

Table 75: Physical Specifications for a JNP10K-PWR-AC2 Power Supply

Specification	Value
Height	3.4 in. (8.64 cm)
Width	3.6 in. (9.14 cm)
Depth	16.6 in. (42.16 cm)
Weight	11.4 lb (5.17 kg)

PTX10008 Power Cables Specifications

IN THIS SECTION

- JNP10K-PWR-AC Power Cable Specifications | **198**
- JNP10K-PWR-AC2 Power Cable Specifications | **201**
- JNP10K-PWR-AC2 Power Cable Specifications for 30-A Input | **205**

Most sites distribute power through a main conduit that leads to frame-mounted power distribution panels, one of which can be located at the top of the rack that houses the router. An AC power cord connects each power supply to the power distribution panel.

NOTE: In North America, AC power cords must not exceed 15 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 shipped with the router to North America and Canada are in compliance.

PTX10008 AC, high-voltage alternating current (HVAC), and high-voltage direct current (HVDC) power supplies have specific cord requirements. Use the following sections to determine the cable requirements based on the model of your power supply and any mode settings:

- For JNP10K-PWR-AC, see "JNP10K-PWR-AC Power Cable Specifications" on page 198
- For JNP10K-PWR-AC2 with 20-A input, see "JNP10K-PWR-AC2 Power Cable Specifications" on page 201
- For JNP10K-PWR-AC2 with 30-A input, see "JNP10K-PWR-AC2 Power Cable Specifications for 30-A Input" on page 205

JNP10K-PWR-AC Power Cable Specifications

Each JNP10K-PWR-AC power supply has two independent 16 A rated AC inlets on the faceplate.

Each detachable AC power cord is 8 feet (approximately 2.5 meters) long. The coupler end of the appliancecord inserts into the AC appliance inlet on the faceplate of the AC power supply. The coupler type is C19 as described by the International Electrotechnical Commission (IEC) standard 60320. The plug end of the power cord fits into the power source outlet that is standard for your geographical location.

Table 76 on page 199 lists the AC power cord specifications for JNP10K-PWR-AC for various countries and regions.

Table 76: AC Power Cord Specifications for JNP10K-PWR-AC Power Supplies

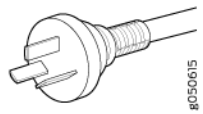
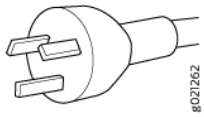
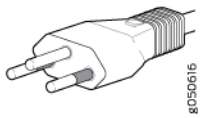
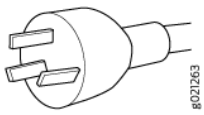
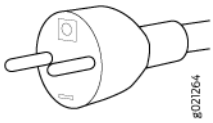
Country/Region	Electrical Specifications	Plug Standards	Juniper Model Number	Graphic
Argentina	250 VAC, 16 A, 50 Hz	IRAM Type RA/3/20	CBL-EX-PWR-C19-AR	
Australia	250 VAC, 15 A, 50 Hz	AS/NZS 3112 Type SAA/3/15	CBL-EX-PWR-C19-AU	
Brazil	250 VAC, 16 A, 50 Hz	NBR 14136: 2002 Type BR/3/20	CBL-EX-PWR-C19-BR	
China	250 VAC, 16 A, 50 Hz	GB 1002 Type PRC/3/16	CBL-EX-PWR-C19-CH	
Europe (except Italy, Switzerland, and United Kingdom)	250 VAC, 16 A, 50 Hz	CEE (7) VII Type VIIG	CBL-EX-PWR-C19-EU	
India	250 AC, 16 A, 50 Hz	SABS 164/1:1992 Type ZA/3	CBL-EX-PWR-C19-SA	

Table 76: AC Power Cord Specifications for JNP10K-PWR-AC Power Supplies *(Continued)*

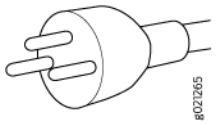
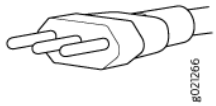
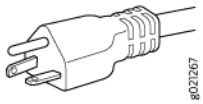
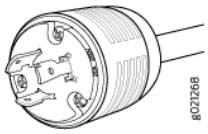
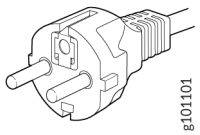
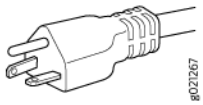
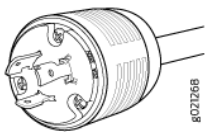
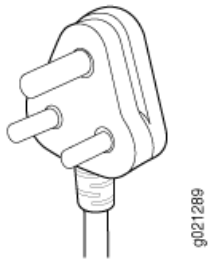
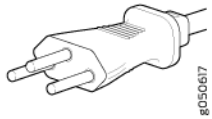
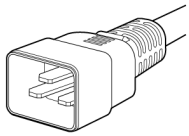
Country/Region	Electrical Specifications	Plug Standards	Juniper Model Number	Graphic
Israel	250 AC, 16 A, 50 Hz	SI 32/1971 Type IL/3	CBL-EX-PWR-C19-IL	
Italy	250 VAC, 16 A, 50 Hz	CEI 23-16 Type I/ 3/16	CBL-EX-PWR-C19-IT	
Japan	250 VAC, 16 A, 60 Hz	NEMA 6–20 Type N6/20	CBL-EX-PWR-C19-JP (default)	
	250 VAC, 16 A, 60 Hz	NEMA L6–20P Type NEMA Locking	CBL-EX-PWR-C19-JPL	
Korea	250 VAC, 16 A, 50 Hz	CEE (7) VII Type VIIG	CBL-EX-PWR-C19-KR	
North America	250 VAC, 16 A, 60 Hz	NEMA 6–20 Type N6/20	CBL-EX-PWR-C19-US (default)	
	250 VAC, 16 A, 60 Hz	NEMA L6–20P Type NEMA Locking	CBL-EX-PWR-C19-USL	

Table 76: AC Power Cord Specifications for JNP10K-PWR-AC Power Supplies *(Continued)*

Country/Region	Electrical Specifications	Plug Standards	Juniper Model Number	Graphic
South Africa	250 VAC, 16 A, 50 Hz	SABS 164/1:1992 Type ZA/3	CBL-EX-PWR-C19-SA	 g021289
Switzerland	250 VAC, 16 A, 50 Hz	SEV 5934/2 Type 23G	CBL-EX-PWR-C19-SZ	 g050617
United Kingdom	250 VAC, 13 A, 50 Hz	BS 1363/A Type BS89/13	CBL-EX-PWR-C19-UK	 g021271
Worldworldwide (except Japan)	250 VAC, 16 A, 50 Hz	EN 60320-2-2/1	CBL-EX-PWR-C19-C20	 g050751

JNP10K-PWR-AC2 Power Cable Specifications

The JNP10K-PWR-AC2 power supply operates in two modes:

- "JNP10K-PWR-AC2 Power Cable Specifications for 30-A Input" on page 205 shows cables and connectors for 30-A input with 5500-W output. One end of the cable has a type SAF-D-GRID Series (3-5958P4) Anderson APP-400 connector, rated 30A/400V/105C, while the other end of the cable is bare wire.
- Table 77 on page 202 shows cables appropriate for 20-A input with 3000-W output. One end of the cable has a type SAF-D-GRID Series (3-5958P4) Anderson APP-400 connector, rated 30A/400V/105C. An example of the connector is shown in Figure 75 on page 205.

WARNING: Do not run JNP10K-PWR-AC2 power supplies using 16-A or 20-A cables if connected to 30-A input.

CAUTION: You can prevent AC power cables from being exposed to hot air exhaust by always routing the power cables away from the fan trays and power supplies.

CAUTION: It is important to connect both input feeds of the JNP10K-PWR-AC2 power supply to AC mains before loading the system with power.

Table 77: JNP10K-PWR-AC2 Power Cable Specifications for 20-A Input

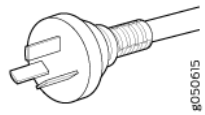
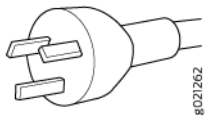
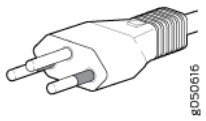
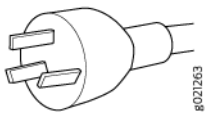
Locale	Cord Set Rating	Plug Standards	Spare Juniper Model Number	Graphic
Argentina	16 A, 250 VAC	IRAM 2073 Type RA/3	CBL-JNP-SG4-AR	 g050615
Australia and New Zealand	15 A, 250 VAC	AS/NZS 3112	CBL-JNP-SG4-AU	 g021262
Brazil	16 A, 250 VAC	NBR 14136 Type BR/3	CBL-JNP-SG4-BR	 g050616
China	16 A, 250 VAC	GB2099	CBL-JNP-SG4-CH	 g021263

Table 77: JNP10K-PWR-AC2 Power Cable Specifications for 20-A Input *(Continued)*

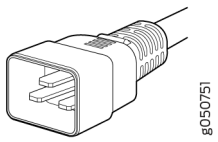
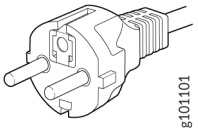
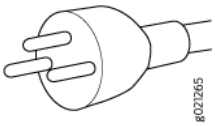
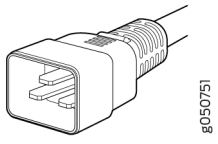
Locale	Cord Set Rating	Plug Standards	Spare Juniper Model Number	Graphic
China, Europe, and Japan	16 A, 250 VAC	C20 to Anderson 3-5958p4	CBL-JNP-SG4-C20-CH	
Europe (except Italy, Switzerland, and United Kingdom)	20 A, 250 VAC	CEE 7/7	CBL-JNP-SG4-EU	
Great Britain	13 A, 250 VAC,	BS1363	CBL-JNP-SG4-UK	
India	16 A, 250 VAC	SANS 164/1	CBL-JNP-SG4-SA	
Israel	16 A, RA, 250 VAC	SI 32/1971 Type IL/3C	CBL-JNP-SG4-IL	
Italy	16 A, 250 VAC	CEI 23-50	CBL-JNP-SG4-IT	
North America	20 A, 250 VAC	3-5958P4 to IEC 60320 C20	CBL-JNP-SG4-C20	

Table 77: JNP10K-PWR-AC2 Power Cable Specifications for 20-A Input *(Continued)*

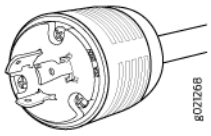
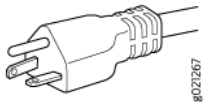
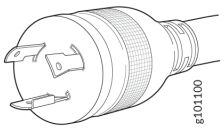
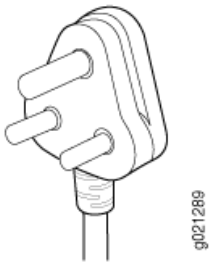
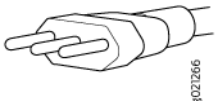
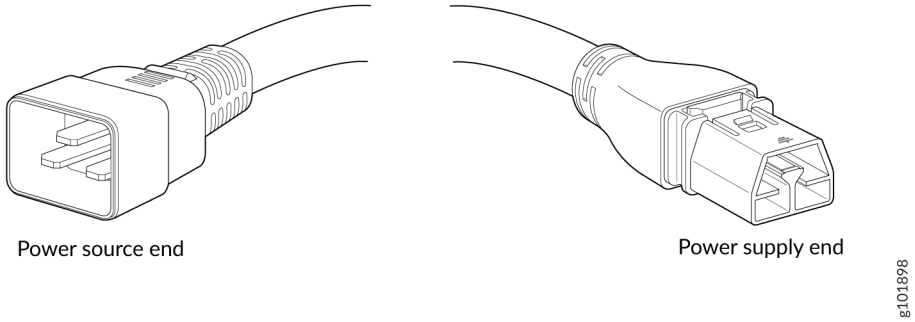
Locale	Cord Set Rating	Plug Standards	Spare Juniper Model Number	Graphic
	16 A, 250 VAC	Locking NEMA L6-20P	CBL-JNP-SG4-US-L	
		NEMA 6-20P	CBL-JNP-SG4-US	
	20 A, 277 V	NEMA I7-20P	CBL-JNP-SG4-HVAC	
South Africa	16 A, 250 VAC	SANS 164/1	CBL-JNP-SG4-SA	
Switzerland	16 A, 250 VAC	CEI 23-50	CBL-JNP-SG4-SZ	

Figure 75: Bare Cable with Anderson Connector



JNP10K-PWR-AC2 Power Cable Specifications for 30-A Input

The JNP10K-PWR-AC2 AC or HVDC power supply require a high current cable assembly when set for 30-A input. One end of the cable has a type SAF-D-GRID Series (3-5958P4) Anderson APP-400 connector, rated 30A/400V/105C, while the other end of the cable is bare wire. See Figure 76 on page 206 and Table 78 on page 206. These cables are separately orderable and are not shipped automatically with JNP10K-PWR-AC2 orders. An example of the right-angle cable and connector is shown in Figure 78 on page 207.

For connection to AC systems, Juniper provides a cable with either a NEMA 30-A connector (Figure 76 on page 206) or an IEC 330P6W connector (Figure 77 on page 206).

Figure 76: NEMA 30-A Connector

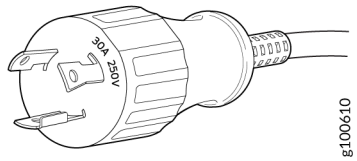


Figure 77: IEC 330P6W Connector

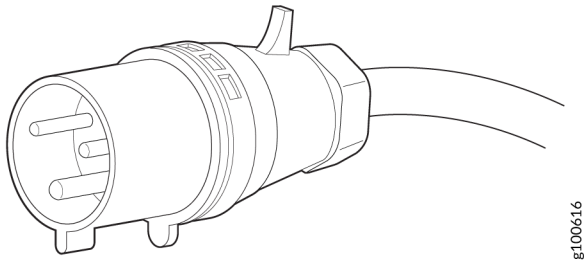


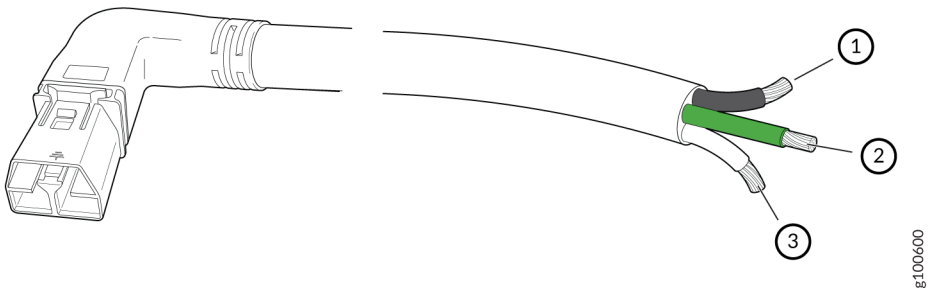
Table 78: 30-A Cabling Options

	Locale	Cord Set Rating	Plug Standards	Connector	Spare Juniper Model Number
AC/HVDC power cord	Any	30-A, 400 VAC	UL 950 and IEC 60950	Anderson/straight to bare wire	CBL-PWR2-BARE
		30-A, 400 VAC	UL 950 and IEC 60950	Anderson/right-angle to bare wire	CBL-PWR2-BARE-RA
AC power cord	Continental Europe	30-A 250 VAC	UL 950 and IEC332P6	Anderson/right-angle to IEC 332P6	CBL-PWR2-332P6W-RA
		30-A 250 VAC	UL 950 and IEC332P6	Anderson/straight to IEC332P6	CBL-PWR2-332P6W

Table 78: 30-A Cabling Options *(Continued)*

	Locale	Cord Set Rating	Plug Standards	Connector	Spare Juniper Model Number
	North America	30-A 250 VAC	IEC330P6	Anderson/right-angle to IEC 330P6	CBL-PWR2-330P6W-RA
		30-A 250 VAC	IEC330P6	Anderson/straight to IEC 330P6	CBL-PWR2-330P6W
		30-A 250 VAC	UL 498, CSA	Anderson/right-angle to L6-30P (NEMA-30A)	CBL-PWR2-L6-30P-RA
		30-A 250 VAC	UL 498, IEC5958P4	Anderson/straight to L6-30P (NEMA-30A)	CBL-PWR2-L6-30P

Figure 78: Right-Angle, Bare Cable with Anderson Connector



1– Black wire – “+” or “-“ for HVDC and “Hot or neutral” for AC	3– White wire – “+” or “-“ for HVDC and “Hot or neutral” for AC
2– Green wire - Ground	

JNP10K-PWR-DC Power Specifications

The DC power supply (JNP10K-PWR-DC) is supported only in routers in which you have installed the JNP10008-SF or JNP10016-SF switch fabric. Table 79 on page 208 lists the power specifications for the JNP10K-PWR-DC power supply used in PTX10008 and PTX10016 routers.

Table 79: Power Specifications for the JNP10K-PWR-DC Power Supply

Item	Specifications
DC input voltage	• Minimum operating voltage: –40 VDC • Nominal operating voltage: –48 VDC • Operating voltage range: –40 VDC through –72 VDC
DC input current rating	60 A maximum at nominal operating voltage (–48 VDC) for each input terminal
Output power	2500 W

Table 80 on page 208 shows the physical specifications of the JNP10K-PWR-DC power supply.

Table 80: Physical Specifications of the JNP10K-PWR-DC Power Supply

Specification	Value
Height	3.4 in. (8.64 cm)
Width	3.6 in. (9.14 cm)
Depth	14.4 in. (36.58 cm)
Weight	6 lb (2.72 kg)

JNP10K-PWR-DC2 Power Specifications

If you are upgrading a JNP10008-SF system to use JNP10K-PWR-DC2 power supplies, also upgrade your fans and fan tray controllers to ensure the proper airflow. JNP10K-PWR-DC2 power supplies require JNP10008-FAN2 and JNP10008-FTC2 cooling systems.Table 81 on page 209 lists the power specifications for the dual DC power supply used in a PTX10008 chassis.

Table 81: Power Specifications for the JNP10K-PWR-DC2 Power Supply

Item	Specifications
DC input voltage	• Minimum operating voltage: –40 VDC • Nominal operating voltage: –48 VDC • Operating voltage range: –40 VDC through –72 VDC
DC input current rating	• 76-A maximum at minimum operating voltage (-40 VDC) with 80-A DIP switch setting and 5500-W output load • 64-A maximum at nominal operating voltage (–48 VDC) with 80-A DIP switch setting and 5500-W output load • 60-A maximum at minimum operating voltage (-40 VDC) with 60-A DIP switch setting and 4400-W output load • 50-A maximum at nominal operating voltage (-48 VDC) with 60-A DIP switch setting and 4400-W output load
Output power	2200 W for low input (60-A) single feed 4400 W for low input (60-A) dual feed 2750 W for high input (80-A) single feed 5500 W for high input (80-A) dual feed

Table 82 on page 210 shows the physical specifications for a JNP10K-PWR-DC2 power supply.

Table 82: Physical Specifications of a JNP10K-PWR-DC2 Power Supply

Specification	Value
Height	3.4 in. (8.64 cm)
Width	3.6 in. (1.63 cm)
Depth	16.05 in. (40.77 cm)
Weight	8.6 lb (3.9 kg)

RELATED DOCUMENTATION

- JNP10K-PWR-AC Power Supply | **61**
- JNP10K-PWR-AC Power Supply LEDs | **72**
- JNP10K-PWR-DC Power Supply | **67**
- JNP10K-PWR-DC Power Supply LEDs | **77**

PTX10008 Power Planning for JNP10008-SF3 Switch Fabric

IN THIS SECTION

- Power Requirements for PTX10008 Components in a JNP10008-SF3 Fabric | **211**
- JNP10K-PWR-AC2 Power Specifications | **212**
- JNP10K-PWR-AC2 Power Cable Specifications | **213**
- JNP10K-PWR-DC2 Power Specifications | **220**

Use this information to calculate the power consumption for the PTX10008 running the JNP10008-SF3 switch fabric and plan your configuration's power requirements.

Power Requirements for PTX10008 Components in a JNP10008-SF3 Fabric

Table 83 on page 211 lists the power requirements for the PTX10008 router running the JNP10008-SF3 under typical voltage conditions and optics.

Table 83: Power Consumption JNP10008-SF3 Fabric Systems Running 14.4 Tbps Line Cards

Component	Description	At 25° C	At 40° C
JNP10008-SF3	PTX10008 Switch Interface Board	700 W	750 W
JNP10008-FAN2	PTX10008 fan tray	600 W	1280 W
JNP10K-RE1-E	PTX10008 Routing Control Board for Junos OS Evolved systems	100 W	150 W
PTX10K-LC1201-36CD	PTX10008 36-port QSFP56-DD line card (without optical transceivers)	1600 W	1775 W
PTX10K-LC1202-36MR	PTX10008 line card with thirty-two QSFP28 ports and four QSFP56-DD ports (without optical transceivers)	740 W	750 W

CAUTION: To ensure adequate power and to avoid raising a power alarm, we recommend that you maintain *n* +1 power supplies in your router at all times. Replace failed power supplies immediately to prevent unexpected failures.

If a new line card is installed in an operational router, power management does not power on the line card if the increased power demand exceeds the total available power, including redundant power. If redundant power is used to power on the line card, a minor alarm is raised, which becomes a major alarm in five minutes if the condition is not corrected.

You can view the total power provided to the chassis, the power required to operate the chassis and the components installed in it, and the balance power available in the chassis by using the show chassis power detail command.

JNP10K-PWR-AC2 Power Specifications

The JNP10K-PWR-AC2 power supply supports AC, HVAC, and HVDC. You can run the JNP10K-PWR-AC2 power supply in either JNP10008-SF or in JNP10008-SF3 fabric systems. However, if you are upgrading a JNP10008-SF system to use JNP10K-PWR-AC2 power supplies, also upgrade your fans and fan tray controllers to ensure the proper airflow. JNP10K-PWR-AC2 power supplies require JNP10008-FAN2 and JNP10008-FTC2 cooling systems.

Table 84 on page 212 lists the power specifications for the AC power supply (JNP10K-PWR-AC2) used in a PTX10008 chassis.

Table 84: Power Specifications for a JNP10K-PWR-AC2 Power Supply

Item	Specifications
AC input voltage	180–305 VAC
DC input voltage	190–410 VDC
Input current rating	28.5 A
DC output power	5500 W with dual feed and 5000 W with single feed

Table 85 on page 212 shows the physical specifications for a JNP10K-PWR-AC2 power supply.

Table 85: Physical Specifications for a JNP10K-PWR-AC2 Power Supply

Specification	Value
Height	3.5 in. (8.89 cm)
Width	3.6 in. (9.14 cm)

Table 85: Physical Specifications for a JNP10K-PWR-AC2 Power Supply *(Continued)*

Specification	Value
Depth	15.1 in. (38.35 cm)
Weight	11.4 lb (5.17 kg)

JNP10K-PWR-AC2 Power Cable Specifications

IN THIS SECTION

- JNP10K-PWR-AC2 Power Cable Specifications | **214**
- JNP10K-PWR-AC2 Power Cable Specifications for 30-A Input | **217**

Most sites distribute power through a main conduit that leads to frame-mounted power distribution panels, one of which can be located at the top of the rack that houses the router. An AC power cord connects each power supply to the power distribution panel.

NOTE: In North America, AC power cords must not exceed 15 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 shipped with the router to North America and Canada are in compliance.

PTX10008 AC, high-voltage alternating current (HVAC), and high-voltage direct current (HVDC) power supplies have specific cord requirements. Use the following sections to determine the cable requirements based on the model of your power supply and any mode settings:

- For JNP10K-PWR-AC2 with 20-A input and 3000-W output, see "JNP10K-PWR-AC2 Power Cable Specifications" on page 214
- For JNP10K-PWR-AC2 with 30-A input and 5500-W output, see "JNP10K-PWR-AC2 Power Cable Specifications for 30-A Input" on page 217

JNP10K-PWR-AC2 Power Cable Specifications

When the JNP10K-PWR-AC2 power supply is operating in 20-A mode, it has an output of 2700-W with a single feed and 3000-W with dual feeds. Table 86 on page 214 shows the cables appropriate for 20-A input. Table 87 on page 217 shows the cable appropriate for HVAC input. One end of the cable has a type SAF-D-GRID Series (3-5958P4) Anderson APP-400 connector, rated 30A/400V/105C. An example of the connector is shown in Figure 79 on page 217.

WARNING: Do not run JNP10K-PWR-AC2 power supplies using 16-A or 20-A cables if connected to 30-A input.

CAUTION: You can prevent AC power cables from being exposed to hot air exhaust by always routing the power cables away from the fan trays and power supplies.

CAUTION: It is important to connect both input feeds of the JNP10K-PWR-AC2 power supply to AC mains before loading the system with power.

NOTE: The cables that we ship are 4.5 m long and come with AWG or mm^2 wire size depending on your country or region.

Table 86: JNP10K-PWR-AC2 Power Cable Specifications for 20-A Input

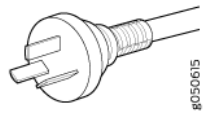
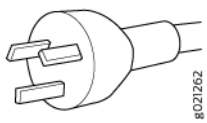
Locale	Cord Set Rating	Plug Standards	Spare Juniper Model Number	Graphic
Argentina	16 A, 250 VAC	IRAM 2073 Type RA/3	CBL-JNP-SG4-AR	 g050615
Australia and New Zealand	15 A, 250 VAC	AS/NZS 3112	CBL-JNP-SG4-AU	 g021262

Table 86: JNP10K-PWR-AC2 Power Cable Specifications for 20-A Input *(Continued)*

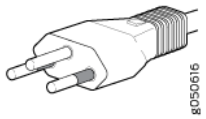
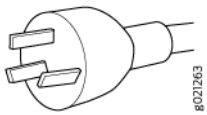
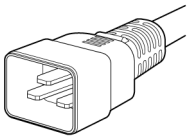
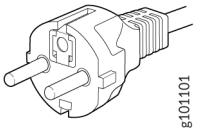
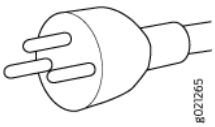
Locale	Cord Set Rating	Plug Standards	Spare Juniper Model Number	Graphic
Brazil	16 A, 250 VAC	NBR 14136 Type BR/3	CBL-JNP-SG4-BR	 g050616
China	16 A, 250 VAC	GB2099	CBL-JNP-SG4-CH	 g021263
China, Europe, and Japan	16 A, 250 VAC	C20 to Anderson 3-5958p4	CBL-JNP-SG4-C20-CH	 g050751
Europe (except Italy, Switzerland, and United Kingdom)	20 A, 250 VAC	CEE 7/7	CBL-JNP-SG4-EU	 g101101
Great Britain	13 A, 250 VAC,	BS1363	CBL-JNP-SG4-UK	 g021271
India	16 A, 250 VAC	SANS 164/1	CBL-JNP-SG4-SA	 g021270
Israel	16 A, RA, 250 VAC	SI 32/1971 Type IL/3C	CBL-JNP-SG4-IL	 g022265

Table 86: JNP10K-PWR-AC2 Power Cable Specifications for 20-A Input *(Continued)*

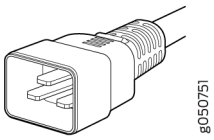
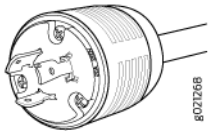
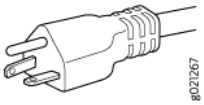
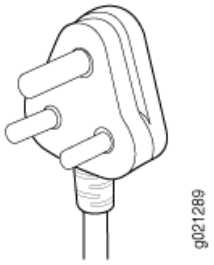
Locale	Cord Set Rating	Plug Standards	Spare Juniper Model Number	Graphic
Italy	16 A, 250 VAC	CEI 23-50	CBL-JNP-SG4-IT	
North America	20 A, 250 VAC	3-5958P4 to IEC 60320 C20	CBL-JNP-SG4-C20	
	16 A, 250 VAC	Locking NEMA L6-20P	CBL-JNP-SG4-US-L	
		NEMA 6-20P	CBL-JNP-SG4-US	
South Africa	16 A, 250 VAC	SANS 164/1	CBL-JNP-SG4-SA	
Switzerland	16 A, 250 VAC	CEI 23-50	CBL-JNP-SG4-SZ	

Figure 79: Bare Cable with Anderson Connector

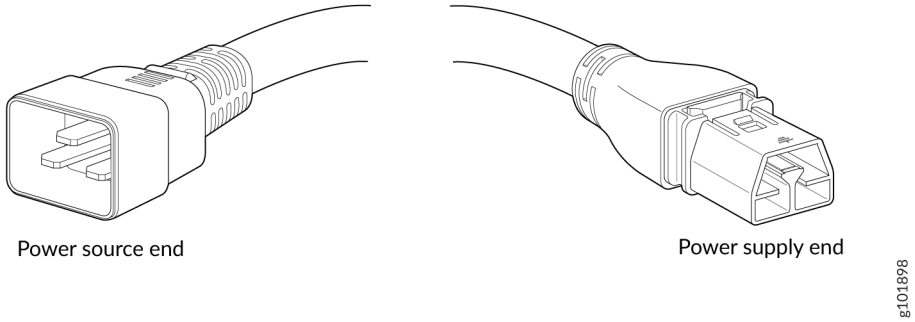
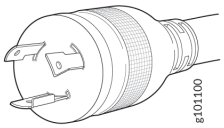


Table 87: JNP10K-PWR-AC2 Power Cable Specifications for HVAC Input

Locale	Cord Set Rating	Plug Standard	Spare Juniper Model Number	Graphic
North America	16 A, 277 V	NEMA L7-20P	CBL-JNP-SG4-HVAC	

JNP10K-PWR-AC2 Power Cable Specifications for 30-A Input

The JNP10K-PWR-AC2 AC or HVDC power supply require a high voltage cable assembly when set for 30-A input. One end of the cable has a type SAF-D-GRID Series (3-5958P4) Anderson APP-400 connector, rated 30A/400V/105C, while the other end of the cable is bare wire. See Figure 80 on page 218 and Table 88 on page 218. These cables are separately orderable and are not shipped automatically with JNP10K-PWR-AC2 orders. An example of the right-angle cable and connector is shown in Figure 82 on page 219.

For connection to AC systems, Juniper provides a cable with either a NEMA 30-A connector (Figure 80 on page 218) or an IEC 330P6W connector (Figure 81 on page 218).

Figure 80: NEMA 30-A Connector

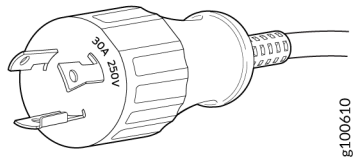


Figure 81: IEC 330P6W Connector

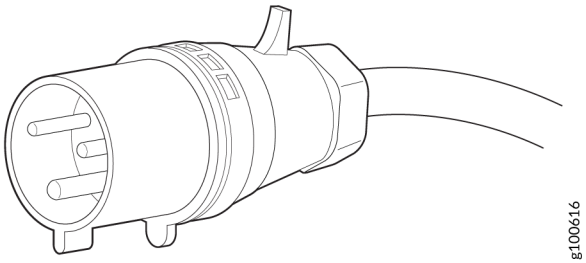


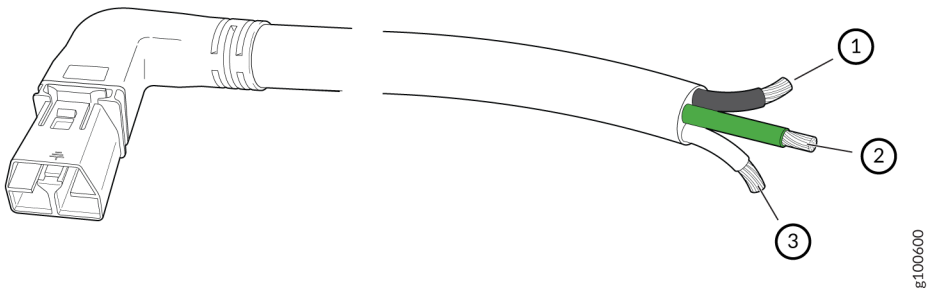
Table 88: 30-A Cabling Options

Description	Locale	Cord Set Rating	Plug Standards	Connector	Spare Juniper Model Number
AC/HVDC power cord	Any	30-A, 400 VAC	UL 950 and IEC 60950	Anderson/straight to bare wire	CBL-PWR2-BARE
		30-A, 400 VAC	UL 950 and IEC 60950	Anderson/right-angle to bare wire	CBL-PWR2-BARE-RA
AC power cord	Continental Europe	30-A 250 VAC	UL 950 and IEC332P6	Anderson/right-angle to IEC 332P6	CBL-PWR2-332P6W-RA
		30-A 250 VAC	UL 950 and IEC332P6	Anderson/straight to IEC332P6	CBL-PWR2-332P6W

Table 88: 30-A Cabling Options *(Continued)*

Description	Locale	Cord Set Rating	Plug Standards	Connector	Spare Juniper Model Number
	North America	30-A 250 VAC	IEC330P6	Anderson/right-angle to IEC 330P6	CBL-PWR2-330P6W-RA
		30-A 250 VAC	IEC330P6	Anderson/straight to IEC 330P6	CBL-PWR2-330P6W
		30-A 250 VAC	UL 498, CSA	Anderson/right-angle to L6-30P (NEMA-30A)	CBL-PWR2-L6-30P-RA
		30-A 250 VAC	UL 498, IEC5958P4	Anderson/straight to L6-30P (NEMA-30A)	CBL-PWR2-L6-30P

Figure 82: Right-Angle, Bare Cable with Anderson Connector



1– Black wire – “+” or “-“ for HVDC and “Hot or neutral” for AC	3– White wire – “+” or “-“ for HVDC and “Hot or neutral” for AC
2– Green wire - Ground	

JNP10K-PWR-DC2 Power Specifications

If you are upgrading a JNP10008-SF system to use JNP10K-PWR-DC2 power supplies, also upgrade your fans and fan tray controllers to ensure the proper airflow. JNP10K-PWR-DC2 power supplies require JNP10008-FAN2 and JNP10008-FTC2 cooling systems.Table 89 on page 220 lists the power specifications for the dual DC power supply used in a PTX10008 chassis.

Table 89: Power Specifications for the JNP10K-PWR-DC2 Power Supply

Item	Specifications
DC input voltage	• Minimum operating voltage: –40 VDC • Nominal operating voltage: –48 VDC • Operating voltage range: –40 VDC through –72 VDC
DC input current rating	• 76-A maximum at minimum operating voltage (-40 VDC) with 80-A DIP switch setting and 5500-W output load • 64-A maximum at nominal operating voltage (–48 VDC) with 80-A DIP switch setting and 5500-W output load • 60-A maximum at minimum operating voltage (-40 VDC) with 60-A DIP switch setting and 4400-W output load • 50-A maximum at nominal operating voltage (-48 VDC) with 60-A DIP switch setting and 4400-W output load
Output power	2200 W for low input (60-A) single feed 4400 W for low input (60-A) dual feed 2750 W for high input (80-A) single feed 5500 W for high input (80-A) dual feed

Table 90 on page 221 shows the physical specifications for a JNP10K-PWR-DC2 power supply.

Table 90: Physical Specifications of a JNP10K-PWR-DC2 Power Supply

Specification	Value
Height	3.5 in. (8.89 cm)
Width	3.6 in. (1.63 cm)
Depth	16.05 in. (40.77 cm)
Weight	8.1 lb (3.67 kg)

RELATED DOCUMENTATION

- JNP10K-PWR-AC2 Power Supply | 64
- JNP10K-PWR-DC2 Power Supply | 69
- Install and Remove PTX10008 Power System Components | 309

PTX10008 Grounding Cable and Lug Specifications

You must install the router in a restricted-access location and ensure it is adequately grounded at all times. Proper grounding ensures your router is operating correctly and that it meets safety and electromagnetic interference (EMI) requirements. The PTX10008 modular chassis has a 2-hole protective grounding terminal on the rear of the chassis beneath the power supplies for grounding.

For AC powered systems, you must also use the grounding wire in the AC power cord along with the 2-hole lug ground connection. This tested system meets or exceeds all applicable EMC regulatory requirements with the 2-hole protective grounding terminal.



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

CAUTION: Before router installation begins, a licensed electrician must attach a cable lug to the grounding cables that you supply. See "Connect the PTX10008 Router to Earth Ground" on page 268. A cable with an incorrectly attached lug can damage the router.

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

- Two threaded inserts (PEM nuts) are provided on the lower rear of the chassis for connecting the router to earth ground. The grounding points are spaced at 0.63 in. (16 mm) centers.
- The chassis grounding lug required is a Panduit LCD4-14A-L or equivalent (provided). This lug accommodates 4 AWG (21.1mm^2) stranded wire. The 4 AWG (21.1 mm^2) stranded wire should be rated 90° C, or as permitted by local electrical code.

  WARNING: Some early PTX10008 chassis shipped with chassis lugs rated for 6 AWG. If you plan to upgrade your power system to use JNP10K-PWR-DC2 power supplies at the high power setting (80 A), be sure your chassis lug is upgraded the Panduit LCD4-14A-L equivalent.

- The grounding cable that you provide for a PTX10008 must be the same size or heavier than the input wire of each power supply.

RELATED DOCUMENTATION

Connect AC Power to a PTX10008 | 271

Connect DC Power to a PTX10008 | 271

PTX10008 Transceiver and Cable Specifications

IN THIS SECTION

PTX10008 Optical Transceiver and Cable Support | 223

PTX10008 Cable Specifications for Console and Management Connections | 224

- PTX10008 Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion | **225**
- Calculate the Fiber-Optic Cable Power Budget for a PTX Series Router | **226**
- Calculate the Fiber-Optic Cable Power Margin for a PTX Series Router | **227**

Review fiber-optic cable characteristics and plan the power budget and power margin for fiber-optic cables connected to your device by using the information in the following topics.

PTX10008 Optical Transceiver and Cable Support

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 PTX10008 is located at https://apps.juniper.net/hct/home/.



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.

SEE ALSO

- Supported Transceivers

PTX10008 Cable Specifications for Console and Management Connections

Table 91 on page 224 lists the specifications for the cables that connect the PTX10008 router to a management device.

NOTE: The PTX10008 can be configured with SFP management ports that support 1000BASE-SX transceivers.

Table 91: Cable Specifications for Console and Management Connections for the PTX10008 Routers

Port on PTX10008 Router	Cable Specification	Cable Supplied	Maximum Length	Device Receptacle
Console 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	2.13 meters	RJ-45
Management port	Category 5 cable or equivalent suitable for 1000BASE-T operation	One 7-foot (2.13-meter) long RJ-45 patch cable	100 meters	RJ-45

SEE ALSO

PTX10008 Console and Management Cable Specifications and Pinouts | 229

Connect a PTX10008 Router to a Management Console | 274

Connect a PTX10008 Router to a Network for Out-of-Band Management | 273

PTX10008 Fiber-Optic Cable Signal Loss, Attenuation, and Dispersion

IN THIS SECTION

- Signal Loss in Multimode and Single-Mode Fiber-Optic Cables | 225
- Attenuation and Dispersion in Fiber-Optic Cable | 225

To determine the power budget and power margin needed for fiber-optic connections, you need to understand how signal loss, attenuation, and dispersion affect transmission. The PTX10008 router uses various types of network cables, including multimode and single-mode fiber-optic cables.

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

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 light sources. They spray varying wavelengths of light into the multimode fiber, which reflect 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 (layers of lower refractive index material in close contact with a core material of higher refractive index), higher-order mode loss occurs. Together, these factors reduce the transmission distance of multimode fiber compared to that of single-mode fiber.

Single-mode fiber is so small in diameter that rays of light 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 to multimode fiber, single-mode fiber has a higher bandwidth and can carry signals for longer distances. It is consequently more expensive.

Attenuation and Dispersion in Fiber-Optic Cable

An optical data link functions correctly provided that modulated light reaching the receiver has enough power to be demodulated correctly. *Attenuation* is the reduction in strength of the light signal during transmission. Passive media components such as cables, cable splices, and connectors cause attenuation. 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 transmit enough light to overcome attenuation.

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

- Chromatic dispersion, which is the spreading of the signal over time caused by the different speeds of light rays.
- Modal dispersion, which is the spreading of the signal over time caused by 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 limits the 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 within the limits specified for the type of link in the Telcordia Technologies document GR-253-CORE (Section 4.3) and International Telecommunications Union (ITU) document G.957.

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

Calculate the Fiber-Optic Cable Power Budget for a PTX Series Router

Calculate the link's power budget when planning fiber-optic cable layout and distances to ensure that fiber-optic connections have sufficient power for correct operation. The power budget is the maximum amount of power the link 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 don't operate at the worst-case levels.

To calculate the worst-case estimate for the fiber-optic cable power budget (P^B) for the link:

1. Determine values for the link's minimum transmitter power (P_T) and minimum receiver sensitivity (P_R). For example, here (P_T) and (P_R) are measured in decibels, and decibels are referenced to 1 milliwatt (dBm):

   P_T = –15 dBm

   P_R = –28 dBm

   > **NOTE**: See the specifications for your transmitter and receiver to find the minimum transmitter power and minimum receiver sensitivity.

2. Calculate the power budget (P^B) by subtracting (P_R) from (P_T):

–15 dBm – (–28 dBm) = 13 dBm

Calculate the Fiber-Optic Cable Power Margin for a PTX Series Router

Before you begin to calculate the power margin, calculate the power budget.

Calculate the link's power margin when planning fiber-optic cable layout and distances to ensure that fiber-optic connections have sufficient signal power to overcome system losses and still satisfy the minimum input requirements of the receiver for the required performance level. The power margin (P_M) is the amount of power available after attenuation or link loss (LL) has been subtracted from the power budget (P_B).

When you calculate the power margin, you use a worst-case analysis to provide a margin of error, even though all the parts of an actual system don't operate at worst-case levels. A power margin (P_M) greater than zero indicates that the power budget is sufficient to operate the receiver and that it does not exceed the maximum receiver input power. This means the link will work. A (P_M) that is zero or negative indicates insufficient power to operate the receiver. See the specification for your receiver to find the maximum receiver input power.

To calculate the worst-case estimate for the power margin (P_M) for the link:

1. Determine the maximum value for LL by adding estimated values for applicable link-loss factors; for example, use the sample values for various factors as provided in Table 92 on page 227 (here, the link is 2 km long and multimode, and the (P_B) is 13 dBm).

   Table 92: Estimated Values for Factors Causing Link Loss

Link-Loss Factor	Estimated Link-Loss Value	Sample Link-Loss Calculation Values
Higher-order mode losses	Multimode—0.5 dBm	0.5 dBm
	Single mode—None	0 dBm
Modal and chromatic dispersion	Multimode—None, if product of bandwidth and distance is less than 500 MHz/km	0 dBm
	Single mode—None	0 dBm

Table 92: Estimated Values for Factors Causing Link Loss *(Continued)*

Link-Loss Factor	Estimated Link-Loss Value	Sample Link-Loss Calculation Values
Connector	0.5 dBm	This example assumes five connectors. Loss for five connectors: 5 (0.5 dBm) = 2.5 dBm.
Splice	0.5 dBm	This example assumes two splices. Loss for two splices: 2 (0.5 dBm) = 1 dBm.
Fiber attenuation	Multimode—1 dBm/km	This example assumes the link is 2-km long. Fiber attenuation for 2 km: 2 km (1 dBm/km) = 2 dBm.
	Single-mode—0.5 dBm/km	This example assumes the link is 2-km long. Fiber attenuation for 2 km: 2 km (0.5 dBm/km) = 1 dBm.
Clock Recovery Module (CRM)	1 dBm	1 dBm

NOTE: For information about the actual amount of signal loss caused by equipment and other factors, see your vendor documentation for that equipment.

2. Calculate the (P_M) by subtracting (LL) from (P_B):

   P_B– LL = P_M

   13 dBm – 0.5 dBm [HOL] – 5 (0.5 dBm) – 2 (0.5 dBm) – 2 km (1.0 dBm/km) – 1 dB [CRM] = P_M

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

   P_M = 6 dBm

   The calculated power margin is greater than zero, indicating that the link has sufficient power for transmission. Also, the power margin value does not exceed the maximum receiver input power. Refer to the specifications for your receiver to find the maximum receiver input power.

PTX10008 Console and Management Cable Specifications and Pinouts

IN THIS SECTION

- Console Port Connector Pinouts for a PTX10008 | 229
- USB Port Specifications for the PTX10008 Router | 230
- Management Port Connector Pinouts for the PTX10008 Router | 231

The following sections describe the console port, the USB port, and the management port connections and specifications.

Console Port Connector Pinouts for a PTX10008

The console port (labeled **CON**) on the Routing and Control Board panel 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 93 on page 229 provides the pinout information for the RJ-45 console connector. An RJ-45 cable and RJ-45 to DB-9 adapter are supplied with the PTX10008 routers.

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 PTX10008 router, use a combination of the RJ-45 cable and RJ-45 to DB-9 adapter supplied with the device and a USB to DB-9 plug adapter. You must provide the USB to DB-9 plug adapter.

Table 93: Console Port Connector Pinouts for the PTX10008 Router

Pin	Signal	Description
1	RTS output	Request to send

Table 93: Console Port Connector Pinouts for the PTX10008 Router *(Continued)*

Pin	Signal	Description
2	DTR output TOD output for PTP applications	Data terminal ready Time of day for Precision Time Protocol (PTP). You can use DTR pins as a TOD universal asynchronous receiver/transmitter (UART) by using breakout cables.
3	TxD output	Transmit data
4	Signal ground	Signal ground
5	Signal ground	Signal ground
6	RxD input	Receive data
7	DCD input TOD output for PTP applications	Data carrier detect Time of day for PTP. You can use DCD pins as a TOD UART by using breakout cables.
8	CTS input	Clear to send

SEE ALSO

Connect a PTX10008 Router to a Management Console | 274

USB Port Specifications for the PTX10008 Router

The following Juniper Networks USB flash drives have been tested and are officially supported for the USB port in the PTX10008 router:

- RE-USB-1G-S—1-GB USB flash drive
- RE-USB-2G-S—2-GB USB flash drive
- RE-USB-4G-S—4-GB USB flash drive

CAUTION: Any USB memory product not listed as supported for the PTX10008 router has not been tested by Juniper Networks. The use of any unsupported USB memory product could expose your device to unpredictable behavior. Juniper Networks Technical Assistance Center (JTAC) can provide only limited support for issues related to unsupported hardware. We strongly recommend that you use only supported USB flash drives.

CAUTION: Remove the USB flash drive before upgrading Junos OS or rebooting a PTX10008 Router. Failure to do so could expose your device to unpredictable behavior.

NOTE: USB flash drives used with the PTX10008 router must support USB 2.0 or later.

Management Port Connector Pinouts for the PTX10008 Router

The 1000BASE-T RJ-45 management ports use an RJ-45 connector to connect a management device for out-of-band management.

Table 94 on page 231 provides the pinout information of the RJ-45 management port connector. An RJ-45 cable is supplied with the PTX10008 router.

Table 94: RJ-45 Management Port Connector Pinouts for the PTX10008 Router

Pin	Signal	Description
1	TRP1+	Transmit/receive data pair 1
2	TRP1–	Transmit/receive data pair 1
3	TRP2+	Transmit/receive data pair 2

Table 94: RJ-45 Management Port Connector Pinouts for the PTX10008 Router *(Continued)*

Pin	Signal	Description
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

CHAPTER 3

Initial Installation and Configuration for New Systems

PTX10008 Installation Overview | 234

Unpack the PTX10008 Router | 235

Mount the PTX10008 by Using the JNP10004-RMK-4POST Rack Mount Kit | 245

Mount the PTX10008 by Using the EX-MOD-RMK-4POST Rack Mount Kit | 253

Install the Front Door on a PTX10008 Router | 262

Connect the PTX10008 to Power | 268

Connect the PTX10008 to External Devices | 273

Perform the Initial Configuration for the PTX10008 Router | 280

PTX10008 Installation Overview

The PTX10008 is a rigid sheet-metal router-chassis that houses the other hardware components such as the Routing and Control boards, Switch Interface Boards (SIBs), power supplies, fan trays, and line cards. The router chassis ships in a cardboard box that has a two-layer wooden pallet base. The router chassis is bolted to the pallet base. You can install a PTX10008 router in a standard 19-in. (483-mm) equipment rack by using the supplied rack mount kit and the flange that is attached to the chassis.

The steps to install the PTX10008 are:

1. Unpack the router following the instructions in "Unpack the PTX10008 Shipping Pallet" on page 235.
2. Mount the chassis in the rack following the instructions in either "Mount the PTX10008 by Using the JNP10004-RMK-4POST Rack Mount Kit" on page 245 or "Mount the PTX10008 by Using the EX-MOD-RMK-4POST Rack Mount Kit" on page 253.

   Because of the weight of the chassis, mounting using a mechanical lift is preferred as the easiest and safest method.
3. Install the line cards following the instructions in "Install a PTX10008 Line Card" on page 368.
4. Connect the chassis to earth ground following the instructions in "Connect the PTX10008 Router to Earth Ground" on page 268.
5. Connect power to the power supplies following the instructions in either "Connect AC Power to a PTX10008" on page 271 or "Connect DC Power to a PTX10008" on page 271.
6. Connect to the network.
   - To connect the router to a network for out-of-band management, follow instructions in "Connect a PTX10008 Router to a Network for Out-of-Band Management" on page 273.
   - To connect the router to a management console, follow instructions in "Connect a PTX10008 Router to a Management Console" on page 274.
7. Configure the router following the instructions in "Perform the Initial Configuration for the PTX10008 Router" on page 280.
8. Install optional equipment such as the cable management system. See "Install the PTX10008 Cable Management System" on page 373.

RELATED DOCUMENTATION

PTX10008 Rack Requirements | **182**

PTX10008 Clearance Requirements for Airflow and Hardware Maintenance | **185**

PTX10008 Chassis Lifting Guidelines | **427**

Unpack the PTX10008 Router

IN THIS SECTION

- Unpack the PTX10008 Shipping Pallet | 235
- Unpack Line Cards, Routing Control Boards, and Switch Interface Boards for the PTX10008 | 237
- Compare the PTX10008 Order to the Packing List | 239
- Register Products—Mandatory to Validate SLAs | 244

To unpack the PTX10008 router and its components, read the following sections:

Unpack the PTX10008 Shipping Pallet

After you prepare the installation site as described in "PTX10008 Site Preparation Checklist" on page 177, you can unpack the router.

NOTE: The chassis is maximally protected inside the shipping box. Do not unpack it until you are ready to begin installation.

Ensure that you have the following parts and tools available to unpack the PTX10008:

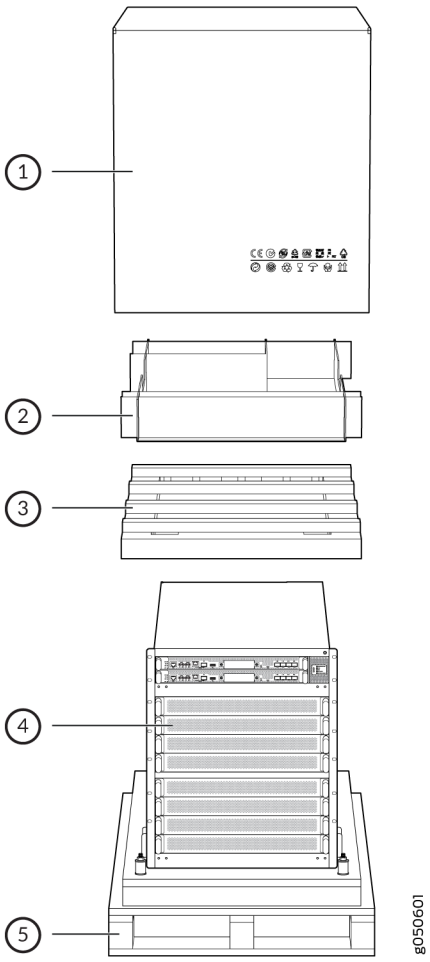
- A 13/32-in. (10-mm) open-end or socket wrench to remove the bracket bolts from the shipping pallet
- A box cutter or packing knife to slice open the nylon straps and tape that seal the crate and boxes

The chassis ships in a cardboard box that has a two-layer wooden pallet base with foam cushioning between the layers. The router chassis is bolted to the pallet base.

The shipper has the option to either ship the front panel separately or ship it along with the chassis. If the front panel arrives with the chassis, set aside the front panel box until you are ready to verify the contents of the order.

To unpack the chassis (see Figure 83 on page 236):

Figure 83: Shipping Crate and Accessory Box

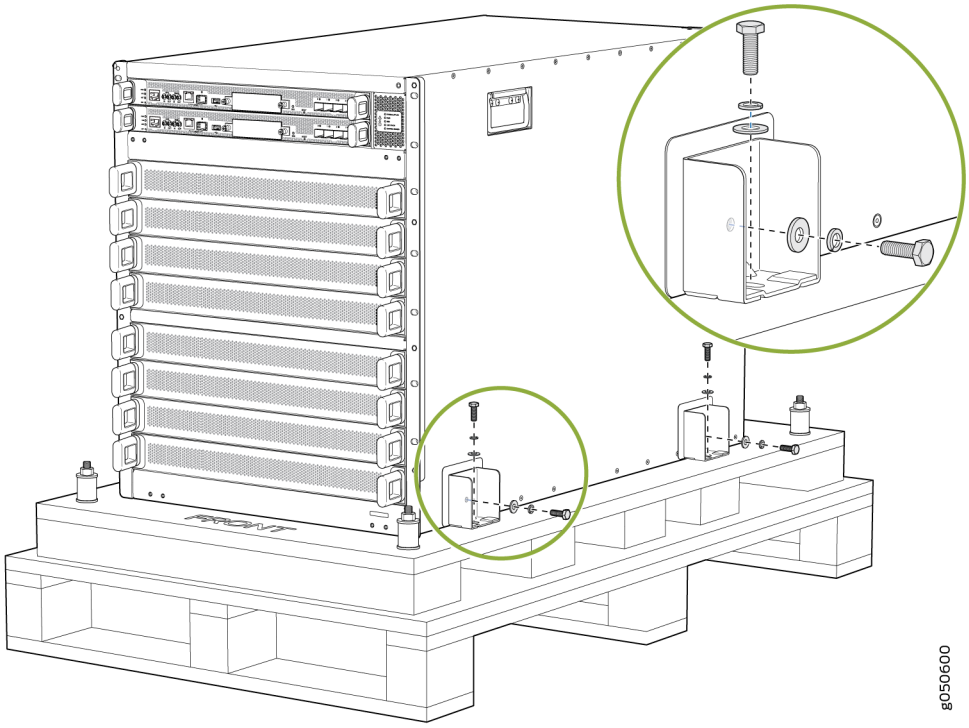


1– Cardboard shipping box	4– PTX10008 chassis
2– Cardboard accessory box	5– Wood pallet
3– Foam cover	

1. Move the shipping box to a staging area as close to the installation site as possible. While the chassis is bolted to the pallet, you can use a forklift or pallet jack to move the shipping box. Make sure there is enough space to remove components from the chassis.
2. Position the shipping box with the arrows pointing up.
3. Use the box cutter to slice the nylon straps that hold the shipping box to the pallet.
4. Lift the shipping box off the chassis.
5. Remove the cardboard accessory box.
6. Remove the foam padding from the top of the box.

7. Remove the plastic cover from the router chassis.
8. Use a 13/32-in. (10-mm) open-end or socket wrench to remove the four sets of bracket bolts that secure the chassis to the shipping pallet (see Figure 84 on page 237).

Figure 84: Remove the Bracket Bolt



9. Unpack the accessory box and lay out the contents so that they are ready for use.
10. Verify that your order includes all appropriate parts. See "Compare the PTX10008 Order to the Packing List" on page 239 and "PTX10008 Configurations and Upgrade Options" on page 17 for information about base configurations and redundant configurations.
11. Store the brackets and bolts inside the accessory box.
12. Save the shipping box and packing materials in case you need to move or ship the router at a later time.

Unpack Line Cards, Routing Control Boards, and Switch Interface Boards for the PTX10008

Before you unpack a component:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.
- Ensure that you know how to handle and store the component. (See "How to Handle and Store PTX10008 Line Cards, RCBs, and SIBs" on page 354).

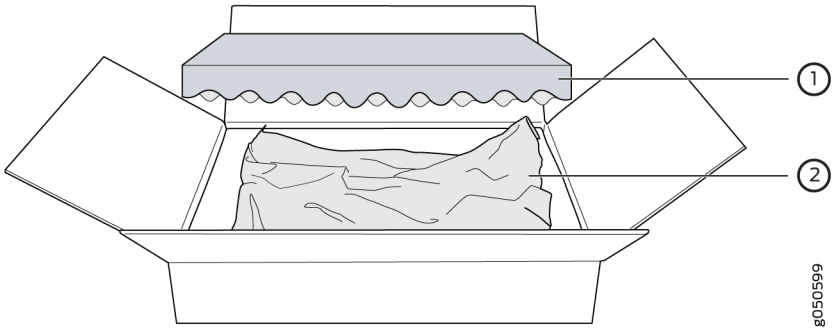
Line cards, additional Routing and Control Boards (RCBs), and additional Switch Interface Boards (SIBs) components are FRUs that are shipped separately from the router chassis. The housing for the RCBs and line cards are rigid sheet-metal structures that house the electronics. SIBs have an exposed printed circuit board (PCB) on one side and sheet metal on the other. All these components are shipped in a cardboard carton, secured with packing material.

CAUTION: The components are maximally protected inside the shipping carton. Do not unpack them until you are ready to install the components in the router chassis.

To unpack an RCB, a SIB, or a line card:

1. Move the shipping carton to a staging area as close to the installation site as possible.
2. Position the carton so that the arrows are pointing up.
3. Open the top flaps on the shipping carton.
4. Pull out the packing material that holds the component in place.
5. Remove the component from the antistatic bag.
6. Save the shipping carton and packing materials in case you need to move or ship the RCB, SIB, or line card later.

Figure 85: Unpacking a Line Card



1– Foam packing material	2– Paper packaging and antistatic bag

SEE ALSO

Install a PTX10008 Line Card | 368

Install a PTX10008 Switch Interface Board | 358

Install a PTX10008 Routing and Control Board | 290

Compare the PTX10008 Order to the Packing List

The router chassis shipment includes a packing list. Check the parts you receive in the shipping crate against the items on the packing list. The packing list specifies the part number and description of each part in your order.

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

Items that ship separately from the chassis are:

- Line cards
- Chassis front door kit (JNP10008-FRNT-PNL or JNP10008-FRPNL1 with air filter)

  NOTE: The kit is a spare part and can ship with the chassis or separately. The JNP10008-FRPNL1 is not available on JNP10008-SF3 switch fabric systems.

- Cable management kit (JLC-CBL-MGMT-KIT)

Use the following procedure to compare the sales order and packing list against the contents of the chassis shipping crate.

1. Determine the configuration. See "PTX10008 Configurations and Upgrade Options" on page 17. The parts shipped depend on the configuration you order. Supported configurations are:
   - Base configuration.
     - PTX10008-BASE for AC and JNP10008-SF fabric systems.
     - PTX10008-BASE for DC and JNP10008-SF fabric systems.
   - Premium redundant configuration.
     - PTX10008-PREMIUM for AC and JNP10008-SF fabric systems.

- PTX10008-PREMIUM for DC and JNP10008-SF fabric systems.
- PTX10008-PREM3 for AC and JNP10008-SF3 fabric systems.
- PTX10008-PREM3 for DC and JNP10008-SF3 fabric systems.

2. Compare premium redundant configuration orders using Table 95 on page 240.

Table 95: Premium Redundant Configuration Order

Component	PTX10008 Quantity
Chassis, including power bus	1
Routing and Control Boards	2
Fan tray controllers • JNP10008-FAN-CTRL or • JNP10008-FTC2	2
Fan trays • JNP10008-FAN or • JNP10008-FAN2	2
Power supplies • JNP10K-PWR-AC • JNP10K-PWR-AC2 • JNP10K-PWR-DC • JNP10K-PWR-DC2	6
Switch Interface Boards (SIBs)	6
Covers in the line-card positions	8
Accessory kit (see Table 97 on page 242)	1

Table 95: Premium Redundant Configuration Order *(Continued)*

Component	PTX10008 Quantity
Rack mount kit (see Table 98 on page 243)	1
Front door kit (see Table 99 on page 243)	1
Documentation Roadmap Card	1

3. Compare base configuration orders using Table 96 on page 241.

Table 96: Base Configuration Order

Component	PTX10008 Quantity
Chassis, including power bus	1
RCBs	1
Cover panel, in the RCB slot	1
Fan tray controllers	2
Fan trays	2
Power supplies	3
SIBs	5
Cover in a SIB position	1
Covers in the power-supply positions	3
Covers in the line-card positions	8

Table 96: Base Configuration Order *(Continued)*

Component	PTX10008 Quantity
Dust covers for RCB ports	5 for RE0; 3 for RE1
Accessory kit (see Table 97 on page 242)	1
Rack mount kit (see Table 98 on page 243)	1
Front door kit, lockable (see Table 99 on page 243)	1
Documentation Roadmap Card	1

4. Compare the contents of the accessory kit with Table 97 on page 242.

Table 97: PTX10008 Accessory Kit

Component	Quantity	
	AC Configurations	DC Configurations
Warranty card	1	1
End User License Agreement (EULA)	1	1
RJ-45 Ethernet cable	1	1
RJ-45 to DB9 rollover cable	1	1
Electrostatic discharge (ESD) wrist strap with cable	1	1
Media kit (flash drives, PCMCIA card adapter)	1	1
Chassis ground lug, 2-hole, 10-32, 4 AWG	1	1

Table 97: PTX10008 Accessory Kit *(Continued)*

Component	Quantity	
	AC Configurations	DC Configurations
Power cord retainer clips	Premium = 12 Base = 6	–
DC terminal lugs, 2-hole, 10-32, 4 AWG	–	Premium = 24 Base = 12
Antistatic bags	2	

5. Compare the contents of the rack mount kit with Table 98 on page 243.

Table 98: PTX10008 Rack Mount Kit

Component	Quantity
Mounting tray	1
Mounting blades	2
Safety restraint	1
Phillips flat-head screws, 8-32 x .375 in.	12

6. Compare the contents of the front door kit with Table 99 on page 243.

Table 99: PTX10008 Front Door Kit

Component	Quantity
Front panel	1

Table 99: PTX10008 Front Door Kit *(Continued)*

Component	Quantity
Left base bracket	1
Right base bracket	1
Latch brackets	2
Phillips flat-head screws	8
Documentation Roadmap Card	1

SEE ALSO

PTX10008 Configurations and Upgrade Options | 17

Register Products—Mandatory to Validate SLAs

Register all new Juniper Networks hardware products and changes to an existing installed product using the Juniper Networks website to activate your hardware replacement service-level agreements (SLAs).

CAUTION: Register product serial numbers on the Juniper Networks website. Update the installation base data if any addition or change to the installation base occurs or if the installation base is moved. Juniper Networks is not responsible for not meeting the hardware replacement service-level agreement for products that do not have registered serial numbers or accurate installation base data.

Register your product(s) at https://tools.juniper.net/svcreg/SRegSerialNum.jsp.
Update your installation base at https://www.juniper.net/customers/csc/management/updateinstallbase.jsp.

Mount the PTX10008 by Using the JNP10004-RMK-4POST Rack Mount Kit

You can mount a PTX10008 router in a four-post closed frame rack or a four-post open frame rack by using a rack mount kit. The rack mount kit with the part number JNP10004-RMK-4POST is shipped by default. You can order the rack mount kit with the part number EX-MOD-RMK-4POST separately. In this topic, we describe how to mount the router by using the JNP10004-RMK-4POST rack mount kit.

The router chassis weighs approximately 145 lb (66 kg) with only the fan tray controllers installed.

You can mount a PTX10008 manually or by using a mechanical lift. Because of the router's size and weight, we strongly recommend that you use a mechanical lift to mount the PTX10008.

If you are mounting the router by using a lift, ensure that you have a mechanical lift rated for 500 lb (226.8 kg).

If you are mounting the router manually, ensure that there are at least three people to lift the chassis.

Before you mount the PTX10008 router:

- Prepare the site for installation as described in "PTX10008 Site Preparation Checklist" on page 177.
- Unpack the router as described in "Unpack the PTX10008 Shipping Pallet" on page 235.
- Review the chassis lifting guidelines in "PTX10008 Chassis Lifting Guidelines" on page 427.

Ensure that you have the following parts and tools available:

- 34 rack mount screws appropriate for your rack to secure the mounting blades, mounting tray, chassis, and safety restraint to the rack (not provided)
- A Phillips (+) screwdriver, number 1, 2, or 3, depending on the size of your rack mount screws (not provided)

The rack mount kit consists of the following components:

- One mounting tray
- Two mounting blades
- One safety restraint
- 12 Phillips 8-32 x .375 flat-head screws

CAUTION: Install line cards and other components in the chassis only after you mount the chassis securely.

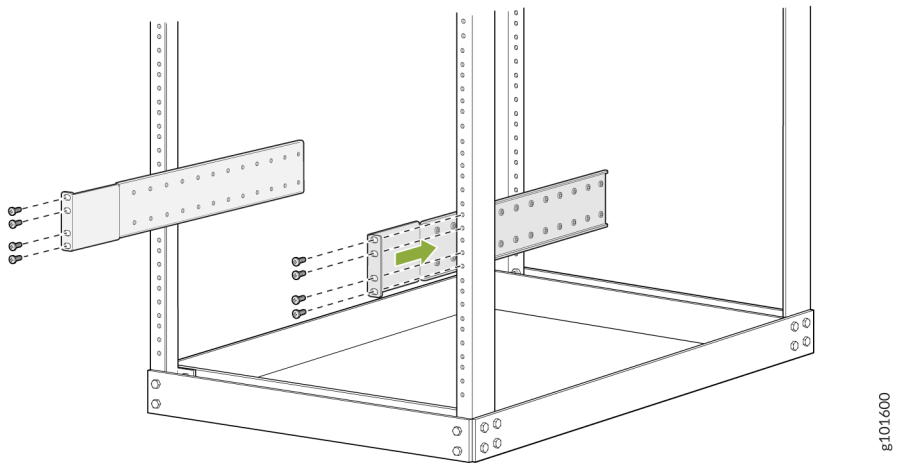
CAUTION: Before mounting the router on a rack, have a qualified technician verify that the rack is strong enough to support the router's weight and is adequately supported at the installation site.

CAUTION: If you are mounting multiple units on a rack, plan to mount the first router at the bottom of the rack. Mount the heaviest unit at the bottom of the rack and mount the other units from the bottom of the rack to the top in decreasing order of the weight of the units.

To mount the router:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist, and connect the other end to a site ESD point.
2. Attach the mounting blades to the front rack posts by using eight rack mount screws appropriate for your rack and a screwdriver (see Figure 86 on page 246).

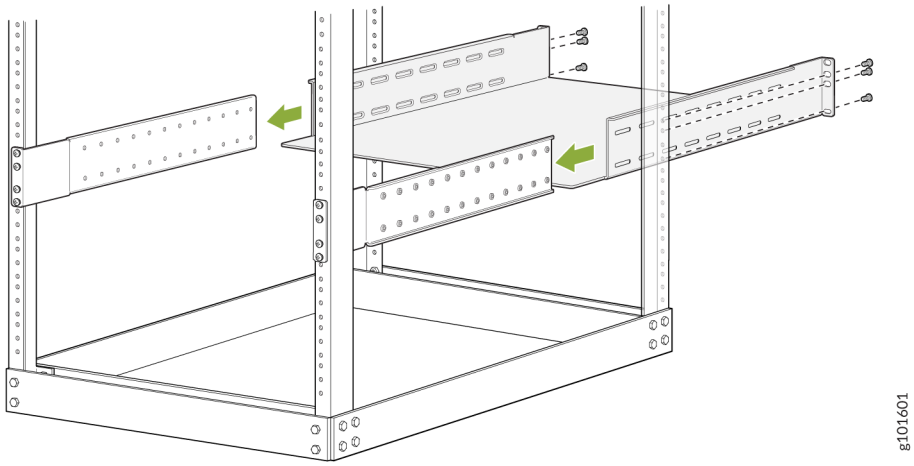
Figure 86: Attach the Mounting Blades



3. From the rear of the rack, slide the mounting tray into the rear posts of the rack such that the mounting blades slide into the grooves on the mounting tray. Attach the tray to the rear rack posts

by using six rack mount screws appropriate for your rack and a screwdriver (see Figure 87 on page 247).

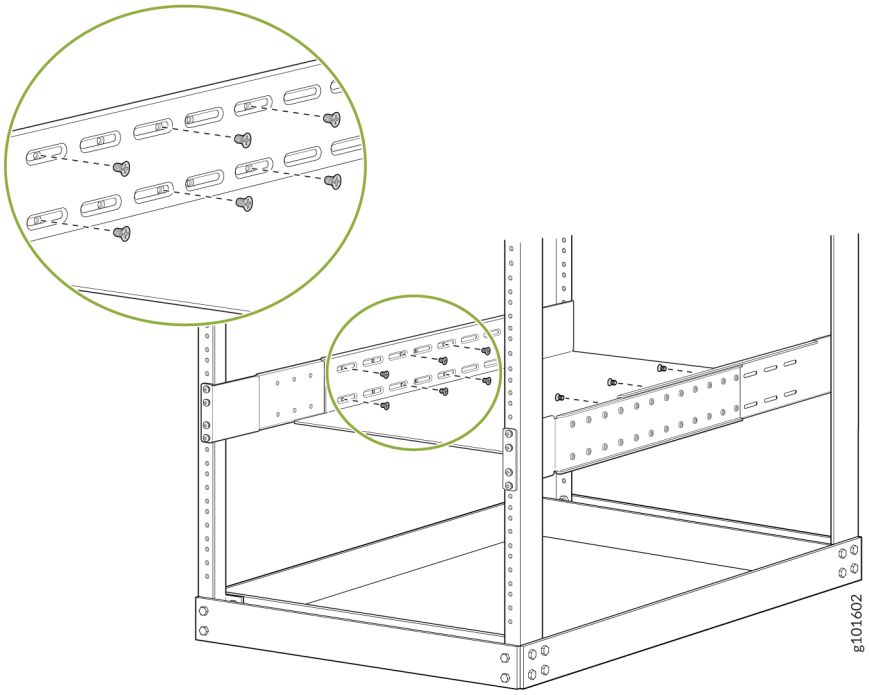
Figure 87: Attach the Mounting Tray



4. Check that the mounting tray is level.

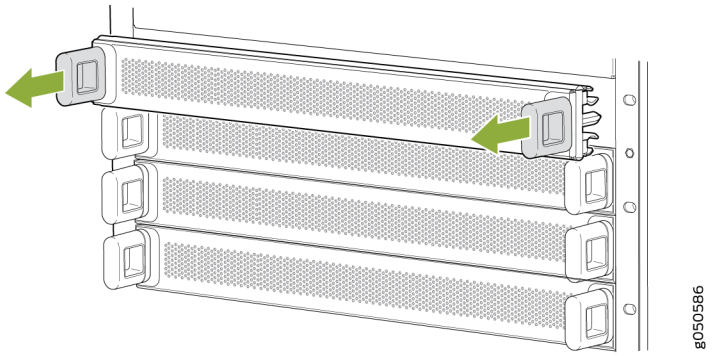
5. Attach the mounting blades to the tray with the 12 Phillips 8-32 x .375 in. flat-head screws (see Figure 88 on page 248).

Figure 88: Attach the Mounting Blades to the Mounting Tray



6. Remove the line card slot covers by grasping the handles and pulling the covers straight out (see Figure 89 on page 248). Store the covers.

Figure 89: Remove the Line Card Slot Covers



7. If you are mounting the router by using a lift:

a. Load the router onto the lift, making sure it rests securely on the lift platform (see Figure 90 on page 249).

Figure 90: Load the PTX10008 onto a Mechanical Lift



b. By using the lift, align the router in front of the rack, centering it in front of the mounting tray.

c. Lift the chassis approximately 0.75 in. (1.9 cm) above the surface of the mounting tray. Align the chassis as close as possible to the mounting tray.

If you are mounting the router manually:

a. Align the router in front of the rack, centering it in front of the mounting tray. Use a pallet jack if one is available.

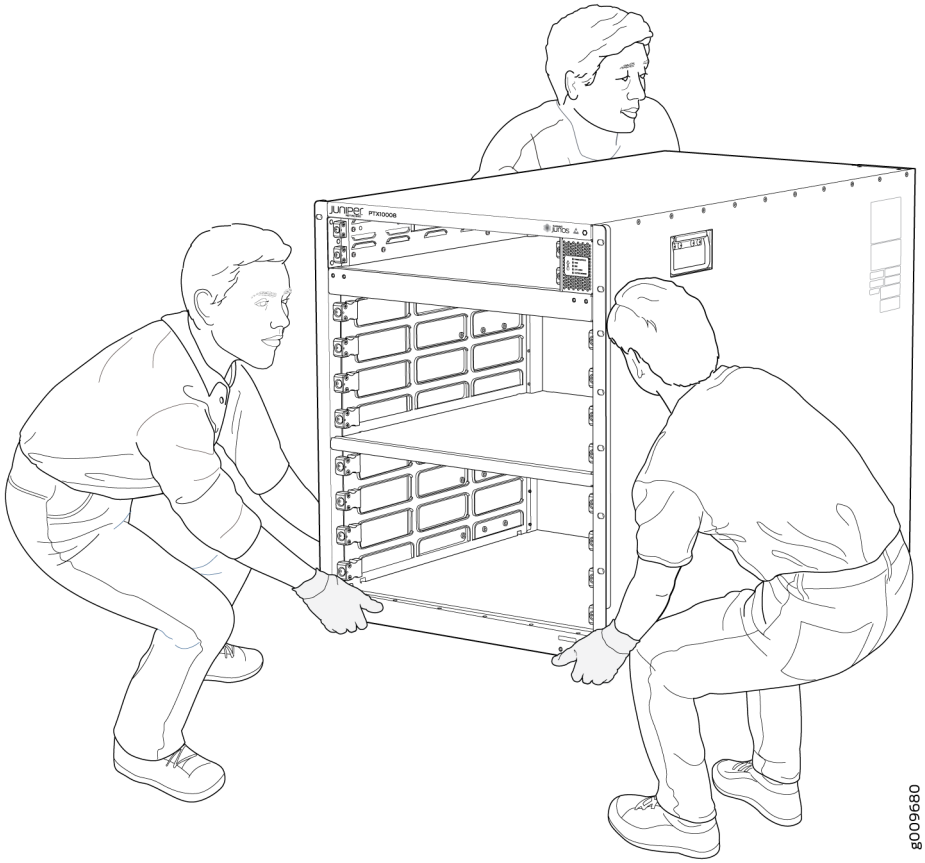
WARNING: To prevent injury, keep your back straight and lift with your legs, not your back. Do not twist your body as you lift. Balance the load evenly and be sure that your footing is firm.

CAUTION: If you are mounting more than one router, mount the first one at the bottom of the rack. Do not attempt to mount a router manually in an upper position in a rack.

NOTE: The chassis has two handles that are designed for subtle positioning of the chassis. Do not lift the chassis by the handles.

b. With one person on each side and one person in the rear, hold the bottom of the chassis and carefully lift it onto the mounting tray (see Figure 91 on page 251).

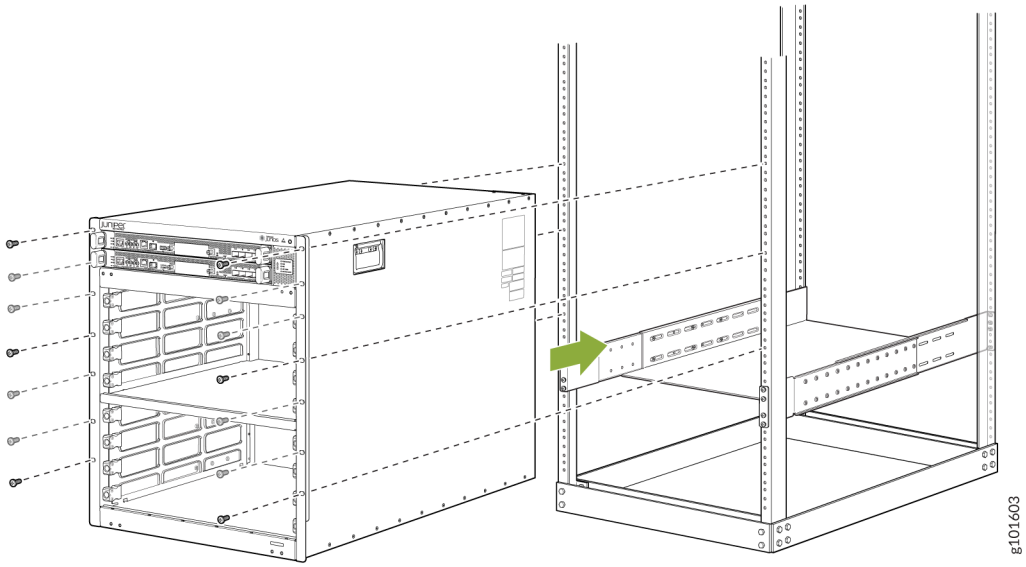
Figure 91: Lift the PTX10008 Manually



8. Carefully slide the chassis onto the mounting tray until the chassis flanges contact the rack rails. The mounting blades ensure that the holes in the chassis flanges line up with the holes in the rack rails.

9. Attach the chassis to the rack by installing 14 rack mount screws through each open flange hole and rack hole (see Figure 92 on page 252).

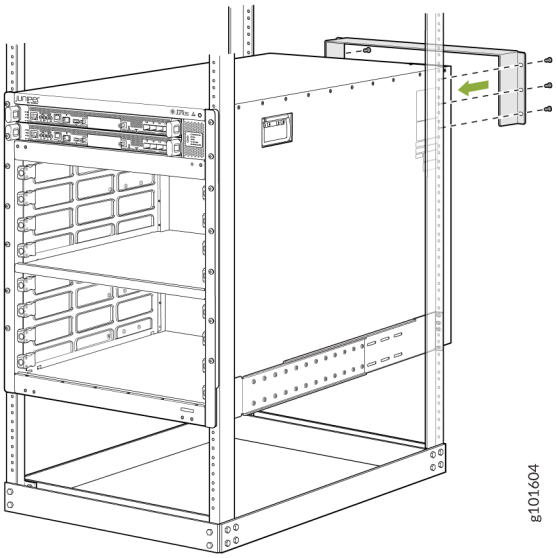
Figure 92: Attach the Chassis to the Rack



10. If you used a lift to mount the router, move the lift away from the rack.
11. Check the alignment of the router. The rack mount screws on each side of the rack should line up, and the router should be level. Tighten the screws.
12. Insert the safety restraint between the rear posts of the rack. It should rest on the top of the chassis and align with the holes in the rack.

13. Attach the restraint to the rack by installing six rack mount screws through each open flange hole and rack hole (see Figure 93 on page 253). Tighten the screws.

Figure 93: Attach the Safety Restraint



Mount the PTX10008 by Using the EX-MOD-RMK-4POST Rack Mount Kit

You can mount a PTX10008 router in a four-post closed frame rack or a four-post open frame rack by using a rack mount kit. The rack mount kit with the part number JNP10004-RMK-4POST is shipped by default. You can order the rack mount kit with the part number EX-MOD-RMK-4POST separately. In this topic, we describe how to mount the router by using the EX-MOD-RMK-4POST rack mount kit.

The router chassis weighs approximately 145 lb (66 kg) with only the fan tray controllers installed.

You can mount a PTX10008 manually or by using a mechanical lift. Because of the router's size and weight, we strongly recommend that you use a mechanical lift to mount the PTX10008.

If you are mounting the router by using a lift, ensure that you have a mechanical lift rated for 500 lb (226.8 kg).

If you are mounting the router manually, ensure that there are at least three people to lift the chassis.

Before you mount the PTX10008 router:

- Prepare the site for installation as described in "PTX10008 Site Preparation Checklist" on page 177.
- Unpack the router as described in "Unpack the PTX10008 Shipping Pallet" on page 235.
- Review the chassis lifting guidelines in "PTX10008 Chassis Lifting Guidelines" on page 427.

Ensure that you have the following parts and tools available:

- 16 rack mount screws appropriate for your rack to secure the mounting brackets to the rack (not provided)
- 14 rack mount screws appropriate for your rack to secure the chassis to the rack (not provided)
- A Phillips (+) screwdriver, number 1, 2, or 3, depending on the size of your rack screws (not provided)
- A Phillips (+) screwdriver, number 2, to install the screws that connect the rear and base brackets (not provided)

The rack mount kit consists of the following components:

- One left base bracket. The bracket is labeled **LEFT FRONT** on the side of the bracket that faces the interior of the rack, near the holes for attaching the bracket to the rack.
- One right base bracket. The bracket is labeled **RIGHT FRONT** on the side of the bracket that faces the interior of the rack, near the holes for attaching the bracket to the rack.
- Two rear brackets. These brackets are labeled **REAR** on the side of the bracket that faces the interior of the rack, near the holes for attaching the bracket to the rack. The rear brackets are interchangeable; you can use either of the rear brackets with the right or left base bracket.
- 12 Phillips flat-head screws



CAUTION: Install line cards and other components in the chassis only after you mount the chassis securely.



CAUTION: Before mounting the router on a rack, have a qualified technician verify that the rack is strong enough to support the router's weight and is adequately supported at the installation site.



CAUTION: If you are mounting multiple units on a rack, plan to mount the first router at the bottom of the rack. Mount the heaviest unit at the bottom of the rack and mount

the other units from the bottom of the rack to the top in decreasing order of the weight of the units.

To mount the router:

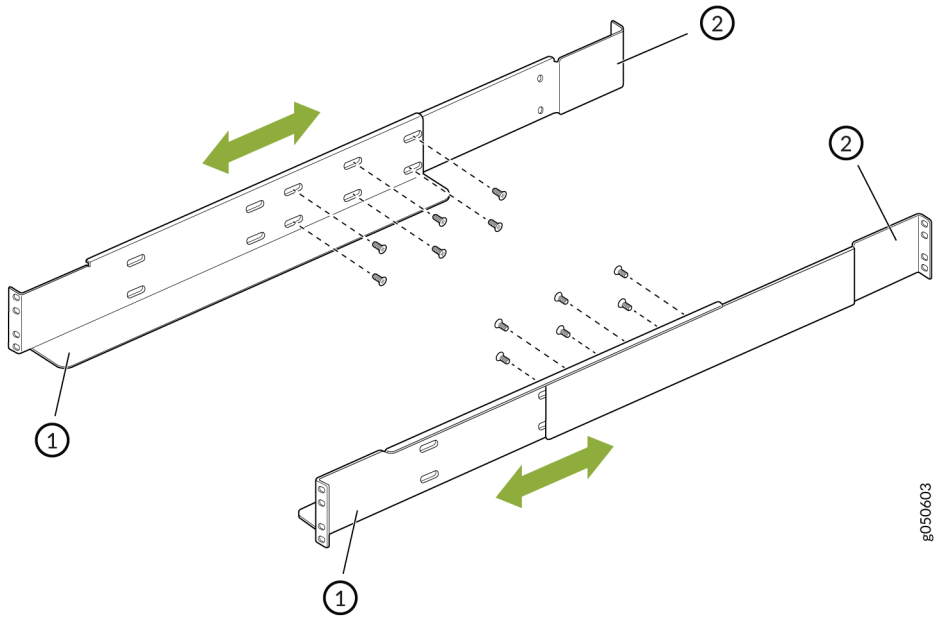
1. Wrap and fasten one end of the ESD grounding strap around your bare wrist, and connect the other end to a site ESD point.
2. Line up the left base bracket in the left side of the rack so that its front screw holes line up with the holes in the rack. Use four mounting screws appropriate for your rack to secure the left base bracket to the rack.
3. Line up one of the rear brackets at the left rear of the rack on the same level as the left base bracket, so that the rear bracket overlaps with the left base bracket. The screw holes for connecting the base and rear brackets should overlap. Use four mounting screws appropriate for your rack to secure the rear bracket to the rack.

   NOTE: When you install the base and rear brackets, the adjustable portion of the brackets overlap. Use the overlap area to adjust the total bracket length to fit any of the four standard rack sizes: 19 in. (483 mm), 23.62 in. (600 mm), 30 in. (762 mm), or 31.5 in. (800 mm).

4. Attach the left base and rear brackets (see Figure 94 on page 256):
   a. Insert six of the flat-head screws provided with the mounting brackets into the overlapping bracket holes.

b. Tighten the screws by using a number 2 Phillips screwdriver.

Figure 94: Attach the Base and Rear Brackets



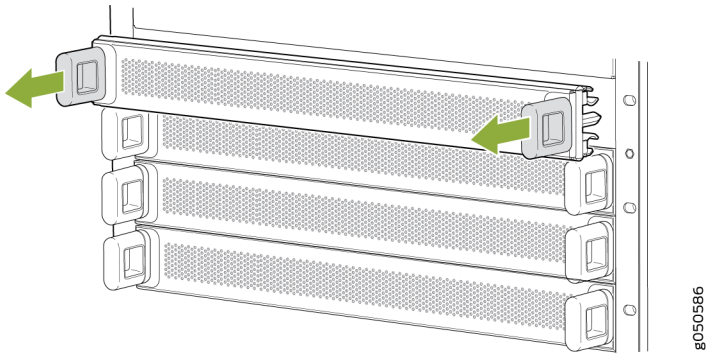
1– Base brackets	2– Rear brackets

5. Repeat the instructions in Step 2 through Step 4 to install the right base and rear brackets.

> **NOTE**: Make sure that the left and right brackets are on the same level; if they are not, the chassis will rest at an angle.

6. Remove the line card slot covers by grasping the handles and pulling the covers straight out (see Figure 95 on page 257). Store the covers.

Figure 95: Remove the Line Card Slot Covers



7. If you are mounting the router by using a lift:

a. Load the router onto the lift, making sure it rests securely on the lift platform (see Figure 96 on page 258).

Figure 96: Load the PTX10008 onto a Mechanical Lift



b. By using the lift, align the router in front of the rack, centering it in front of the base brackets.

c. Lift the chassis approximately 0.75 in. (1.9 cm) above the surface of the base brackets. Align the chassis as close as possible to the base brackets.

If you are mounting the router manually:

a. Align the router in front of the rack, centering it in front of the base brackets. Use a pallet jack if one is available.

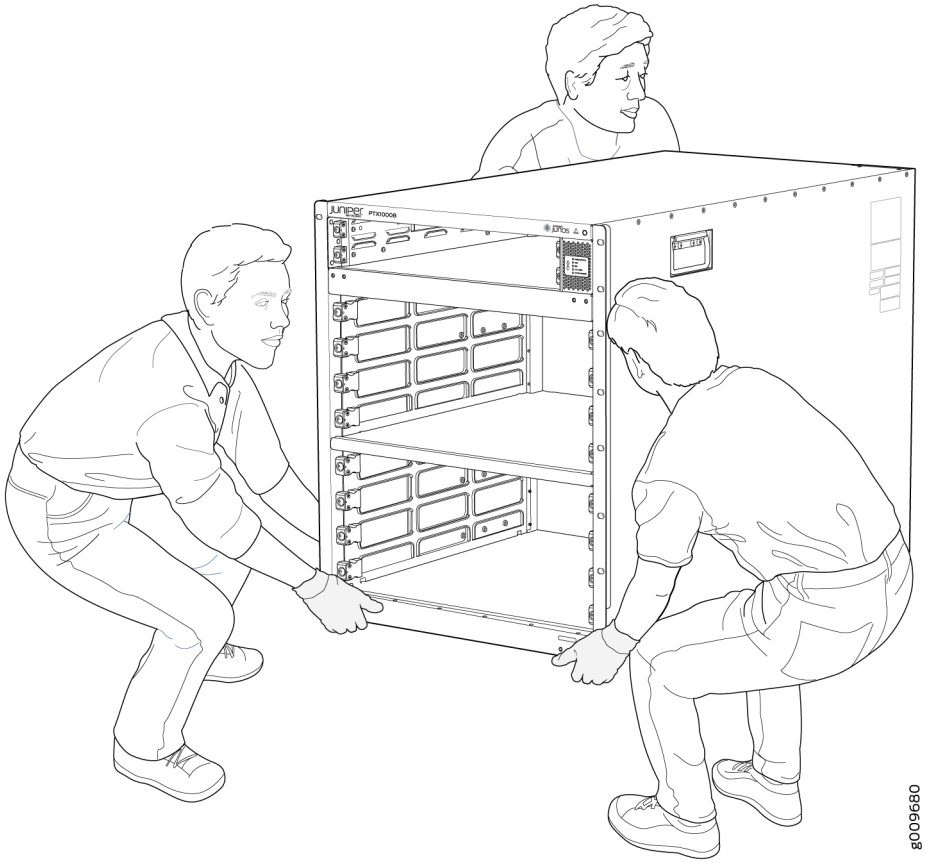
WARNING: To prevent injury, keep your back straight and lift with your legs, not your back. Do not twist your body as you lift. Balance the load evenly and be sure that your footing is firm.

CAUTION: If you are mounting more than one router, mount the first one at the bottom of the rack. Do not attempt to mount a router manually in an upper position in a rack.

NOTE: The chassis has two handles that are designed for subtle positioning of the chassis. Do not lift the chassis by the handles.

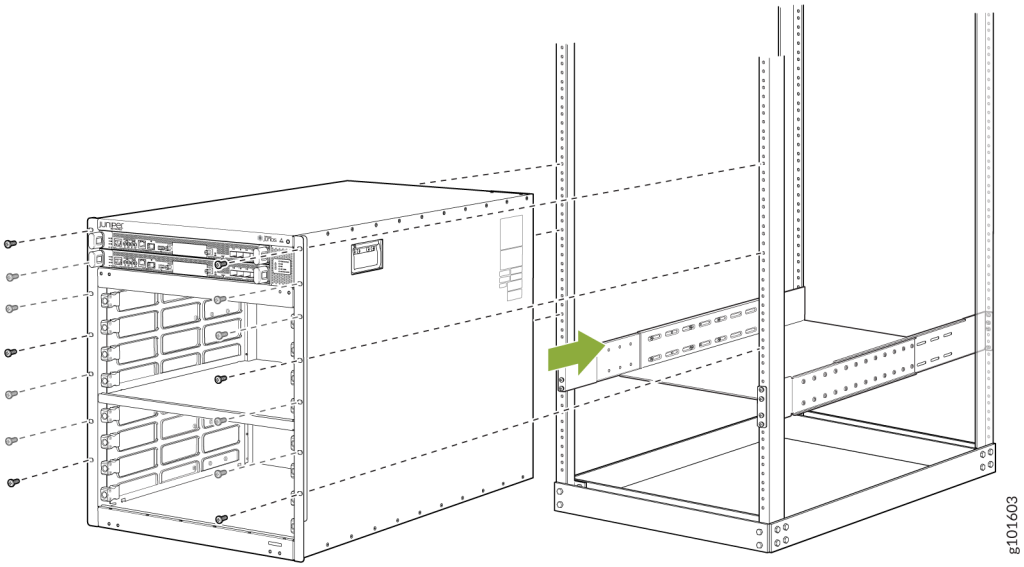
b. With one person on each side and one person in the rear, hold the bottom of the chassis and carefully lift it onto the base brackets (see Figure 97 on page 260).

Figure 97: Lift the PTX10008 Manually



8. Carefully slide the chassis onto the adjustable base and rear brackets until the chassis flanges contact the rack rails (see Figure 98 on page 261). The base and rear brackets ensure that the holes in the chassis flanges line up with the holes in the rack rails.

Figure 98: Attach the Chassis to the Rack



9. Move the lift away from the rack.
10. Attach the chassis to the rack by installing a rack mount screw appropriate for your rack through each open flange hole and rack hole, starting from the bottom.
11. Visually inspect the alignment of the router. If the router is installed properly in the rack, all the rack mount screws on one side of the rack are aligned with the rack mount screws on the other side and the router is level.
12. After ensuring that the router is aligned properly, tighten the screws.
13. After you install the rack mount screws and securely bolt the chassis to the rack, install the components in the chassis.

Install the Front Door on a PTX10008 Router

IN THIS SECTION

- Install the Air Filter | 265

The front door is required on the PTX10008 to protect fiber-optic cabling and to provide additional protection from electromagnetic interference (EMI). The front door can be installed with or without the optional cable management system.

The front door is available in two models:

- JNP10008-FRNT-PNL, without an air filter
- JNP10008-FRPNL1, with an air filter

Both models are covered in the following procedures.

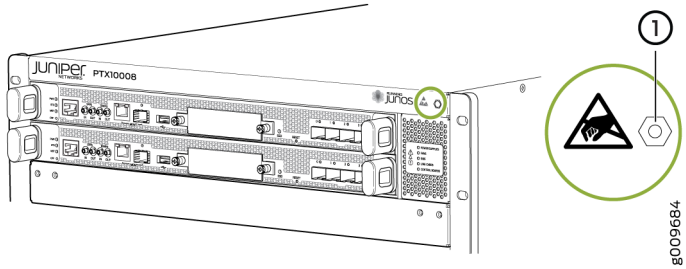
Be sure you have the following tools and parts before you begin:

- A Phillips (+) screwdriver, number 2
- Front door (provided with the router chassis)
- Right base bracket (provided)
- Left base bracket (provided)
- Two interchangeable latch brackets (provided)
- Eight Phillips flat-head mounting screws (provided)

To install the front door:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to the ESD point on the front of the chassis. See Figure 99 on page 263.

Figure 99: ESD Point for PTX10008 Chassis Front

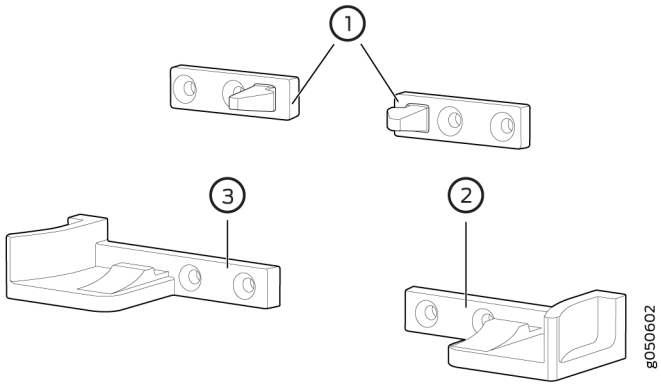


1– ESD point	

2. Remove the plastic bag that is taped to the front door. This bag holds the brackets and screws.
3. Attach the right and left base brackets to the bottom front of the chassis. Use the Phillips screwdriver to attach the base brackets to the lower front of the chassis using four of the supplied flat-head screws.

> **NOTE**: The base brackets are larger than the latch brackets. The right and left base bracket cannot be interchanged (see Figure 100 on page 263).

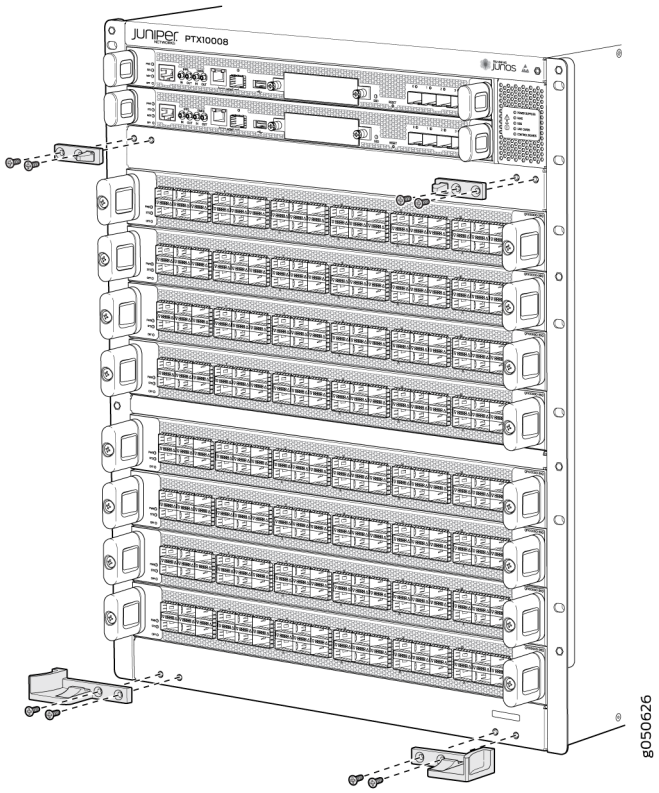
Figure 100: Front Door Mounting Hardware



1– Latch brackets	3– Left base bracket
2– Right base bracket	

4. Attach the two latch brackets to the chassis. Screw holes are located for each latch bracket between the top line card slot and the Routing and Control Boards (RCBs). Use the Phillips screwdriver to attach two supplied screws for each bracket. See Figure 101 on page 264.

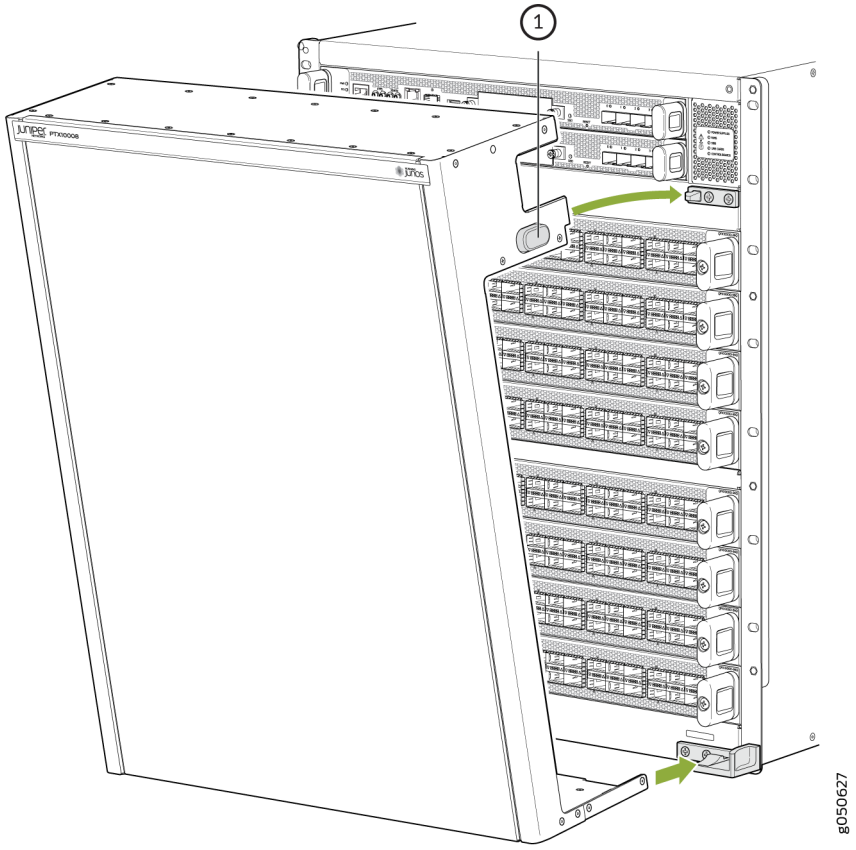
Figure 101: Attach Base and Latch Brackets on a PTX10008



5. Lift the front door and rest it on the two base brackets.
6. Slide the door back on the bracket glides until it engages on the two ramps.

7. Tilt the door toward the chassis until it is vertical with the chassis. The blue release buttons on the side of the door allow the door to latch into place (see Figure 102 on page 265).

Figure 102: Install the Front Door on a PTX10008



1– Release button

Install the Air Filter

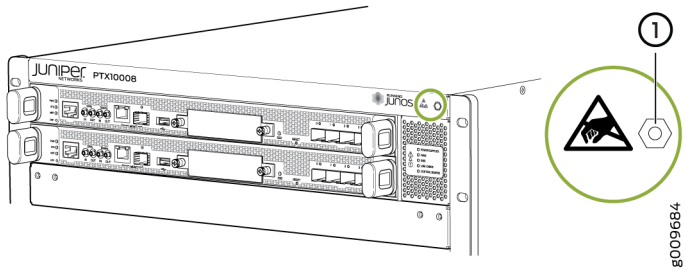
If you have the JNP10008-FRPNL1 model of the front door, there is also an air filter to install. Read and follow the following procedure to add the air filter.

NOTE: The maximum supported temperature for normal operation must be lower by 3° C when the air filter is new and lower by 6° C when the air filter is at the end of its life.

To install the air filter in the front door:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to the ESD point on the front of the chassis. See Figure 103 on page 266.

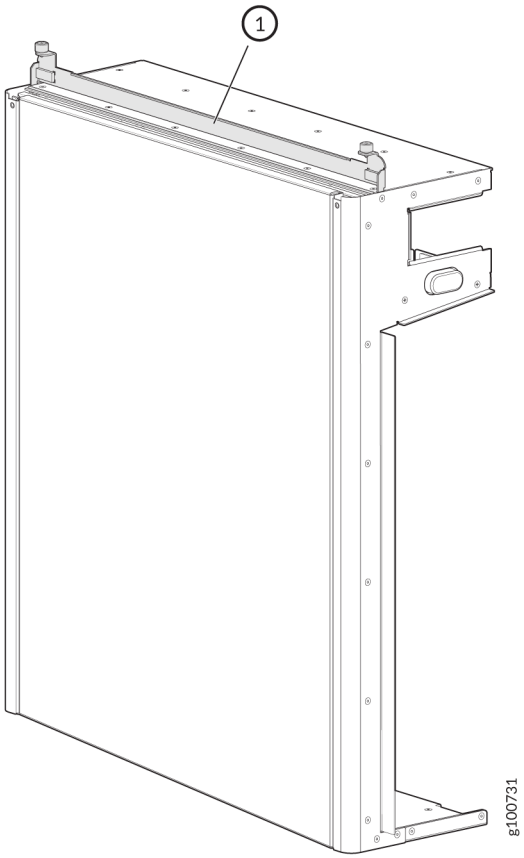
Figure 103: ESD Point for PTX10008 Chassis Front



1– ESD point

2. Turn the knob of the air filter frame anti-clockwise and move it over the top of the front door. See Figure 104 on page 266.

Figure 104: Air Filter Frame on the Front Door

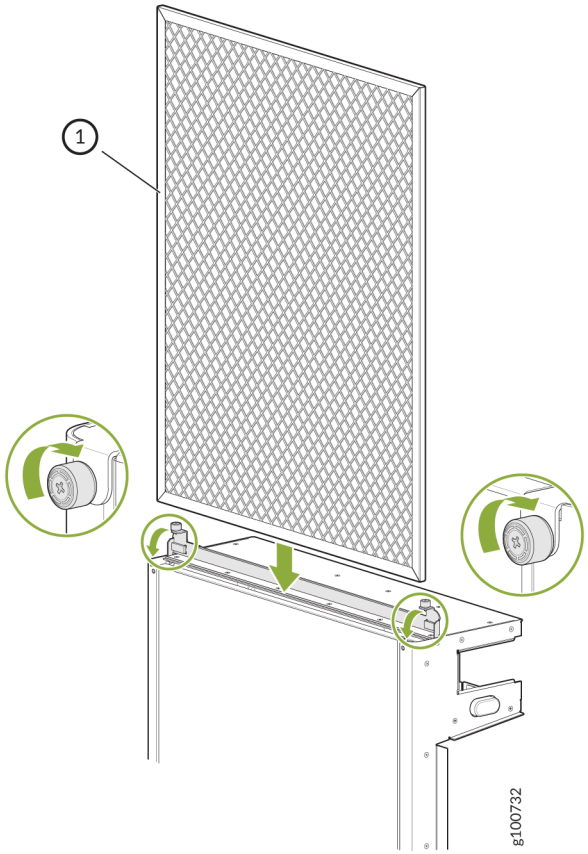


1– Air filter frame	

CAUTION: We recommend installing the air filter to prevent harmful debris from entering the chassis.

3. Hold the air filter with both hands and insert it into the front door until it stops. See Figure 105 on page 267.

Figure 105: Insert the Air Filter into the Front Door



4. Move the air filter frame over the front door and turn the knob on the air filter frame clockwise back in place.

NOTE: You must replace the filter every 6 months.

RELATED DOCUMENTATION

PTX10008 Optional Equipment | 41

Connect the PTX10008 to Power

IN THIS SECTION

- Connect the PTX10008 Router to Earth Ground | 268
- Connect AC Power to a PTX10008 | 271
- Connect DC Power to a PTX10008 | 271

PTX10008 routers support both AC, DC, high-voltage alternating current (HVAC) and high-voltage direct current (HVDC) power supplies. To connect power to a PTX10008 router, read the following procedures.

NOTE: Do not mix power supply models in the same chassis in a running environment. DC and HVDC can coexist in the same chassis during the hot swap of DC for HVDC.

Connect the PTX10008 Router to Earth 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.

You must install the PTX10008 in a restricted-access location and ensure that the chassis is always properly grounded. The PTX10008 has a two-hole protective grounding terminal provided on the chassis. See Figure 107 on page 270. Under all circumstances, use this grounding connection to ground the chassis. For AC-powered systems, you must also use the grounding wire in the AC power cord along with the two-hole grounding lug connection. This tested system meets or exceeds all applicable EMC regulatory requirements with the two-hole protective grounding terminal.

If an external ground connection is required, ensure that a licensed electrician has attached an appropriate grounding lug to the grounding cable you supply. Using a grounding cable with an incorrectly attached lug can damage the switch.

NOTE: Mount your router in the rack before attaching the grounding lug to the router; see Install the PTX10008 into a Rack.

Ensure that you have the following parts and tools available:

- An electrostatic discharge (ESD) grounding strap (provided).
- Protective earthing terminal lug (provided).
- Grounding cable for your PTX10008 (not provided)—The grounding cable must be the same size or heavier than the input wire of each power supply.
- Grounding lug for your grounding cable (provided)—This bracket attaches to the lower left corner of the router chassis next to the bottom power supply, providing a protective earthing terminal for the router. The grounding lug required is a Panduit LCD4-14A-L or equivalent.
- A Phillips screwdriver (not provided) to tighten the two screws that are mounted on the chassis.

The provided terminal lugs for the JNP10K-PWR-DC2 are Panduit LCD4-14A-L, or equivalent, and sized for 4 AWG (21.1 mm^2) power source cables. The 4 AWG (21.1 mm^2) stranded wire should be rated 90° C, or per local electrical code. When using all JNP10K-PWR-DC power supply modules in the chassis, the DC power source cables that you provide must be 6 AWG (13.3 mm^2) stranded wire. We recommend that you install heat-shrink tubing insulation around the crimped section of the power cables and lugs.

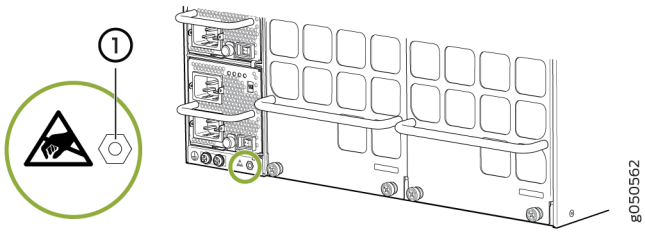
An AC-powered PTX10008 gains additional grounding when you plug the power supply in the router into a grounded AC power outlet by using an AC power cord appropriate for your geographical location. See "PTX10008 Power Cables Specifications" on page 198.

To connect earth ground to a PTX10008:

1. Verify that a licensed electrician has attached the cable lug (provided in the accessory kit) to the grounding cable.
2. Connect the other end of the grounding cable to a proper earth ground, such as the rack in which the router is mounted.

3. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to one of the ESD points on the chassis (see Figure 106 on page 270).

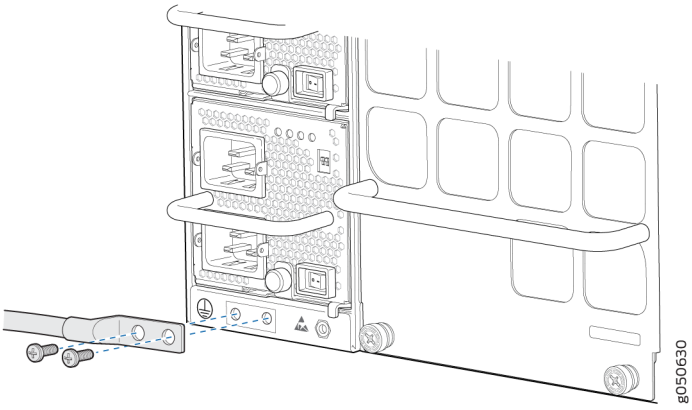
Figure 106: ESD Point for the PTX10008



1– Grounding point

4. Remove the two screws on the chassis using a Phillips screwdriver.
5. Place the chassis grounding lug and cable over the screw holes with the cable connection pointing to the left. See Figure 107 on page 270.

Figure 107: Connect a Grounding Cable to the PTX10008



6. Place the two screws over the grounding lug and grounding cable.
7. Tighten the two 10-32 screws using a Phillips screwdriver.
8. 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 can trip over it.

Connect AC Power to a PTX10008

Before you begin to connect power to the router, be sure you understand how to prevent ESD damage. See *Prevention of Electrostatic Discharge Damage*.

After you ground the chassis, add power supplies, and supply power to the chassis, the system initiates the power-on sequence. This sequence can start incrementally with a single power supply, but we do not recommend that you bring up a PTX10008 system with less than three power supplies.

To connect AC power to a PTX10008 chassis:

1. Connect the chassis to earth ground (see "Connect the PTX10008 Router to Earth Ground" on page 268).

   CAUTION: To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, a PTX10008 must be adequately grounded before it is connected to power.

   For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the rear panel of the PTX10008 to connect to the earth ground.

   A PTX10008 router gets additional grounding when you plug the power supply in the router into a grounded AC power outlet by using the AC power cord appropriate for your geographical location. See "PTX10008 Power Cables Specifications" on page 198.

2. Install power supplies in the router and apply power. See "Install a JNP10K-PWR-AC Power Supply" on page 310 and "Install a JNP10K-PWR-AC2 Power Supply" on page 319.

SEE ALSO

JNP10K-PWR-AC Power Supply | 61

Install a JNP10K-PWR-AC Power Supply | 310

Connect DC Power to a PTX10008

Before you begin to connect power to the router, be sure you understand how to prevent electrostatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.

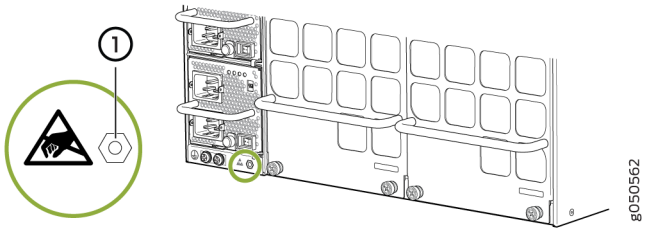
The overall process of bringing up a DC-powered chassis involves the proper cabling of the individual power supplies, adding the power supplies to the chassis, and supplying power. The power-on sequence can start incrementally with a single power supply, but it is not recommended that you bring up a PTX10008 system with less than three power supplies.

Each power supply input feed must be connected to a dedicated DC power source outlet.

To connect DC power to a PTX10008 chassis:

1. Connect the chassis to earth ground (see Figure 108 on page 272).

Figure 108: ESD Point for the PTX10008



1– Grounding point

CAUTION: To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, a PTX10008 router must be adequately grounded before it is connected to power.

For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the rear panel of the PTX10008 to connect to the earth ground.

2. Connect DC power to the JNP10K-PWR-DC or JNP10K-PWR-DC2 power supplies and install in the chassis.

   To connect DC power to a JNP10K-PWR-DC power supply, see "Install a JNP10K-PWR-DC Power Supply" on page 326. To connect DC power to a JNP10K-PWR-DC2 power supply, see "Install a JNP10K-PWR-DC2 Power Supply" on page 340.

SEE ALSO

JNP10K-PWR-DC Power Supply | 67

Install a JNP10K-PWR-DC Power Supply | 326

JNP10K-PWR-DC2 Power Supply | 69

Install a JNP10K-PWR-DC2 Power Supply | 340

RELATED DOCUMENTATION

General Safety Guidelines and Warnings

Grounded Equipment Warning

Connect the PTX10008 to External Devices

IN THIS SECTION

- Connect a PTX10008 Router to a Network for Out-of-Band Management | 273
- Connect a PTX10008 Router to a Management Console | 274
- Connect the Router to External Clocking and Timing Devices | 275

You can manage the PTX10008 router by using the two management ports on the Routing and Control Board (RCB) for out-of-band management or through the console port on the RCB. To connect a PTX10008 router to external management devices, read the following sections.

Connect a PTX10008 Router to a Network for Out-of-Band Management

Ensure that you have an appropriate cable available. See "Management Port Connector Pinouts for the PTX10008 Router" on page 231 and "Connect a PTX10008 Router to a Management Console" on page 274.

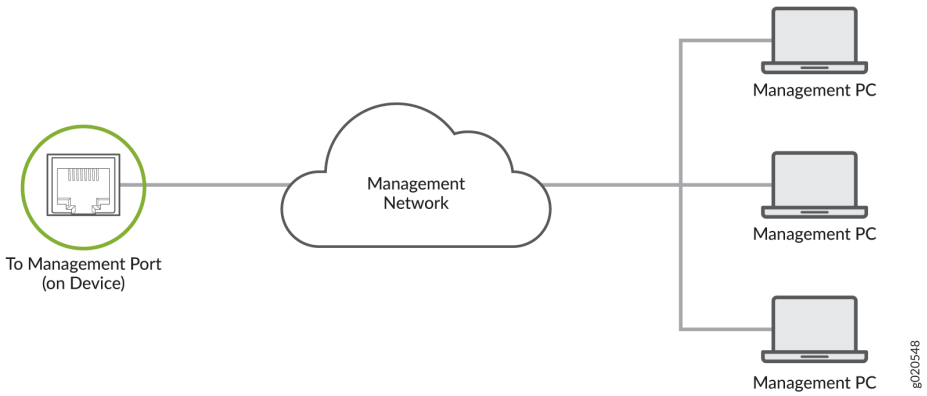
You can monitor and manage a PTX10008 router using a dedicated management channel. Each PTX10008 Routing and Control Board (RCB) has two management ports: a 10/100/1000BASE-T RJ-45 port for copper connections and a 1-Gigabit SFP port for fiber connections. Use the management ports to connect the RCB to a network for out-of-band management.

NOTE: You cannot use the management ports to perform the initial configuration of the PTX10008. You must configure the management ports before you can successfully connect to the PTX10008 using these ports. See "Perform the Initial Configuration for the PTX10008 Router" on page 280.

To connect a PTX10008 to a network for out-of-band management (see Figure 109 on page 274):

1. Connect one end of the cable to one of the two management ports (labeled **MGMT**) on one of the RCBs.
2. Connect the other end of the cable to the management router.

Figure 109: Connect a PTX10008 to a Network for Out-of-Band Management



Connect a PTX10008 Router 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 device.

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 PTX10008 router, use a combination of the RJ-45 cable and RJ-45 to DB-9 adapter supplied with the device and a USB to DB-9 plug adapter. You must provide the USB to DB-9 plug adapter.

The PTX10008 router has a console port with an RJ-45 connector. Use the console port to connect the device to a management console or to a console server.

To connect the PTX10008 router to a management console (see Figure 110 on page 275 and Figure 111 on page 275):

1. Connect one end of the Ethernet cable to the console port (labeled **CON**).
2. Connect the other end of the Ethernet cable into the console server (see Figure 110 on page 275) or management console (see Figure 111 on page 275).

Figure 110: Connect the PTX10008 Router to a Management Console Through a Console Server

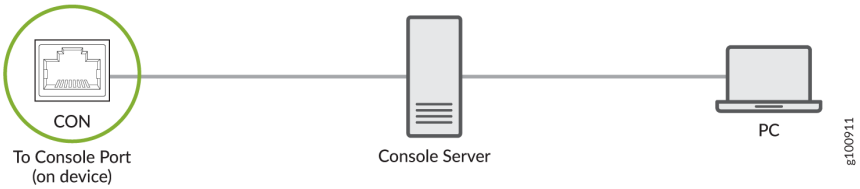


Figure 111: Connect the PTX10008 Router Directly to a Management Console



Connect the Router to External Clocking and Timing Devices

IN THIS SECTION

- Connect the Router to a 1PPS and 10MHz Timing Device | **276**
- Connect the Router to a Time-of-Day Device | **277**
- Connect the Router to a BITS External Clocking Device | **278**

The router supports external clock synchronization for Synchronous Ethernet and external inputs.

Connect the Router to a 1PPS and 10MHz Timing Device

The routing and control boards installed in the router has GPS clock ports that you can use to connect the router to a 1PPS and 10MHz timing device. Table 100 on page 276 describes the GPS clock ports on the router.

Table 100: GPS Clock Ports on the Router

Label	Description
1PPS – IN	1 PPS input port
10MHz – IN	10 MHz input port
1PPS – OUT	1 PPS output port
10MHz – OUT	10 MHz output port

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

Before you connect the router to a 1PPS and 10MHz timing device, ensure that you have two cables that meet the specifications in Table 101 on page 276.

Table 101: GPS Port Cable Specifications

Specifications	Value
Cable type	Coaxial
Connectors at the router end	2x1 DIN 1.0/2.3 latching male connectors
Connectors at the timing device end	Compatible with the ports on the timing device
Maximum length	9.84 feet (3 m)

Table 101: GPS Port Cable Specifications *(Continued)*

Specifications	Value
Impedance	50 ohms

To connect the router to a 1PPS and 10MHz timing device:

1. Connect one end of the cables to the input ports on the router.

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

   > **NOTE**: Ensure that the timing device supports an input or output impedance of 50 ohms, and supports input and output voltage levels that comply with ITU G.703. The timing device inputs must be 5V tolerant.

2. Connect the other end of the cables to the 1PPS and 10MHz connectors on the timing device.

Connect the Router to a Time-of-Day Device

The JNP10K-RE1, JNP10K-RE1-E, JNP10K-RE1-LT, and JNP10K-RE1-ELT routing and control boards installed in the router have a time-of-day (ToD) port labeled **ToD**. You can use that port to connect the router to a ToD timing device.

Before you connect the router to a ToD timing device, ensure that you have an ESD grounding strap and a cable that meets the specifications in Table 102 on page 277.

Table 102: ToD Port Cable Specifications

Specifications	Value
Cable type	RS-232 (EIA-232) serial cable
Connector at the router end	RJ-45
Connector at the timing device end	RJ-45
Maximum length	19.69 feet (6 m)

Table 103 on page 278 provides the pinout information for the RS-232 connector for the ToD port.

Table 103: ToD Port Connector Pinouts

Pin	Description	Direction
1	Reserved	–
2	Reserved	–
3	Transmit Data	Output
4	Signal Ground	–
5	Signal Ground	–
6	Receive Data	Input
7	Reserved	–
8	Reserved	–

To connect the router to a ToD timing device:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to one of the ESD points on the chassis.
2. Plug one end of the RJ-45 cable into the **ToD** port.
3. Plug the other end of the RJ-45 cable into the ToD timing device.
4. Configure the port.

Connect the Router to a BITS External Clocking Device

The JNP10K-RE1, JNP10K-RE1-E, JNP10K-RE1-LT, and JNP10K-RE1-ELT routing and control boards installed in the router have two building-integrated timing supply (BITS) ports labeled **BITS-0** and **BITS-1**. You can use them to connect the router to a BITS timing device.

Before you connect the router to a BITS timing device, ensure that you have an ESD grounding strap and a cable that meets the specifications in Table 104 on page 279.

Table 104: BITS Port Cable Specifications

Specifications	Value
Cable type	RJ-48 shielded cable
Connector at the router end	Autosensing RJ-48 connector

Table 105 on page 279 provides the pinout information for the RJ-48 connector for the BITS ports.

Table 105: BITS Ports Pinouts

Pin Number	Description	Direction
1	EXT_CLKA_RRING_LINE	Input
2	EXT_CLKA_RTIP_LINE	Input
3	Reserved	–
4	EXT_CLKA_TRING_LINE	Output
5	EXT_CLKA_TTIP_LINE	Output
6	Reserved	–
7	Reserved	–
8	Reserved	–

To connect the router to a BITS timing device:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to one of the ESD points on the chassis.
2. Plug one end of the RJ-45 cable into a BITS port.
3. Plug the other end of the RJ-45 cable into the BITS external clocking device.
4. Verify that the LED for the **BITS** port is lit steadily green.

5. Configure the port.

RELATED DOCUMENTATION

PTX10008 Routing and Control Board Components and Descriptions | 84

Management Port Connector Pinouts for the PTX10008 Router | 231

Console Port Connector Pinouts for a PTX10008 | 229

Perform the Initial Configuration for the PTX10008 Router

IN THIS SECTION

- Before You Start | 281
- Enter Configuration Mode | 281
- Establish a Root Password and Optional Host Name | 282
- Configure the Default Gateway and Ethernet Interface | 282
- Configure Optional Routes, Services, and Commit the Configuration | 283

You must perform the initial configuration of the PTX10008 through the console port using the CLI or through Zero Touch Provisioning (ZTP). In order to use ZTP to provision the device, you must have 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. For more information about using ZTP for provisioning the device, see Understanding Zero Touch Provisioning in the *Software Installation and Upgrade Guide*.

These procedures step you through the configuration of the PTX10008 using the console **CON| CONSOLE** port on the Routing and Control Board (RCB). For directions on connecting into a console server or a management server, see "Connect a PTX10008 Router to a Management Console" on page 274.

Before You Start

1. Set the following values on the console server or PC:
   - Baud Rate—9600
   - Flow Control—None
   - Data—8
   - Parity—None
   - Stop Bits—1
   - DCD State—Disregard
2. Gather the information you will need for configuring the PTX10008:
   - The password you'll set for the root user
   - The name on the system that the PTX10008 will be known as (host name)
   - The IP address and prefix of the default gateway router
   - The IP address and prefix length information for the Ethernet interface
   - The IP address and prefix length of remote prefixes

Enter Configuration Mode

1. Check that the PTX10008 has power.
2. Connect the console port to a laptop or PC using the supplied RJ-45 cable and RJ-45 to DB-9 adapter. The console (**CON**) port is located on the port panel of the router.
3. Log in as **root**. There is no password. If the software booted before you connected to the console port, you might need to press the Enter key for the prompt to appear.

```
Amnesiac <ttyd0>
login: root
```

4. Start the CLI.

```
root@% cli
```

5. Enter configuration mode.

```
root> configure
```

Establish a Root Password and Optional Host Name

1. 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
```

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

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

Configure the Default Gateway and Ethernet Interface

1. Configure the default gateway.
   - For standard Junos OS systems:

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

   - For Junos OS Evolved system:

```
[edit]
root@# set system management-instance
```

```
root@# set routing-instances mgmt_junos routing-optins static route prefix/prefix-length next-hop
default-gateway-ip-address
```

2. Configure the IP address and prefix length for the router management interface.

   - For standard Junos OS systems:

     ```
     [edit]
     root@# set interfaces em0 unit 0 family inet address ip-address/prefix-length
     ```

   - For Junos OS Evolved systems:

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

     CAUTION: Although the CLI permits you to configure two management Ethernet interfaces within the same subnet, only one interface is usable and supported.

     NOTE: The management ports, `em0` or `re0:mgmt-0` (**MGMT** for RJ-45 connections) and `em1` (also labeled **MGMT** for fiber connections), are found on the front of the RCBs of the PTX10008 router.

Configure Optional Routes, Services, and Commit the Configuration

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

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

2. Enable services such as SSH and Telnet.

NOTE: You will not be able to log in to the router as the `root` user through Telnet. Root login is allowed only through SSH.

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

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

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

RELATED DOCUMENTATION

PTX10008 Hardware Overview | 2

PTX10008 Installation Overview | 234

CHAPTER 4

Hardware Upgrades

PTX10008 Hardware Upgrade Procedures | 286

PTX10008 Hardware Upgrade Procedures

IN THIS SECTION

- Before You Begin | 286
- Remove PTX10008 Components for Upgrade | 287
- Install the PTX10008 Upgrade Components | 287

QFX10008, MX10008, and older versions of the PTX10008 can future-proof their chassis investment by upgrading their systems to the latest PTX10008 running Juniper Junos OS Evolved system. The following sections guide you through the planning and installation process of upgrading your system to a PTX10008 router that can support the latest switch fabric and 14.4 Tbps line cards.

Before You Begin

Before you begin the chassis upgrade, it is a good idea to back up your existing configuration to a storage location for reference. QFX Series and MX Series systems becoming PTX Series systems need some configuration to operate in the new environment.

Schedule the upgrade in a maintenance window with sufficient time to remove all the components, install new components, and configure the new PTX10008 router.

Use the appropriate hardware guide for your current system to order the correct upgrade kit, power off the system, and to remove components. See:

- MX10008 Universal Routing Platform Hardware Guide
- QFX10008 Switch Hardware Guide
- The following sections for PTX10008:
  - For ordering upgrade kits (see "PTX10008 Configurations and Upgrade Options" on page 17).
  - For powering off the system and removing power cables (see "Power Off a PTX10008" on page 384).
  - For removing existing components (see "Remove PTX10008 Components for Upgrade" on page 287).

Remove PTX10008 Components for Upgrade

Ensure you are familiar with how to safely store and handle PTX10008 components before starting your upgrade. See:

- "How to Handle and Store PTX10008 Line Cards, RCBs, and SIBs" on page 354
- "How to Handle and Store PTX10008 Line Cards, RCBs, and SIBs" on page 354
- "How to Handle and Store PTX10008 Line Cards, RCBs, and SIBs" on page 354

Remove and safely store the following components in this order:

1. Optical cables and connections to external devices (see "Remove a Transceiver From a PTX0008" on page 379)
2. Power supplies and power cables (see "Install and Remove PTX10008 Power System Components" on page 309)
3. Line cards (see "Remove a PTX10008 Line Card" on page 371)
4. Routing and Control Boards (RCBs) (see "Remove a PTX10008 Routing and Control Board" on page 293)
5. Fan trays (see "Remove a PTX10008 Fan Tray" on page 298)
6. Switch Interface Boards (SIBs) (see "Remove a PTX10008 Switch Interface Board" on page 363)
7. JNP10008-FAN-CTRL fan controllers (see "Remove a PTX10008 Fan Tray Controller" on page 306)

   If you have JNP10008-FTC2 installed, you may skip this step.

Install the PTX10008 Upgrade Components

After the upgrade kits are on the premises:

1. Unpack the upgrade kit (see "Unpack Line Cards, Routing Control Boards, and Switch Interface Boards for the PTX10008" on page 237).
2. Compare the contents of the kit to the order, see ("Compare the PTX10008 Order to the Packing List" on page 239).
3. Install the components in the following order:

   CAUTION: The installation order of components is important. To avoid cooling problems, do not apply power until all components are installed.

   a. Fan tray controllers JNP10008-FTC2 (see "Install a PTX10008 Fan Tray Controller" on page 302)

b. SIBs JNP10008-SF3 (see "Install a PTX10008 Switch Interface Board" on page 358)

c. Fan trays JNP10K-FAN2 (see "Install a PTX10008 Fan Tray" on page 295)

d. RCBs JNP10K-RE1-E (see "Install a PTX10008 Routing and Control Board" on page 290)

e. Line cards PTX10K-LC1201-36CD or PTX10K-LC1202-36MR (see "Install a PTX10008 Line Card" on page 368)

f. Install power supplies JNP10K-PWR-AC2 or JNP10K-PWR-DC2 (see "Install a JNP10K-PWR-AC2 Power Supply" on page 319 or "Install a JNP10K-PWR-DC2 Power Supply" on page 340)

g. Install optics (see "Install a PTX10008 Transceiver" on page 377)

4. Perform the first-time configuration (see "Perform the Initial Configuration for the PTX10008 Router" on page 280).
5. Update your installation base with Juniper Networks (see "Register Products—Mandatory to Validate SLAs" on page 244).

5

CHAPTER

Maintain Components

Install and Remove PTX10008 Routing and Control Boards | 290

Install and Remove PTX10008 Cooling System Components | 294

Install and Remove PTX10008 Power System Components | 309

Install and Remove PTX10008 Switch Fabric Components | 354

Install and Remove PTX10008 Line Card Components | 367

PTX10008 Transceiver and Fiber Optic Cable Installation and Removal | 377

Remove the PTX10008 Router | 384

Install and Remove PTX10008 Routing and Control Boards

IN THIS SECTION

- Install a PTX10008 Routing and Control Board | 290
- Remove a PTX10008 Routing and Control Board | 293

We ship PTX10008 routers with one or two Routing and Control Boards (RCBs) preinstalled in the chassis, depending on the configuration. You can install RCBs in the two top slots on the front of the chassis.

When you power on a router with a single RCB preinstalled in it, the RCB comes online as the primary and powers on the line cards and the switch fabric. If you install the second RCB, it powers up and the Routing Engine comes online in the backup mode; you must bring the control board of that RCB online by using the request chassis cb online command.

When you power on a router with two RCBs installed in it for the first time, the RCB installed in slot **CB 0** comes online as the primary (`RE0` in the CLI) and powers on the line cards and the switch fabric, and the RCB installed in slot **CB 1** comes online as the backup (`RE1` in the CLI) by default. You can change this configuration by using the CLI. If you replace an RCB, it powers up and the Routing Engine comes online in the backup mode; you must bring the control board of that RCB online by using the request chassis cb online command.

To install or remove an RCB, read the following sections.

Install a PTX10008 Routing and Control Board

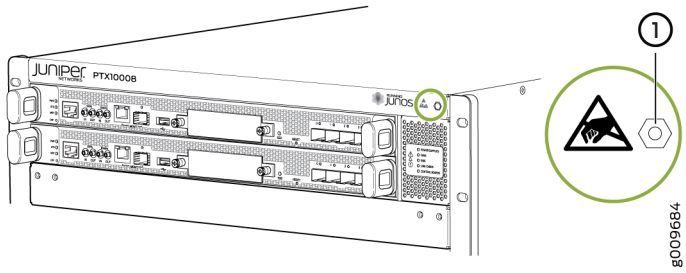
In redundant configurations, a PTX10008 RCB is a hot-removable and hot-insertable field-replaceable unit (FRU). In base configurations, you need to install a second RCB before removing a failing RCB in order to prevent the router from shutting down.

Before you install an RCB, ensure that you have an electrostatic discharge (ESD) grounding strap.

To install an RCB:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to one of the ESD points on the chassis (see Figure 112 on page 291).

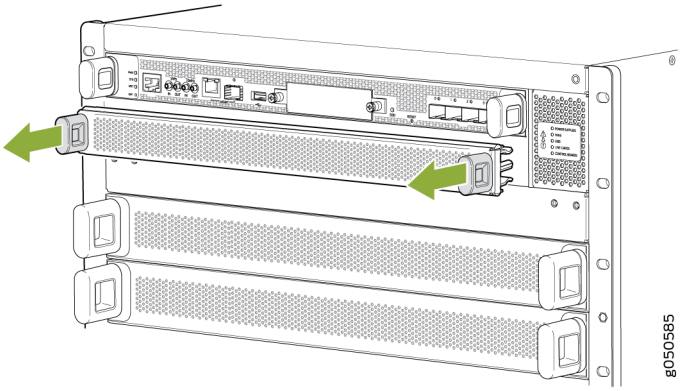
Figure 112: ESD Point on the Front of the PTX10008 Chassis



1– ESD point

2. Either remove the cover from the available RCB slot (see Figure 113 on page 291) or remove the failing RCB (see "Remove a PTX10008 Routing and Control Board" on page 293).

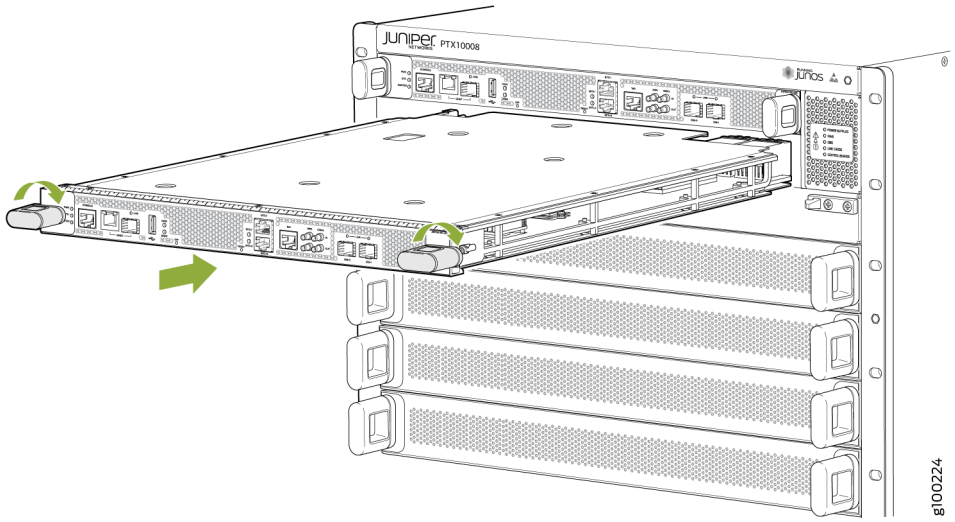
Figure 113: Remove an RCB Cover



3. Remove the new RCB from the antistatic bag and inspect it for any damage before installing it into the chassis.
4. Lift the RCB by its sides, being careful not to bump the connectors.
5. Carefully align the sides of the RCB with the guides inside the chassis.
6. Slide the RCB into the chassis, carefully ensuring that it is correctly aligned.

7. Grasp both handles on the RCB and rotate them simultaneously clockwise until the RCB is fully seated and the handles are vertical (see Figure 114 on page 292).

Figure 114: Install an RCB



The RCB begins the power-on sequence when fully seated.

8. To verify that the RCB is functioning normally, check the **PWR** LED on its faceplate and the **CONTROL BOARDS** LED on the status panel. Both LEDs should light steadily shortly after the RCB is installed. If the **PWR** LED is blinking yellow, there might be insufficient power available. See "PTX10008 Power Planning for JNP10008-SF Switch Fabric" on page 187 and "PTX10008 Power Planning for JNP10008-SF3 Switch Fabric" on page 210 to ensure that you have adequate power for the additional unit.

   Another method of verifying that the RCB is online is to use the following CLI command:

```
user@host> show chassis environment cb
```

SEE ALSO

Power Requirements for PTX10008 Components in a JNP10008-SF Fabric | 187

PTX10008 Routing and Control Board LEDs | 88

Remove a PTX10008 Routing and Control Board

In redundant configurations, a PTX10008 RCB is a hot-removable and hot-insertable field-replaceable unit (FRU). In base configurations, you need to install a second RCB before removing a failing RCB in order to prevent the router from shutting down. We recommend that you take base systems offline before replacing the RCB.

Before you remove a RCB, ensure that you have an electrostatic discharge (ESD) grounding strap.

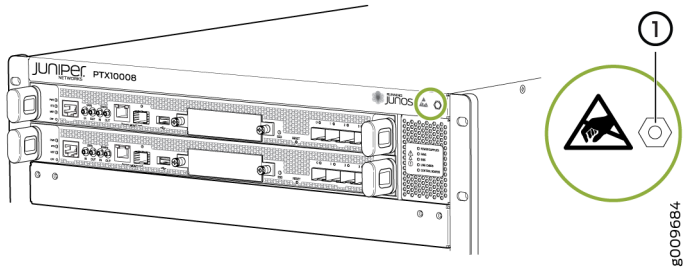
CAUTION: In base configurations, removal of the RCB causes the system to shut down. In redundant configurations, removal of the RCB causes the system to reboot and start the election process for a new primary.

To remove a RCB:

1. Take the RCB offline.

   Place an antistatic bag or antistatic mat on a flat, stable surface.
2. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to one of the ESD points on the chassis (see Figure 115 on page 293).

Figure 115: ESD Point on the Front of the PTX10008 Chassis

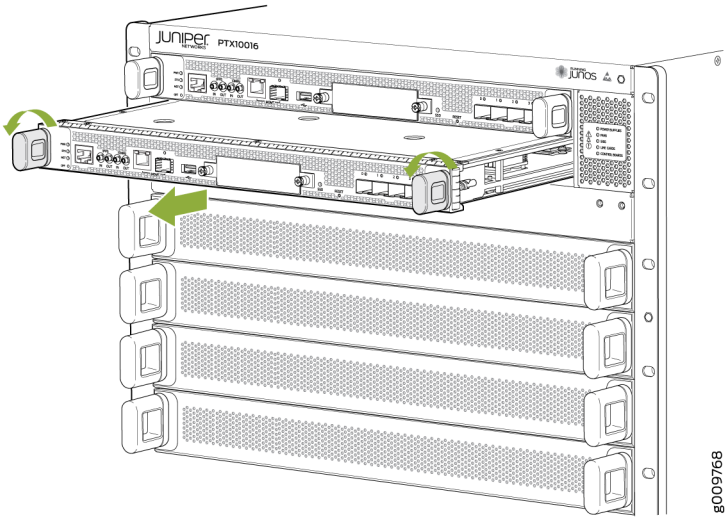


1– ESD point

3. Simultaneously rotate the RCB handles counterclockwise to unseat the RCB.

4. Grasp the handles and slide the RCB about halfway out of the chassis (see Figure 116 on page 294).

Figure 116: Remove an RCB



5. Grasp each side of the RCB and slide it completely out of the chassis.
6. Place the RCB on the antistatic mat.
7. If you are not replacing the RCB immediately, install a cover in the empty slot.

SEE ALSO

How to Handle and Store PTX10008 Line Cards, RCBs, and SIBs | **354**

Install and Remove PTX10008 Cooling System Components

IN THIS SECTION

- Install a PTX10008 Fan Tray | **295**
- Remove a PTX10008 Fan Tray | **298**
- Install a PTX10008 Fan Tray Controller | **302**

Remove a PTX10008 Fan Tray Controller | 306

The PTX10008 router has two independent, field-replaceable fan trays. To install or remove the fan trays and fan tray controller, see the following sections.

Install a PTX10008 Fan Tray

Before you begin to install a fan tray:

- Ensure that you understand how to prevent ESD damage. See *Prevention of Electrostatic Discharge Damage*.
- Ensure that you have the following parts and tools available to install a fan tray in a PTX10008 router:
  - Electrostatic discharge (ESD) grounding strap
  - A Phillips (+) screwdriver, number 1 or 2 (optional), for the captive screws
  - A replacement fan tray

If you are upgrading a JNP10008-SF fabric system to use JNP10008-FAN2 and JNP10008-FTC2 cooling, also upgrade your power supplies to ensure the proper airflow. JNP10008-FAN2 and JNP10008-FTC2 cooling systems require either JNP10K-PWR-AC2 or JNP10K-PWR-DC2 power supplies.

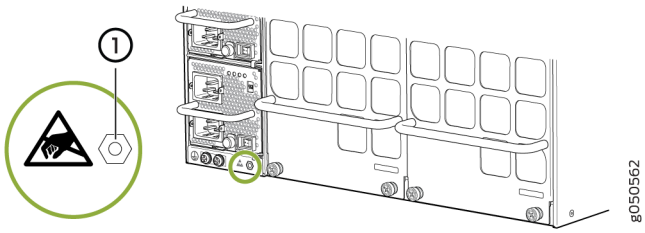
Each fan tray is a hot-removable and hot-insertable field-replaceable unit (FRU); you can remove and replace the fan tray while the router is running without turning off power to the router or disrupting routing functions. There are two models of the fan tray, JNP10008-FAN and JNP10008-FAN2.

Each fan tray is installed vertically on the rear, or FRU side, of the chassis.

To install any PTX10008 fan tray:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to one of the ESD points on the chassis (see Figure 117 on page 296).

Figure 117: ESD Point on the Rear of the PTX10008 Chassis



1– ESD point

2. Grasp the top and bottom fan tray handles and align the bottom of the fan tray with the bottom of the fan tray slot.
3. Rest the bottom edge of the fan tray in the slot and slide the fan tray into place so it is fully seated.

4. Tighten the captive screws until the screws are finger tight. See Figure 118 on page 297 and Figure 119 on page 298.

Figure 118: Install the Fan Tray JNP10008-FAN in a PTX10008

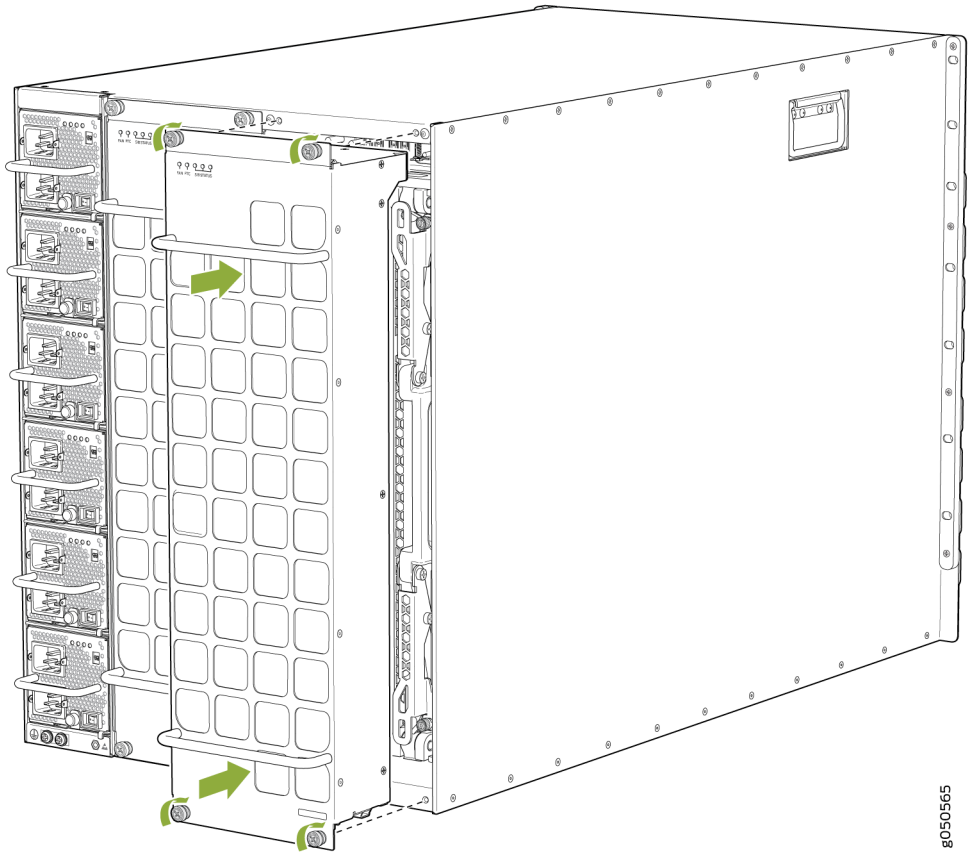
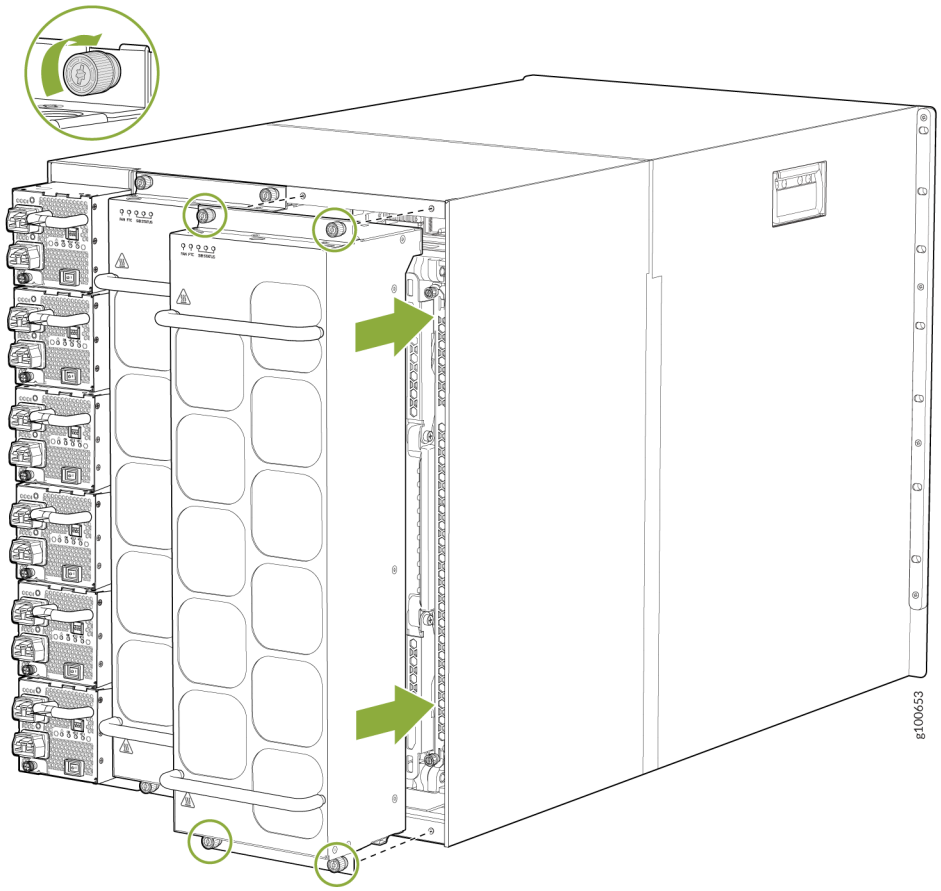


Figure 119: Install the Fan Tray JNP10008-FAN2 in a PTX10008



Remove a PTX10008 Fan Tray

The PTX10008 chassis has two independent, field-replaceable fan trays. Each fan tray is a hot-removable and hot-insertable field-replaceable unit (FRU); you can remove and replace the fan tray while the router is running without turning off power to the router or disrupting routing functions. There are two models of fan tray for the PTX10008 (JNP10008-FAN and JNP10008-FAN2).

Each fan tray is installed vertically on the rear, or FRU-side, of the chassis.

Before you remove a fan tray:

- Ensure that you understand how to prevent ESD damage. See *Prevention of Electrostatic Discharge Damage*.
- Ensure that you have the following parts and tools available:

- Electrostatic discharge (ESD) grounding strap
- A replacement fan tray
- A Phillips (+) screwdriver, number 1 or 2 (optional), for the captive screws

NOTE: If you are replacing the fans at 40° C chassis ambient temperature, run the fans at 100% speed for at least 10 minutes before you start the repalcement procedure.

If Junos OS is installed in your router, use the `test chassis fan tray 0 speed` *`full-speed`* and `test chassis fan tray 1 speed` *`full-speed`* commands to configure the fans to operate at 100% speed.

If Junos OS Evolved is installed in your router, use the `request chassis fan tray 0 speed 100` and `request chassis fan tray 1 speed 100` commands to configure the fans to operate at 100% speed.

After you replace the fan tray, you must configure the fan trays to operate at the normal speed. If Junos OS is installed in your router, use the `test chassis fan tray 0 speed` *`normal`* and `test chassis fan tray 1 speed` *`normal`* commands to configure the fan trays to operate at the normal speed.

If Junos OS Evolved is installed in your router, use the `request chassis fan tray 0 speed normal` and `request chassis fan tray 1 speed normal` commands to configure the fan trays to operate at the normal speed.

You must replace the fan tray within the time mentioned in Table 106 on page 299 of removing the fan tray to prevent overheating of the chassis. If you are removing a JNP10008-FAN2 fan tray to access a JNP10008-SF3 Switch Interface Board (SIB), we recommend that you either perform the necessary work during a maintenance window or reinstall the fan tray within time mentioned in Table 106 on page 299.

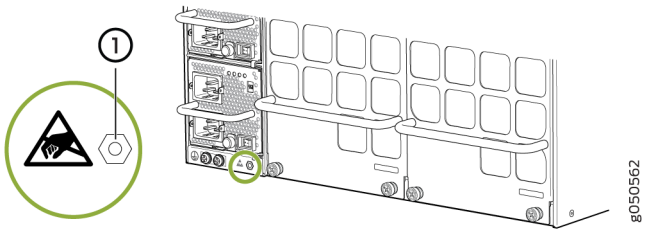
Table 106: Replacement Duration for the Fan Tray

Chassis Ambient Temperature	Duration
20° C	5 minutes
30° C	2.3 minutes
40° C	1.2 minutes

To remove a PTX10008 fan tray (JNP10008-FAN or JNP10008-FAN2):

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to one of the ESD points on the chassis (see Figure 120 on page 300).

Figure 120: ESD Point on the Rear of the PTX10008



1– ESD point

2. Loosen the four captive screws either by unscrewing with your thumb and forefinger or with a Phillips screwdriver.

3. Grasp the top and bottom handles and pull the fan tray out about 3 in. (7.6 cm). See Figure 121 on page 301 and Figure 122 on page 302.

Figure 121: Remove a JNP10008-FAN Fan Tray

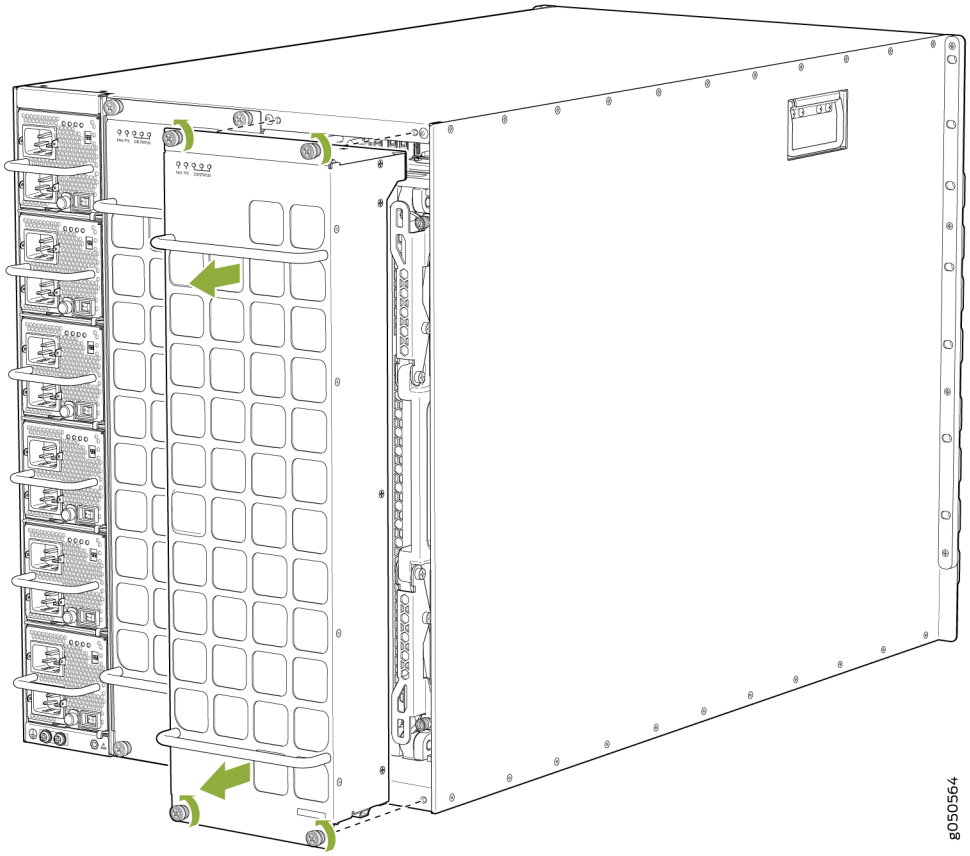
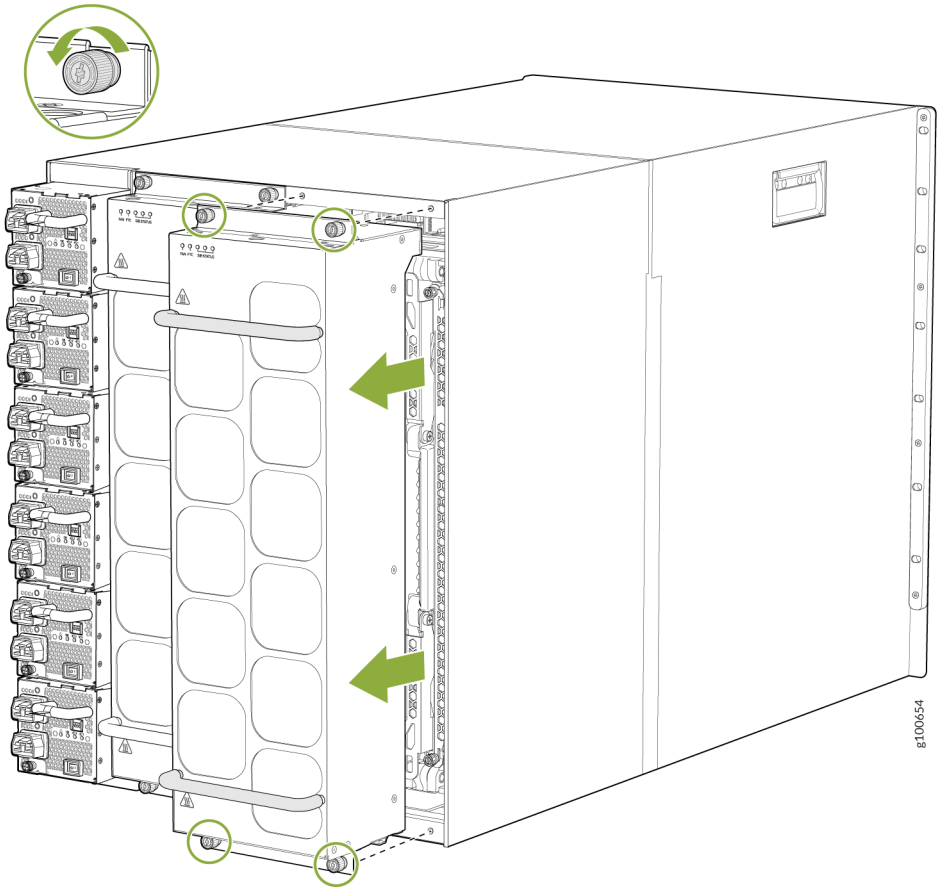


Figure 122: Remove a JNP10008-FAN2 Fan Tray



4. Tilt the top of the fan tray forward.
5. Using both hands, lift the fan tray out of the slot and rest it on a flat surface with the handles to the side.

Install a PTX10008 Fan Tray Controller

For each of the two fan trays, there is a fan tray controller. Each controller is a hot-removable and hot-insertable field-replaceable unit (FRU); you can remove and replace one fan tray controller while the router is running without turning off power to the router or disrupting routing functions. There are two

models of fan tray controller for the PTX10008, JNP10008-FAN-CTRL and JNP10008-FTC2. See .Figure 123 on page 303 and Figure 124 on page 303.

Figure 123: JNP10008-FAN-CTRL

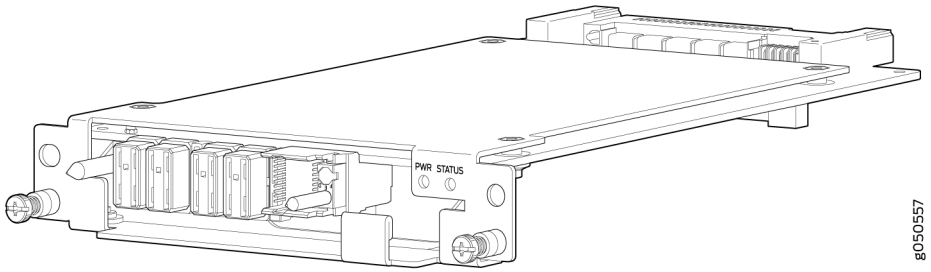
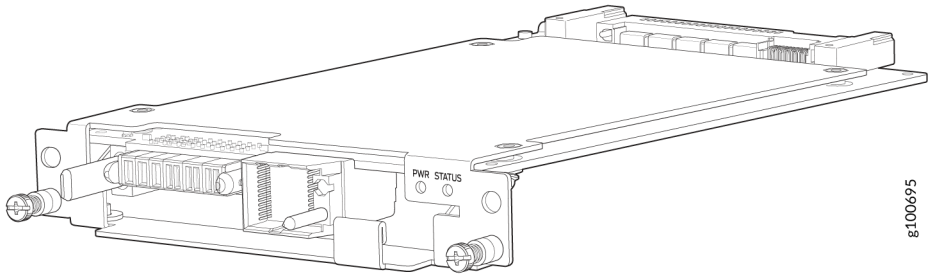


Figure 124: JNP10008-FTC2



CAUTION: Do not remove the fan tray controller unless you have a replacement controller available.

In order to install a fan tray controller, you must first remove the associated fan tray. With the fan tray removed, the fan tray controller is installed horizontally above the Switch Interface Boards (SIBs) at the top of the chassis.

Before you install a fan tray controller:

- Ensure that you have removed the associated fan tray and fan tray controller. See "Remove a PTX10008 Fan Tray" on page 298 and "Remove a PTX10008 Fan Tray Controller" on page 306.

- Ensure that you understand how to prevent ESD damage. See *Prevention of Electrostatic Discharge Damage*.
- Ensure that you have the following parts and tools available to install a fan tray controller into a PTX10008:
  - Electrostatic discharge (ESD) grounding strap
  - Replacement fan tray controller (JNP10008-FAN-CTRL or JNP10008-FTC2)
  - A Phillips (+) screwdriver, number 1, for the captive screws

To install a fan tray controller:

1. Remove the replacement fan tray controller from the antistatic bag.

2. Carefully slide the fan tray controller into the fan tray controller slot until it is flush with the mounting holes. See Figure 125 on page 305 and Figure 126 on page 305.

Figure 125: Install a JNP10008-FAN-CTRL

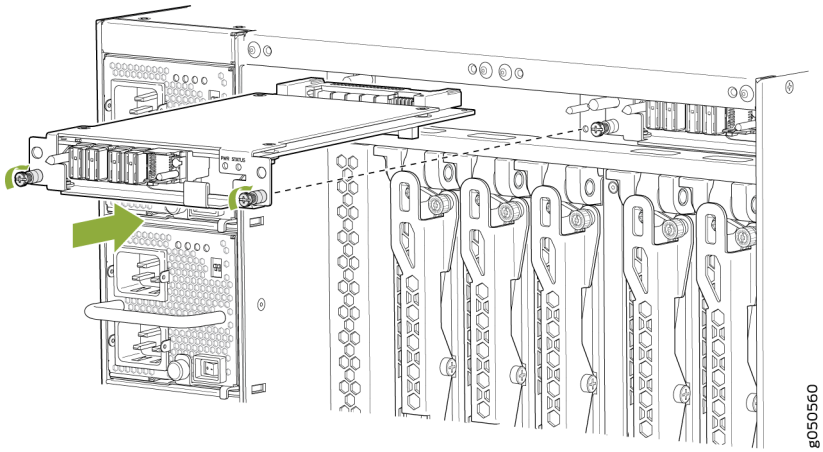
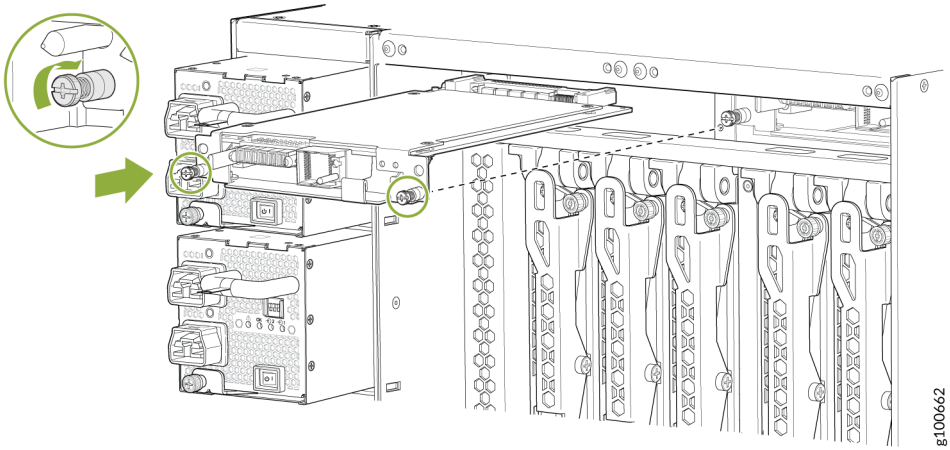


Figure 126: Install a JNP10008-FTC2



3. Using a Phillips screwdriver, tighten the captive screws for the fan tray controller.
4. Reinstall the fan tray. See "Install a PTX10008 Fan Tray" on page 295.

Remove a PTX10008 Fan Tray Controller

For each of the two fan trays, there is a fan tray controller. Each controller is a hot-removable and hot-insertable field-replaceable unit (FRU); you can remove and replace one fan tray controller while the router is running without turning off power to the router or disrupting routing functions. There are two models of fan tray controller:

- JNP10008-FAN-CTRL, which supports fan tray JNP10008-FAN
- JNP10008-FTC2, which supports fan tray JNP10008-FAN2

See Figure 127 on page 306 for the JNP10008-FAN-CTRL and Figure 128 on page 306 for the JNP10008-FTC2.

Figure 127: JNP10008-FAN-CTRL

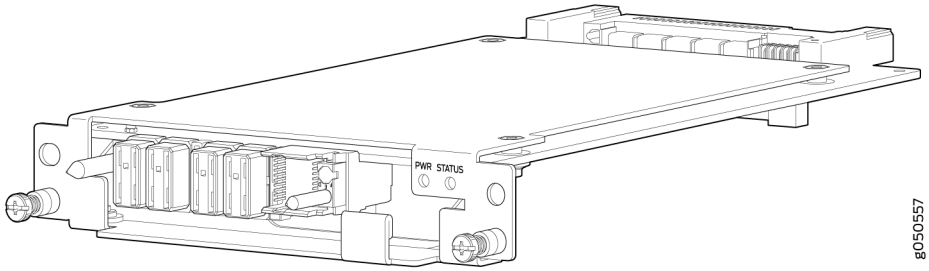
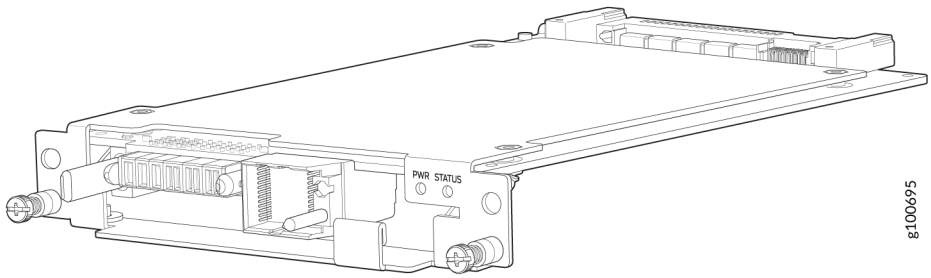


Figure 128: JNP10008-FTC2





CAUTION: Do not remove the fan tray controller unless you have a replacement controller available.

In order to access a fan tray controller, you must first remove the fan tray. With the fan tray removed, the fan tray controller is installed horizontally above the switch interface boards (SIBs) at the top of the chassis.

Before you remove a fan tray controller:

- Ensure that you understand how to prevent ESD damage. See *Prevention of Electrostatic Discharge Damage*.
- Ensure that you have the following parts and tools available to remove a fan tray controller from a PTX10008:
  - Electrostatic discharge (ESD) grounding strap
  - An electrostatic bag or an antistatic mat
  - Replacement fan tray controller
  - A Phillips (+) screwdriver, number 1, for the captive screws

Both models of fan controller are removed using the same procedure.

1. Remove the fan tray. See "Remove a PTX10008 Fan Tray" on page 298.
2. Loosen the two captive screws on each side of the fan tray controller.

3. Grasp the fan tray controller and pull it straight out of the slot. See Figure 129 on page 308 for the JNP10008-FAN-CTRL and Figure 130 on page 308 for the JNP10008-FTC2.

Figure 129: Remove a JNP10008-FAN-CTRL

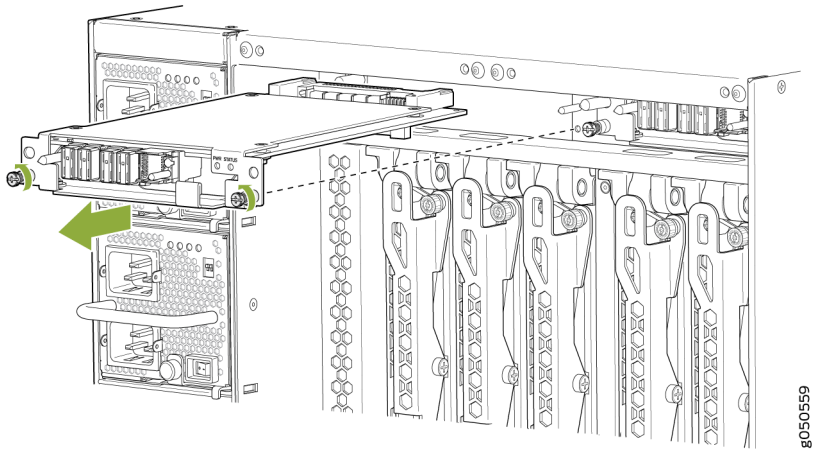
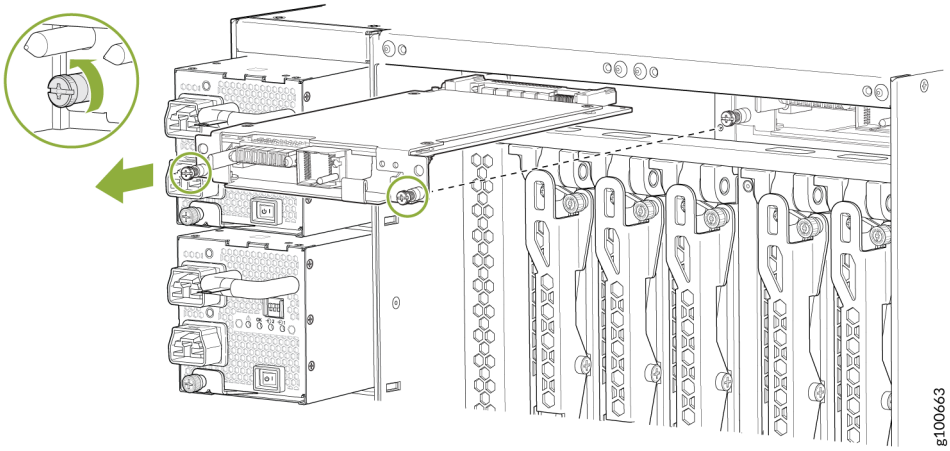


Figure 130: Remove a JNP10008-FTC2



4. Place the fan tray controller in an antiostatic bag or on an antistatic mat.

RELATED DOCUMENTATION

PTX10008 Cooling System and Airflow | 44

PTX10008 Field-Replaceable Units | 35

Install and Remove PTX10008 Power System Components

IN THIS SECTION

- Install a JNP10K-PWR-AC Power Supply | **310**
- Remove a JNP10K-PWR-AC Power Supply | **315**
- Install a JNP10K-PWR-AC2 Power Supply | **319**
- Remove a JNP10K-PWR-AC2 Power Supply | **323**
- Install a JNP10K-PWR-DC Power Supply | **326**
- Remove a JNP10K-PWR-DC Power Supply | **336**
- Install a JNP10K-PWR-DC2 Power Supply | **340**
- Remove a JNP10K-PWR-DC2 Power Supply | **351**

PTX10008 routers support both AC, DC, high voltage alternating current (HVAC), and high voltage direct current (HVDC) power supplies. To install and remove the power supplies in a PTX10008 router, read the following sections. All power supply models are hot-insertable and hot-removeable field-replaceable units (FRUs). You can install up to six power supplies in the rear of the chassis in the slots provided along the left side.

If you are upgrading a JNP10008-SF fabric system to use JNP10K-PWR-AC2 power supplies, also upgrade your fans and fan tray controllers to ensure the proper airflow. JNP10K-PWR-AC2 power supplies require JNP10008-FAN2 and JNP10008-FTC2 cooling systems.



CAUTION: Use the same type of power supply in all slots. Do not mix power supply models in the same chassis.

NOTE: See the heat symbol



. Wear heat-resistant hand gloves while accessing the fan tray and power supply.

Install a JNP10K-PWR-AC Power Supply

Before you install a JNP10K-PWR-AC power supply in the router:

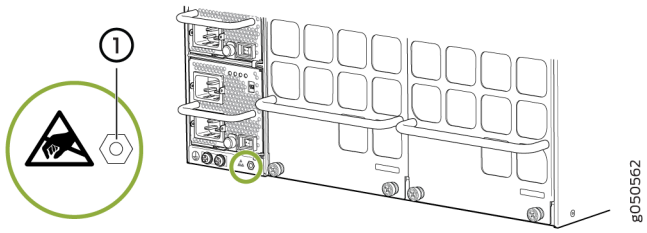
- Ensure that you understand how to prevent ESD damage. See *Prevention of Electrostatic Discharge Damage*.
- If the AC power source outlets have a power router, set them to the off (**O**) position.
- Ensure that you have the following parts and tools available to install a JNP10K-PWR-AC power supply:
  - Electrostatic discharge (ESD) grounding strap
  - Phillips (+) screwdriver, number 1
  - Power cords appropriate for your geographical location. See "PTX10008 Power Cables Specifications" on page 198.
  - Power cord retainer clips

To install a JNP10K-PWR-AC power supply in a PTX10008:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to an ESD point on the chassis. There is an ESD point located next to the

protective earthing terminal and below **PSU 5** on the rear of the PTX10008 (see Figure 131 on page 311).

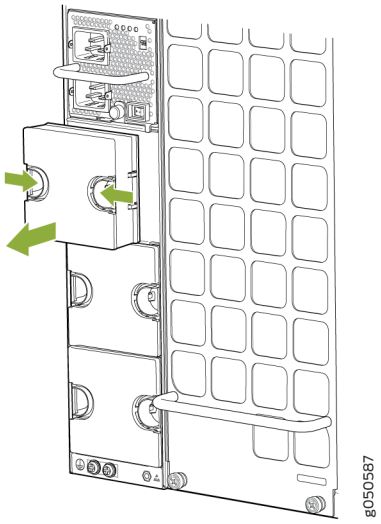
Figure 131: ESD Point on the Rear of the PTX10008



1– ESD point

2. If the power supply slot has a cover on it, insert your thumb and forefinger into the finger holes, squeeze and pull the cover out of the slot. Save the cover for later use. See Figure 132 on page 311.

Figure 132: Remove the Power Supply Cover on a PTX10008



3. Taking care not to touch power supply connections, remove the power supply from its bag.
4. Peel back and remove the protective plastic wrap that covers all four sides of the power supply.
5. Ensure that the power switch is set to the standby (**O**) position. This switch turns off the output voltage; it does not interrupt AC supply.
6. Unscrew the captive screw in the counterclockwise direction by using your fingers or by using the Phillips (+) screwdriver, number 1.

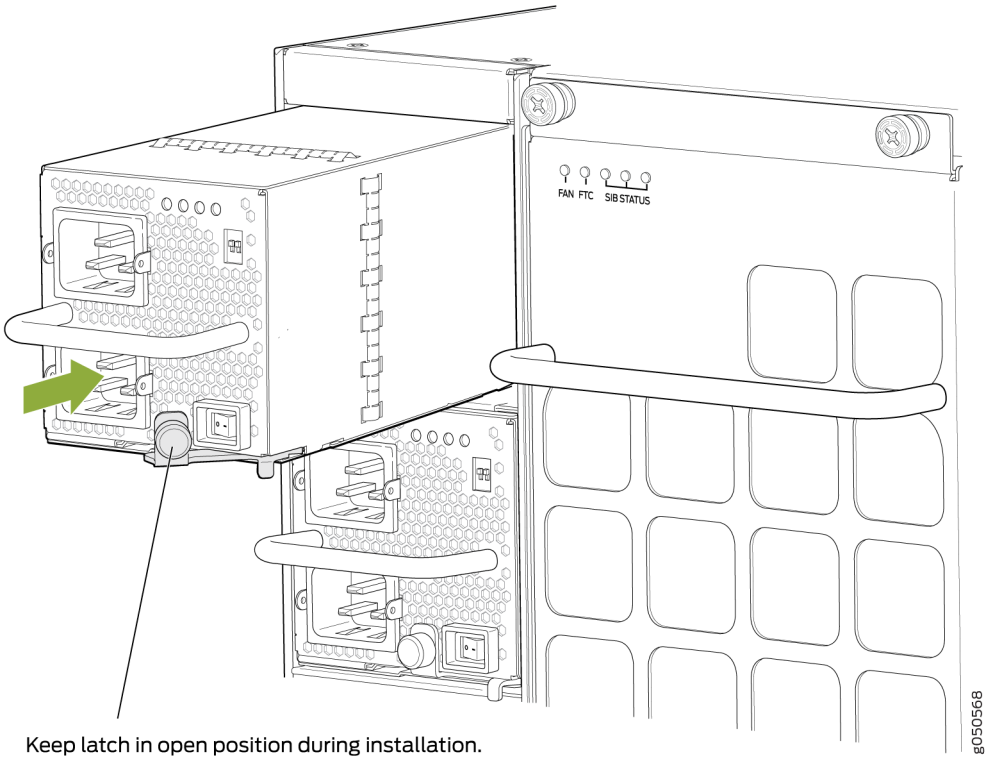
7. Rotate the captive screw away from the faceplate of the power supply to release the latch.

   NOTE: You can install the power supplies in any slot labeled **PSU 0** through **PSU 5** (top to bottom) on a PTX10008.

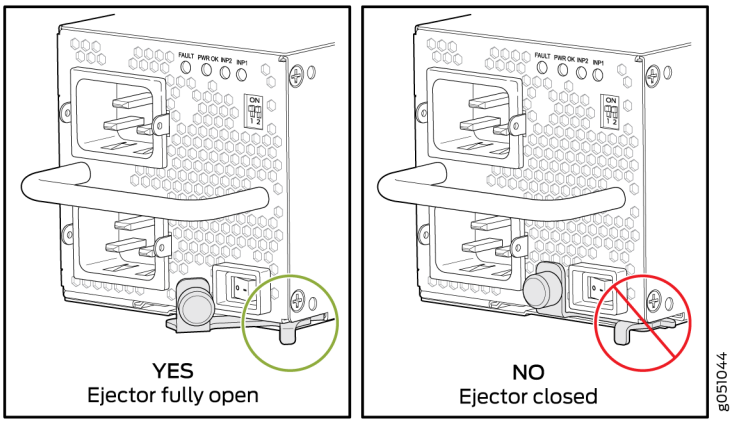
8. Using both hands, place the power supply in the power supply slot on the rear of the system.
9. Slide the power supply straight into the chassis until the power supply is fully seated in the slot. Ensure that the power supply faceplate is flush with any adjacent power supply faceplates or power supply covers (see Figure 133 on page 313).
10. Push the captive screw into the power supply faceplate. Ensure that the screw is seated inside the corresponding hole on the faceplate.

11. Tighten the captive screw by turning it clockwise by using your fingers or by using the Phillips (+) screwdriver, number 1. Do not overtighten—do not apply more than 7.3 lb-in (0.82 Nm) of torque to the screws. When the screw is completely tight, the latch locks into the router chassis.

Figure 133: Install a JNP10K-PWR-AC Power Supply in a PTX10008



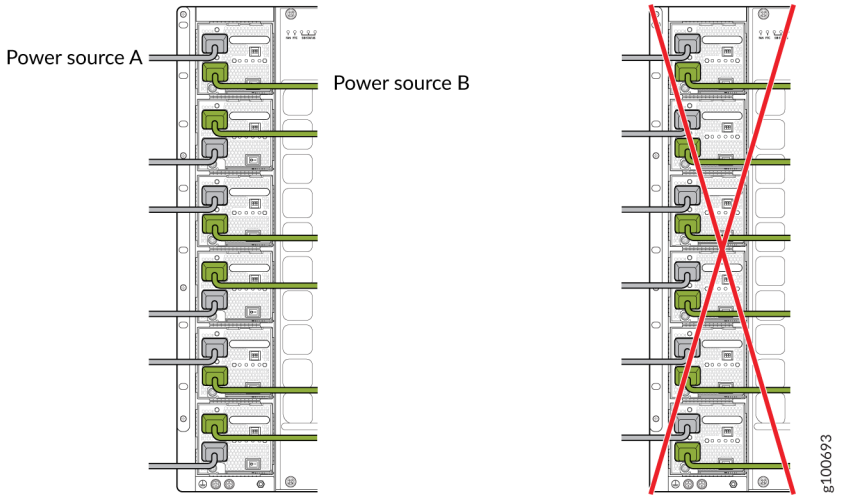
Keep latch in open position during installation.



NOTE: Ensure that the ejector is fully open to avoid scratching the chassis.

12. Manually load-balance the power supplies as you attach each power cable to a dedicated AC power source outlet. To load-balance, route the power cables to alternate between power sources. The JNP10K-PWR-AC does not share power; all power comes into INP1 (lower receptacle) and uses INP2 (top receptacle) only at failover. See Figure 134 on page 314.

Figure 134: Proper Load Balancing for JNP10K-PWR-AC Power Cables on PTX10008



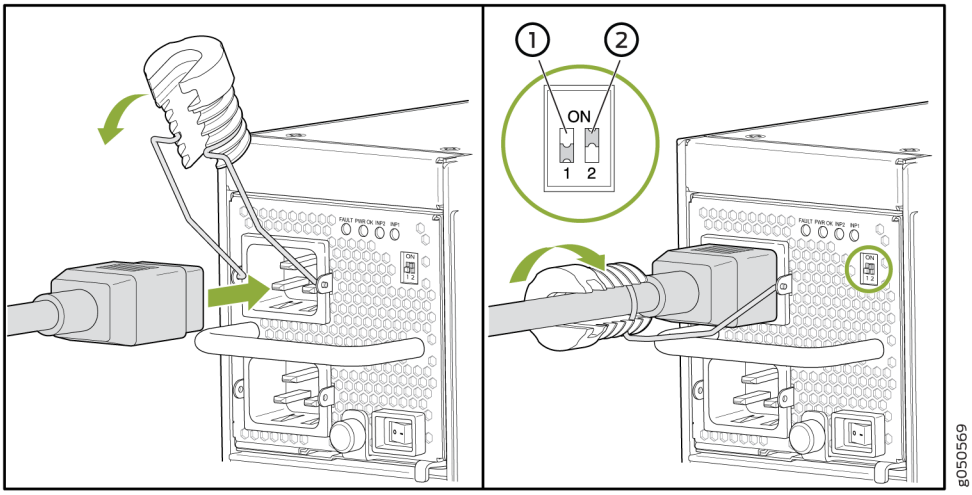
WARNING: Ensure that the power cords do not block access to router components or drape where people can trip on them. Always prevent cords and cables from being exposed to hot air exhaust by routing them away from the fan trays and power supplies at the rear of the chassis.

13. Squeeze the two sides of the power cord retainer clip and insert the ends of the clip into the holes in the bracket on each side of the AC appliance inlets on the AC power supply faceplate. See Figure 135 on page 315.
14. Locate two power cords shipped with the router; the cords have plugs appropriate for your geographical location.
15. Insert the power cord coupler into the power supply.

    Each AC power supply has two independent 16-A-rated AC inlets on the faceplate. Each inlet must be connected to a dedicated AC power feed to achieve 2*n* source redundancy. If redundancy is not a requirement, use the default input **INP1** for a single connection.

16. Fasten the cord retainer by lowering the clip over the cord and pushing the cord into the adjustment nut of the cord retainer. Rotate the nut until it is tight against the base of the cord. See Figure 135 on page 315.

Figure 135: Power Cord and Retainer Clip



1– Enable switch for **INP1** appears as `PS0` in output.	2– Enable switch for **INP2** appears as `PS1` in output.

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

17. If the AC power source outlets have a power switch, set them to the on (|) position.
18. Move the enable switches for input**1** and input**2** to the **ON** position.
19. Verify that the **INP1** and **INP2** LEDs on the power supply faceplate are lit and are on steadily.
20. Press the power switch to the on (|) position.

Remove a JNP10K-PWR-AC Power Supply

Before you remove a JNP10K-PWR-AC power supply from the chassis:

- Ensure that you understand how to prevent ESD damage. See *Prevention of Electrostatic Discharge Damage*.

- Ensure that you have the following parts and tools available to remove a JNP10K-PWR-AC power supply from a PTX10008 router:
  - Electrostatic discharge (ESD) grounding strap
  - Phillips (+) screwdriver, number 1
  - Heat-protective gloves
  - Replacement power supply or a cover for the power supply slot

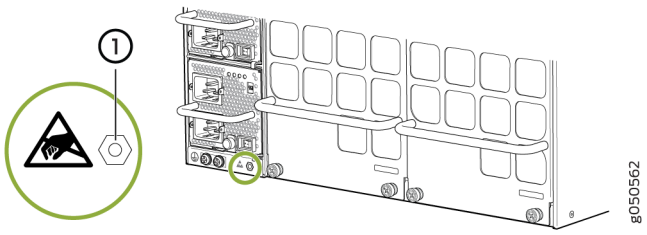
> ⚠ **CAUTION**: Do not leave the power supply slot empty for a long time while the router is operational. Either replace the power supply promptly or install a cover over the empty slot.

> ⚠ **CAUTION**: Before you remove a power supply, ensure that you have power supplies sufficient to power the router left in the chassis. See "PTX10008 Power Planning for JNP10008-SF3 Switch Fabric" on page 210 or "PTX10008 Power Planning for JNP10008-SF Switch Fabric" on page 187.

To remove a JNP10K-PWR-AC power supply from a PTX10008 router:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to an ESD point on the chassis. There is an ESD point located next to the protective earthing terminal and below **PSU 5** on the rear of the PTX10008 (see Figure 136 on page 316).

Figure 136: ESD Point on Rear of the PTX10008



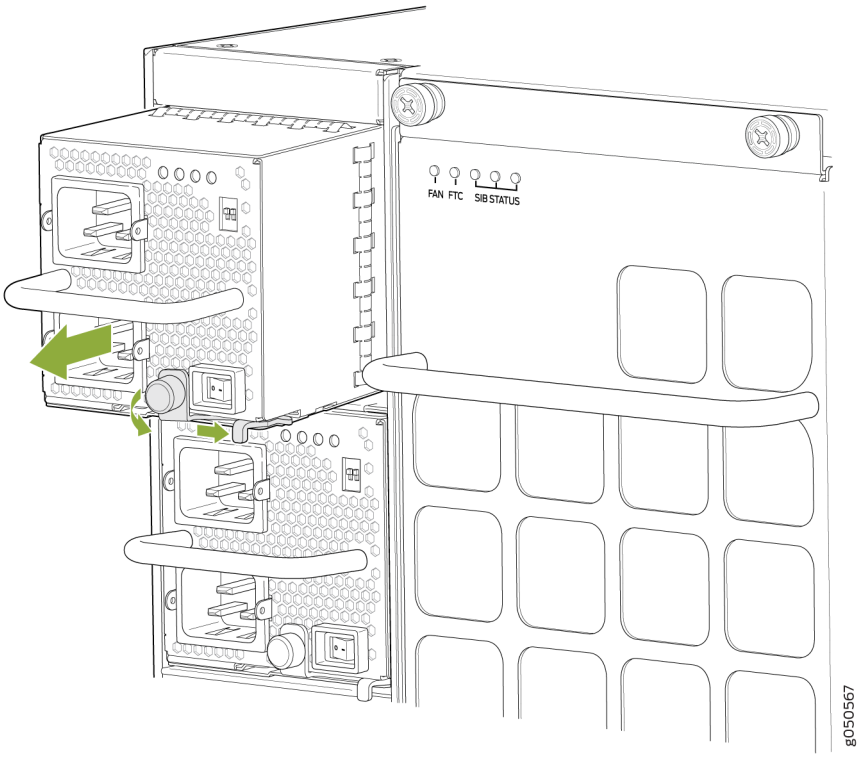
1– ESD point

2. Flip the power switch (**O** and **|**) next to the appliance inlet on the power supply to the standby position (**O**).
3. Disconnect power from the router by performing one of the following tasks:

- If the AC power source outlets have a power switch, set them to the off (**O**) position.
- If the AC power source outlets do not have a power switch, gently pull the plug end of the power cords connected to the power source outlets out of the outlets.

4. Remove the power cords from the AC appliance inlets on the AC power supply faceplate.
5. Turn the adjustment nut of the power cord retainers counterclockwise till you can see the power cord. Pull the power cord from the slot in the adjustment nuts.
6. Unscrew the captive screw counterclockwise by using your fingers or by using the Phillips (+) screwdriver, number 1. See Figure 137 on page 317.

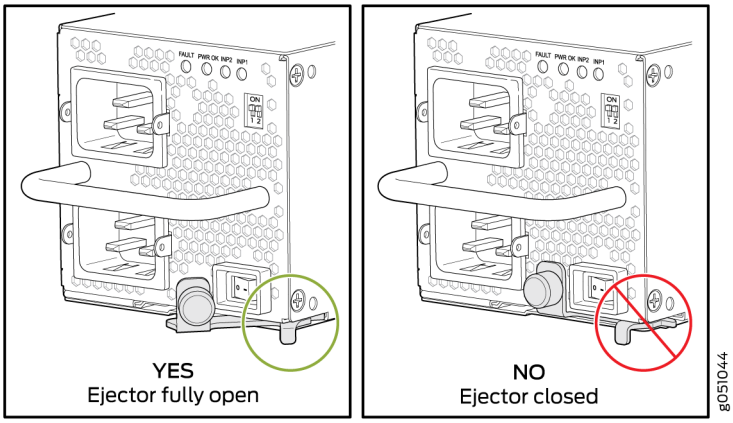
Figure 137: Remove a JNP10K-PWR-AC Power Supply from a PTX10008



7. Rotate the captive screw away from the faceplate of the power supply to release the latch.

NOTE: Ensure that the ejector is fully open to avoid scratching the chassis, see Figure 138 on page 318.

Figure 138: Open Power Supply Ejector



8. Taking care not to touch the power supply output connections, pins, leads, or solder connections, place one hand under the power supply to support it. Grasp the power supply handle with your other hand and pull the power supply completely out of the chassis.

CAUTION: Do not bump the output connections. If the connection hits a solid object, it could damage the power supply.

CAUTION: See the heat symbol



. The power supply surfaces are hot. Allow a few minutes for the power supply to cool by pulling the power supply halfway out of the chassis, or wear protective, heat-resistant gloves while removing the power supply.

9. If you are not replacing the power supply, install the cover over the slot. To install the cover, insert your thumb and forefinger into the finger holes of the cover, squeeze to retract the spring latches, and place the cover in the slot. Do not run the chassis without a power supply or cover in place.

Install a JNP10K-PWR-AC2 Power Supply

CAUTION: Use the same type of power supply in all slots. Do not mix power supply models in a production chassis. The only time you are allowed to have two models concurrently running in a system is when you are in the process of swapping out all JNP10K-PWR-AC power supplies with all JNP10K-PWR-AC2 power supplies.

WARNING: Protect yourself from severe burns by wearing heat-protective gloves when removing a running JNP10K-PWR-AC2 power supply from the chassis. The power supply can reach temperatures between 158°F and 176°F (70°C to 80°C) under running conditions.

Before you install a JNP10K-PWR-AC2 power supply in the chassis:

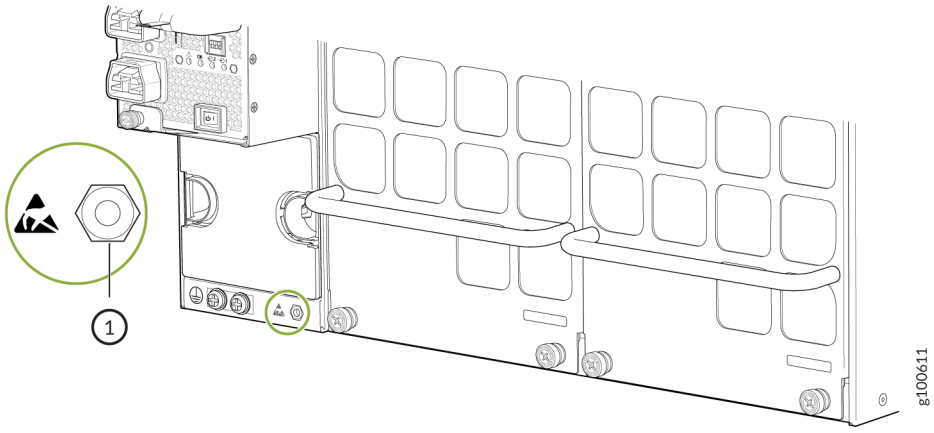
- Ensure that you have followed all safety warnings and cautions.
- Ensure that you understand how to prevent ESD damage. See *Prevention of Electrostatic Discharge Damage*.
- If the AC or DC power source outlets have a power switch, set them to off (**O**). Ensure that you have the following parts and tools available to install a JNP10K-PWR-AC2 power supply:
  - Electrostatic discharge (ESD) grounding strap
  - Phillips (+) screwdriver, number 1
  - Power cables appropriate for your geographical location (for low-voltage installations) or input amperage (for high-voltage installations). See "PTX10008 Power Cables Specifications" on page 198. HVAC and HVDC connectors and lugs must be installed by a qualified electrician before installation.

To install a JNP10K-PWR-AC2 power supply in a PTX10008:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to an ESD point on the chassis. There is an ESD point located next to the

protective earthing terminal and below **PSU5** on the rear of the PTX10008 (see Figure 139 on page 320).

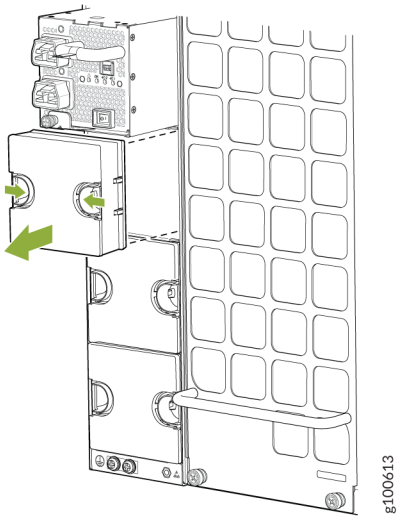
Figure 139: ESD Point on the Rear of the PTX10008



1– ESD point

2. If the power supply slot has a cover on it, insert your thumb and forefinger into the finger holes, squeeze, and pull the cover out of the slot. Save the cover for later use. See Figure 140 on page 320 for the removal on a PTX10008.

Figure 140: Remove the Power Supply Cover on a PTX10008



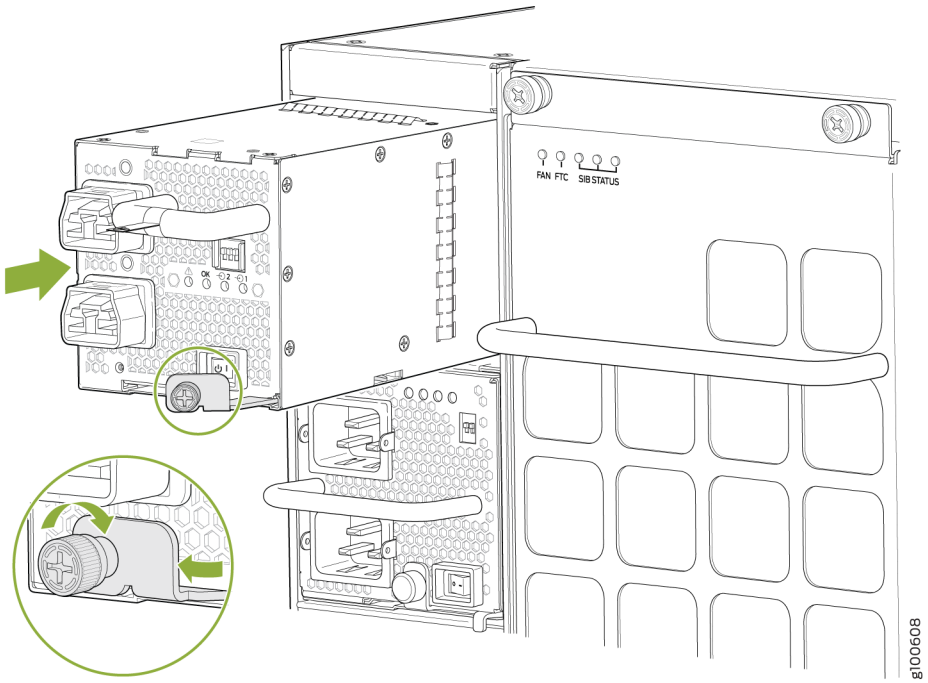
3. Taking care not to touch power supply connections, remove the power supply from its bag.
4. Peel back and remove the protective plastic wrap that covers all four sides of the power supply.

5. Ensure that the power switch is set to the standby (**O**) position. This switch turns off the output voltage; it does not interrupt input power.
6. Unscrew the captive screw in the counterclockwise direction by using your fingers or by using the Phillips (+) screwdriver, number 1.
7. Rotate the captive screw away from the faceplate of the power supply to release the latch.

> **NOTE**: You can install the power supplies in any slot labeled **PSU 0** through **PSU 5** (top to bottom) on a PTX10008.

8. Using both hands, place the power supply in the power supply slot on the rear of the system. Slide the power supply straight into the chassis until the power supply is fully seated in the slot. Ensure that the power supply faceplate is flush with any adjacent power supply faceplates or power supply covers (see Figure 141 on page 321).

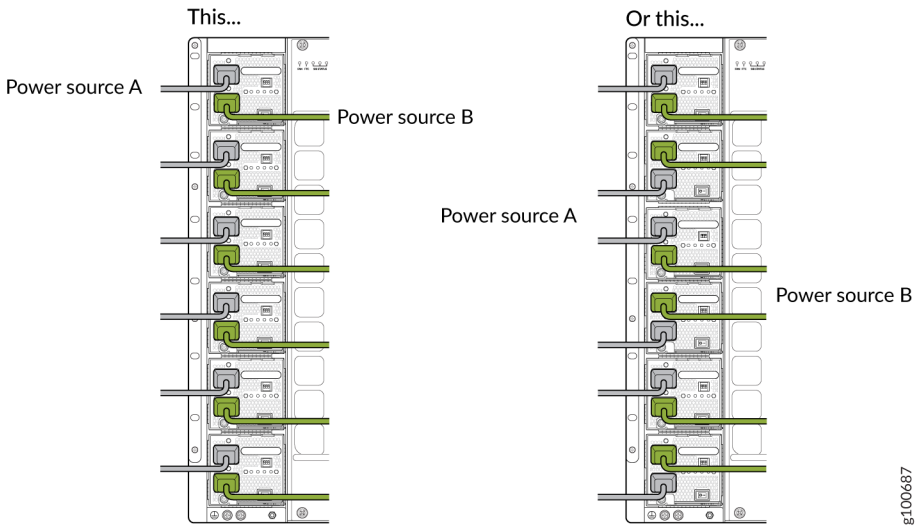
Figure 141: Install a JNP10K-PWR-AC2 Power Supply in a PTX10008



9. Push the captive screw into the power supply faceplate. Ensure that the screw is seated inside the corresponding hole on the faceplate.
10. Tighten the captive screw by turning it clockwise by using your fingers or by using the Phillips (+) screwdriver, number 1. Do not overtighten—do not apply more than 7.3 lb-in (0.82 Nm) of torque to the screws. When the screw is completely tight, the latch locks into the router chassis.

11. Attach each power cable to a dedicated power (A and B). The JNP10K-PWR-AC2 only requires that each power supply be connected to a separate source. See Figure 142 on page 322 for some possible cabling combinations for PTX10008.

Figure 142: Proper Load Balancing for JNP10K-PWR-AC2 Power Cables on a PTX10008



12. For each power cable, insert the end of the cable with the Anderson connector into the JNP10K-PWR-AC2 power supply. The connector snaps and locks the cable into position.

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

13. If the AC or DC power source outlets have a power switch, set them to the on (|) position.
14. Set the three DIP switches to set the inputs and whether the power supply is running at 3000 W, 5000 W, or 5500 W. See Table 107 on page 322.

    Set both enable switches to the **on** position when using both power source inputs. When not using source redundancy, set the unused source to the off (**O**) position. The LED turns red and indicates an error if a source input is not in use and the enable switch is on (|).

Table 107: Set the JNP10K-PWR-AC2 DIP Switches

Switch	State	Description
1	On	INP0 is present.

Table 107: Set the JNP10K-PWR-AC2 DIP Switches *(Continued)*

Switch	State	Description
	Off	INP0 is not present.
2	On	INP1 is present.
	Off	INP1 is not present.
3	On	Enabled for 30-A feed; 5000 W for single feed, 5500 W for dual feeds.
	Off	Enabled for 20-A feed; power supply capacity is 3000 W.

15. Verify that the **INP1** and **INP2** LEDs on the power supply faceplate are lit and are on steadily.
16. Press the power switch to the on (|) position.

Remove a JNP10K-PWR-AC2 Power Supply

Before you remove an JNP10K-PWR-AC2 power supply from the chassis:

- Ensure that you understand how to prevent ESD damage. See *Prevention of Electrostatic Discharge Damage*.
- Ensure that you have the following parts and tools available to remove a JNP10K-PWR-AC2 power supply from a PTX10008 router:
  - Heat-protective gloves able to withstand temperatures of 158°F (70°C)
  - Electrostatic discharge (ESD) grounding strap
  - Phillips (+) screwdriver, number 1
  - Replacement power supply or a cover for the power supply slot



WARNING: Protect yourself from severe burns by wearing heat-protective gloves when removing a working JNP10K-PWR-AC2 power supply from the chassis. These power

supplies can reach temperatures between 158°F to 176°F (70°C to 80°C) under running conditions.

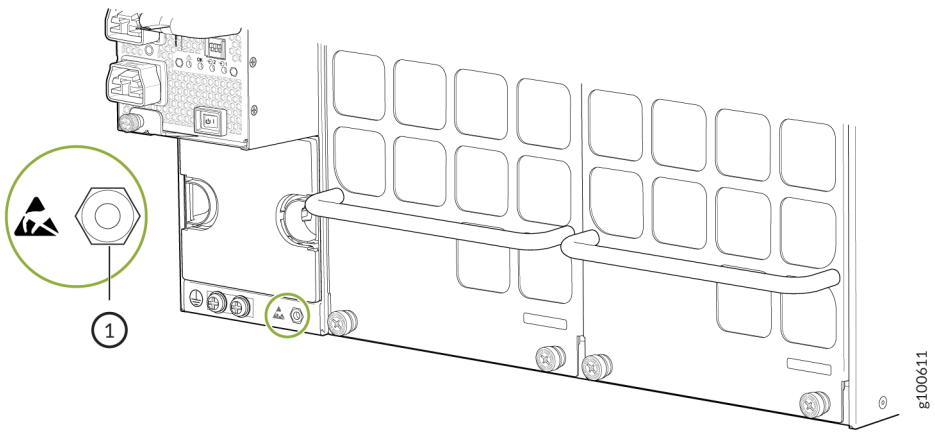
CAUTION: Before you remove a power supply, ensure that you have power supplies sufficient to power the router left in the chassis. See "PTX10008 Power Planning for JNP10008-SF3 Switch Fabric" on page 210 or "PTX10008 Power Planning for JNP10008-SF Switch Fabric" on page 187.

CAUTION: Do not leave the power supply slot empty for a long time while the router is operational. Either replace the power supply promptly or install a cover over the empty slot.

To remove a JNP10K-PWR-AC2 power supply from a PTX10008 router:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to an ESD point on the chassis. There is an ESD point located next to the protective earthing terminal and below **PSU 5** on the rear of the PTX10008 (see Figure 143 on page 324).

Figure 143: ESD Point on the Rear of the PTX10008

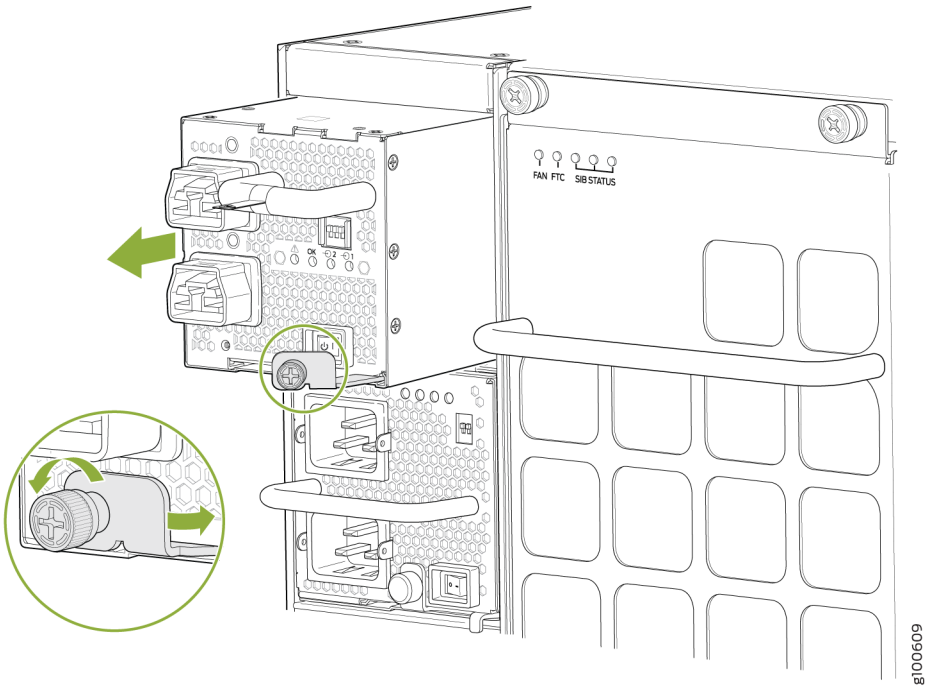


1– ESD point

2. Flip the power (|) switch next to the appliance inlet on the power supply to the standby position (**O**).
3. If the AC or DC power source outlets have a power switch, set them to the off (**O**) position.

4. Disconnect the Anderson connectors from each input on the JNP10K-PWR-AC2 power supply faceplate.
5. Unscrew the captive screw counterclockwise by using your fingers or by using the Phillips (+) screwdriver, number 1. See Figure 144 on page 325.

Figure 144: Remove a JNP10K-PWR-AC2 Power Supply from a PTX10008



6. Rotate the captive screw away from the faceplate of the power supply to release the latch.
7. Wear heat-protective gloves before removing the power supply from the chassis.
8. Taking care not to touch the power supply output connections, pins, leads, or solder connections, place one hand under the power supply to support it. Grasp the power supply handle with your other hand and pull the power supply completely out of the chassis.

> ⚠ **CAUTION**: Do not bump the output connections. If the connection hits a solid object, it could damage the power supply.

9. Place the JNP10K-PWR-AC2 power supply on an antistatic surface to completely cool before placing the power supply in an antistatic bag for storage.
10. If you are not replacing the power supply, install the cover over the slot. To install the cover, insert your thumb and forefinger into the finger holes of the cover, squeeze to retract the spring latches, and place the cover in the slot. Do not run the chassis without a power supply or cover in place.

Install a JNP10K-PWR-DC Power Supply

Before you install a JNP10K-PWR-DC power supply in the chassis:

- Ensure that you have followed all safety warnings and cautions:

  WARNING: Before you perform DC power procedures, ensure there is no power to 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 switch handle of the circuit breaker in the off position.

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

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

  CAUTION: To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect PTX10008 routers to earth ground before you connect them to power. For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the router chassis to connect to earth ground. For instructions on connecting a PTX10008 router to ground using a separate grounding conductor, see "Connect the PTX10008 Router to Earth Ground" on page 268.

  NOTE: The battery returns of the JNP10K-PWR-DC power supply must be connected as an isolated DC return (DC-I).

- Ensure that you understand how to prevent ESD damage. See *Prevention of Electrostatic Discharge Damage*.

- Ensure that you have the following parts and tools available to install a JNP10K-PWR-DC power supply:

- Electrostatic discharge (ESD) grounding strap
- DC power source cables (not provided) with the cable lugs (provided) attached.

  The provided Panduit LCD4-14A-L, or equivalent, terminal lugs in a PTX10008 are sized for either 4 AWG (21.1 mm^2) or 6 AWG (13.3 mm^2) power source cables. When using all JNP10K-PWR-DC power supply modules in the chassis, the DC power source cables that you provide must be 6 AWG (13.3 mm^2) stranded wire. We recommend that you install heat-shrink tubing insulation around the crimped section of the power cables and lugs.

  NOTE: If you upgrade the JNP10K-PWR-DC to a JNP10K-PWR-DC2 and set the input mode to high (80 A), you must use 4 AWG (21.1 mm^2) stranded wire. The 4 AWG (21.1 mm^2) stranded wire should be rated 75° C, or per local electrical code.

  NOTE: See the heat symbol

  . Wear heat-resistant gloves while accessing the fan tray and power supply.

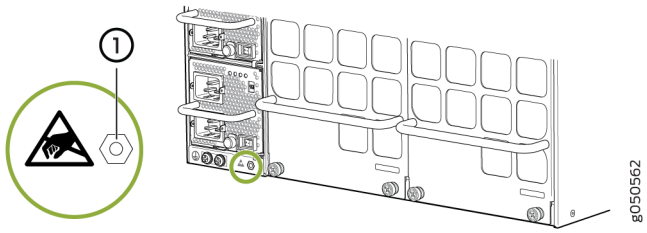
- 13/32 in. (10 mm) nut driver or socket wrench
- Phillips (+) screwdrivers, numbers 1 and 2
- Multimeter
- Heat resistant gloves

To install a JNP10K-PWR-DC power supply in a PTX10008 router:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to an ESD point on the chassis. There is an ESD point located next to the

protective earthing terminal and below **PSU 5** on the rear of the PTX10008 (see Figure 145 on page 328).

Figure 145: ESD Point on the Rear of the PTX10008



1– ESD point

2. Taking care not to touch power supply components, pins, leads, or solder connections, remove the power supply from its bag.

CAUTION: See the heat symbol

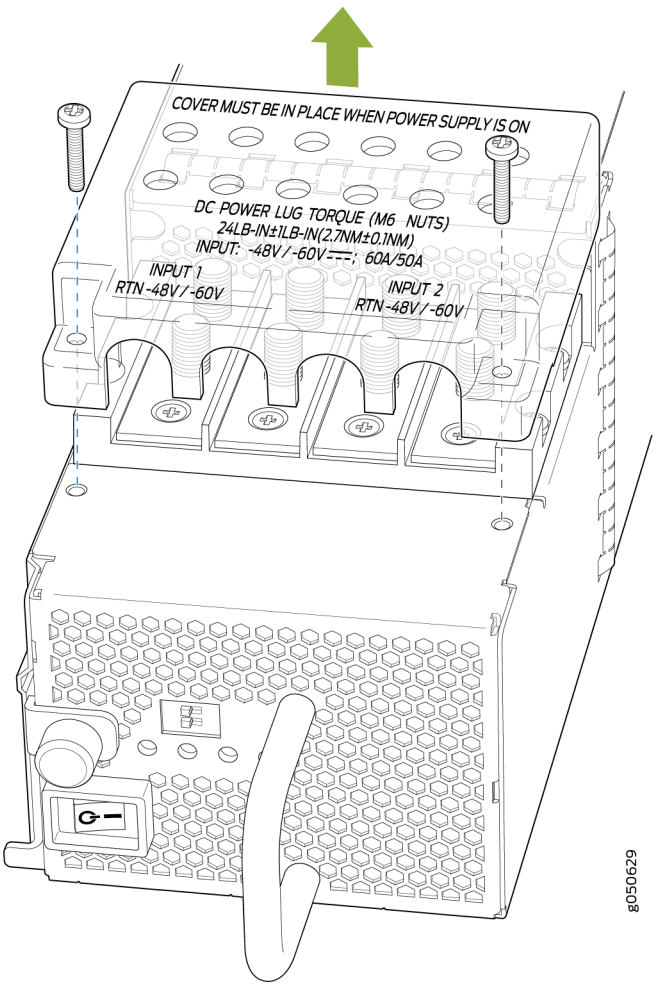


. The power supply surfaces are hot. Allow a few minutes for the power supply to cool by pulling the power supply halfway out of the chassis, or wear heat-resistant gloves while removing the power supply.

3. Peel back and remove the protective plastic wrap that covers all four sides of the power supply.
4. Ensure that the power switch is set to the standby (**O**) position. This switch turns off the output voltage; it does not interrupt DC.

5. Remove the plastic cable cover from the DC power input terminals by using the Phillips (+) screwdriver, number 2, to loosen the screws (see Figure 146 on page 329).

Figure 146: Remove the Plastic Cable Cover on a JNP10K-PWR-DC Power Supply



6. Remove the nuts from each DC power input terminal, using the 13/32 in. (10 mm) nut driver or socket wrench to loosen the nuts.
7. Ensure that the power source circuit breaker is open so that the voltage across the cable leads of the DC power source cable is 0 V and that the cable leads do not become active while you are connecting DC power.
8. Install a power lug on each DC power cable. Ensure that the lug meets the double-hole standard lug terminal for 4 AWG wire. The lugs should be dual, 1/4 in. spaced 5/8 in. apart. The terminal must accommodate double-hole standard lug terminal for 4 AWG or larger wire.
9. Verify that the DC power cables are correctly labeled before making connections to the power supply. In a typical power distribution scheme where the return is connected to chassis ground at

the battery plant, you can use a multimeter to verify the resistance of the **–48V** and **RTN** DC cables to chassis ground:

- The cable with very high resistance (indicating an open circuit) to chassis ground is negative (–) and will be installed on the **–48V** (input) DC power input terminal.
- The cable with very low resistance (indicating a closed circuit) to chassis ground is positive (+) and will be installed on the **RTN** (return) DC power input terminal.

> ⚠ **CAUTION**: You must ensure that power connections maintain the proper polarity. The power source cables might be labeled **(+)** and **(–)** to indicate their polarity. There is no standard color coding for DC power cables.

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

    To install heat-shrink tubing:

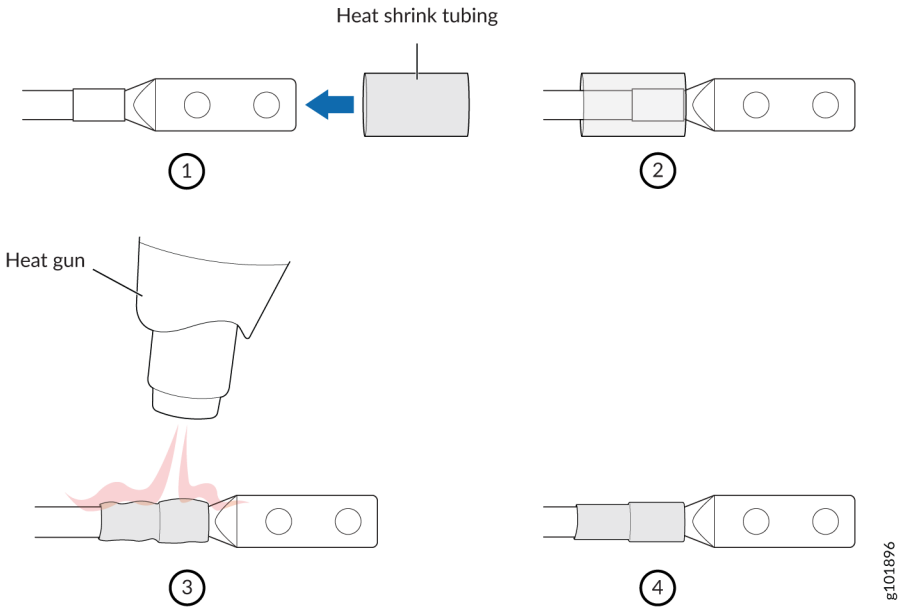
    a. Slide the tubing over the portion of the cable where it is attached to the lug barrel. Ensure that tubing covers the end of the wire and the barrel of the lug attached to it.

    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 147 on page 331 shows the steps to install heat-shrink tubing.

NOTE: Do not overheat the tubing.

Figure 147: How to Install Heat-Shrink Tubing

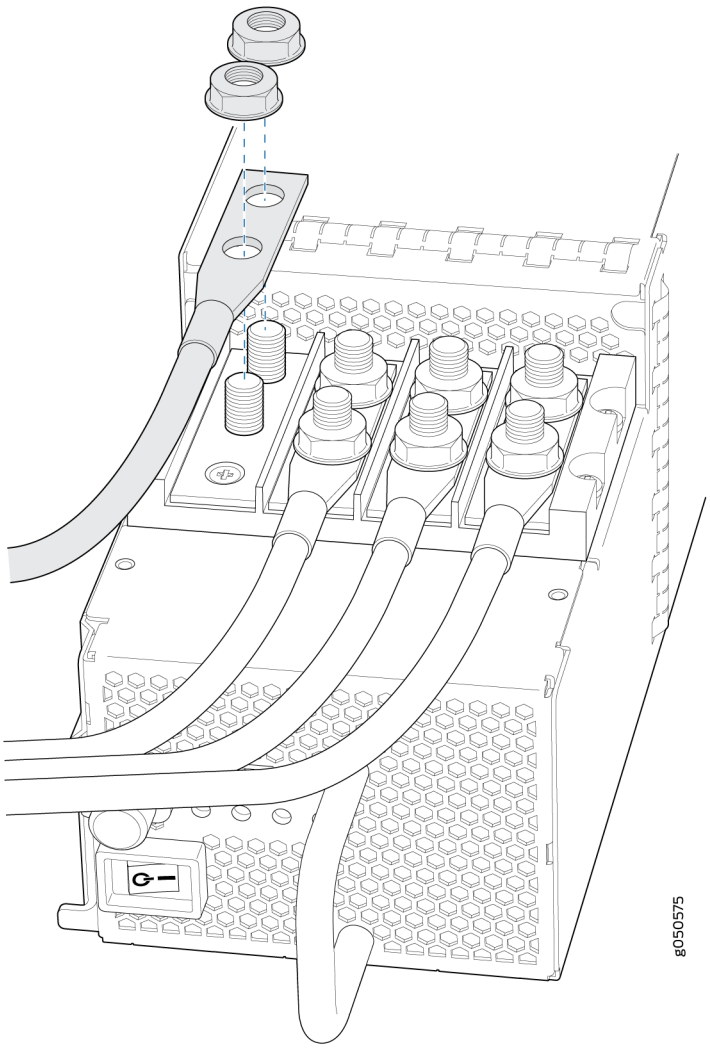


11. Install each power cable lug on the DC power input terminal, securing it with the nut (see Figure 148 on page 332). Apply between 23 lb-in. (2.6 Nm) and 25 lb-in. (2.8 Nm) of torque to each nut. (Use the 13/32 in. [10 mm] nut driver or socket wrench.)

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

b. Secure each negative **(–)** DC source power cable lug to the **–48V** (input) DC power input terminal.

Figure 148: Connect the DC Power Source Cables to a JNP10K-PWR-DC

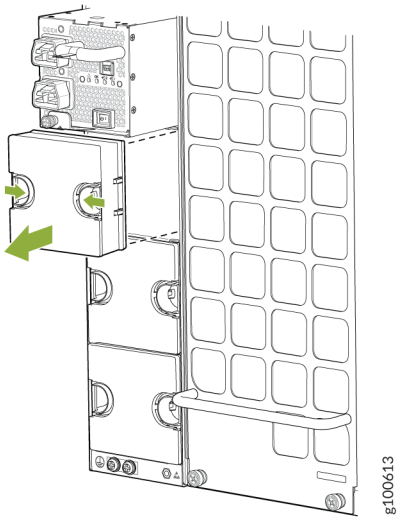


Each power supply has two independent sets of DC power input terminals (**INPUT 1: RTN -48V/-60V** and **INPUT 2: RTN -48V/760V)**. For feed redundancy, each power supply must be powered by dedicated power feeds derived from feed **INPUT 1** and feed **INPUT 2**. This configuration provides the commonly deployed INPUT 1 / INPUT 2 feed redundancy for the router. There is basic insulation between the inputs and the chassis ground. Also, there is basic insulation between RTN input feeds.

12. Install the plastic cable cover over each set of power cables by using the Phillips (+) screwdriver, number 2, to tighten the screw.

13. If the power supply slot on the chassis has a cover on it, insert your thumb and forefinger into the finger holes, squeeze, and pull the cover out of the slot. Save the cover for later use (see Figure 149 on page 333).

Figure 149: Remove the Power Supply Cover on a PTX10008



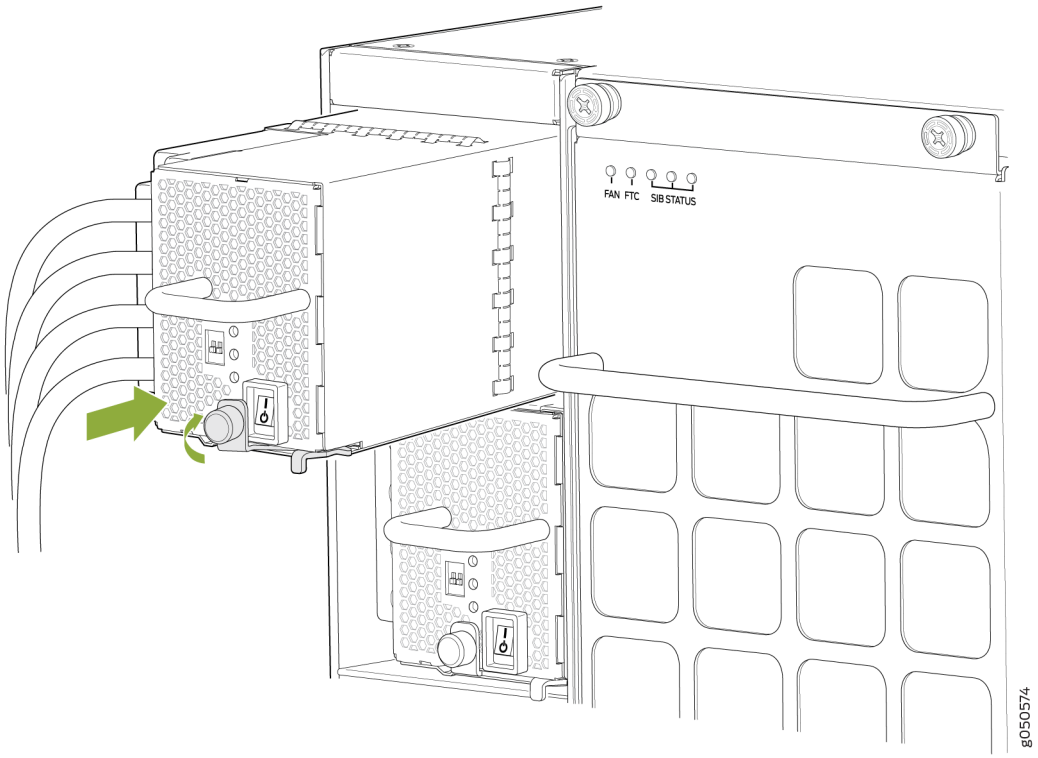
14. Unscrew the captive screw in the counterclockwise direction by using your fingers or by using the Phillips (+) screwdriver, number 1.
15. Pull the captive screw away from the faceplate of the power supply to release the latch.

> **NOTE**: You can install the power supplies in any slot labeled **PSU 0** through **PSU 5** (top to bottom) on a PTX10008.

16. Using both hands, place the power supply in the power supply slot on the rear of the router.
17. Slide the power supply straight into the chassis until the power supply is fully seated in the slot. Ensure that the power supply faceplate is flush with any adjacent power supply faceplates or power supply covers (see Figure 150 on page 334).
18. Push the captive screw into the power supply faceplate. Ensure that the screw is seated inside the corresponding hole on the faceplate.

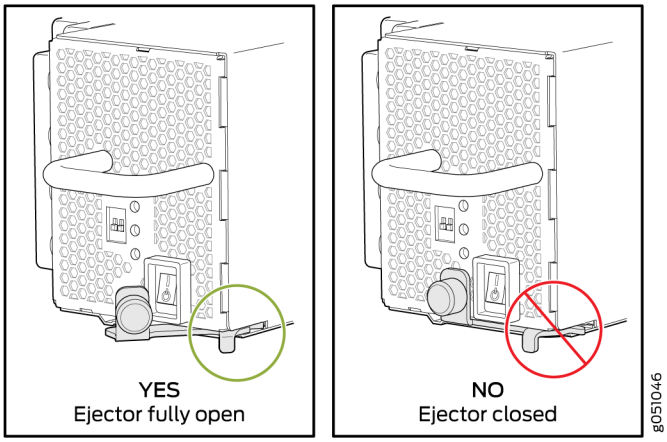
19. Tighten the captive screw by turning it clockwise by using your fingers or by using the Phillips (+) screwdriver, number 1. Do not overtighten—do not apply more than 7.3 lb-in (0.82 Nm) of torque to the screws. When the screw is completely tight, the latch locks into the router chassis.

Figure 150: Install a JNP10K-PWR-DC Power Supply in a PTX10008



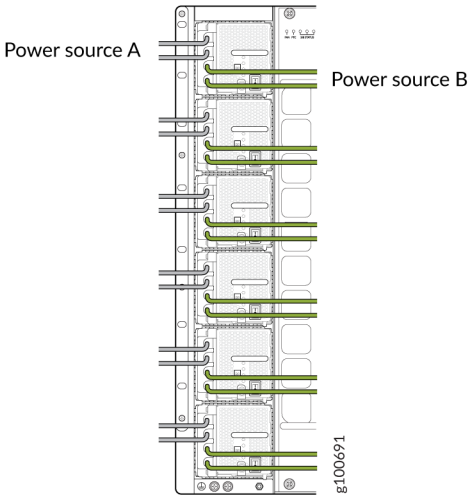
NOTE: Ensure that the ejector is fully open to avoid scratching the chassis (see Figure 151 on page 335).

Figure 151: Proper NP10K-PWR-DC Power Supply Ejector Position



20. Route input 1 cables to a power source and input 2 cables to another power source. The JNP10K-PWR-DC shares power, so if power dips on one input, the power supply is able to load-balance internally. See Figure 152 on page 335.

Figure 152: Proper Load Balancing for JNP10K-PWR-DC Power Cables on a PTX10008

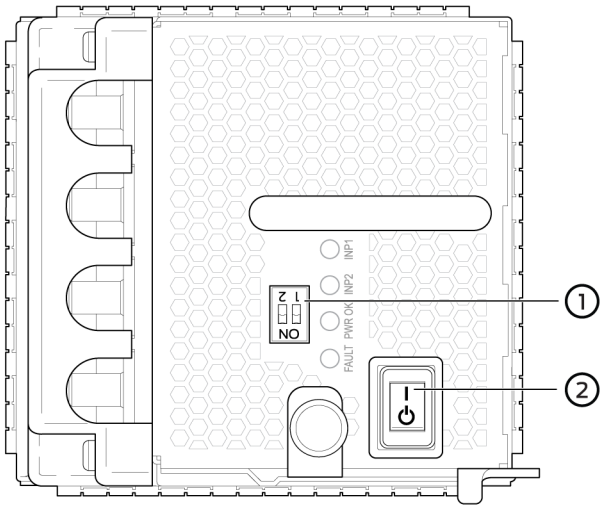


WARNING: Ensure that the power cords do not block access to router components or drape where people can trip on them.

21. Set the enable switches for input 1 and input 2 (see Figure 153 on page 336).

    Set both enable switches to the **|** (on) position when using both source inputs. When not using source redundancy, set the unused source to the off (**O**) position. The LED turns red and indicates an error if a source input is not in use and the enable switch is on (**|**).

Figure 153: Set the Enable Switches for the Power Source



1– DIP switches for enabling input sources	2– Power switch, on (**|**) and standby (**O**)

22. Verify that the input 1 and 2 LEDs on the power supply faceplate are lit and are on steadily.
23. Press the power switch to the on (**|**) position.

Remove a JNP10K-PWR-DC Power Supply

Before you remove a JNP10K-PWR-DC power supply from the router:

- Ensure that you understand how to prevent ESD damage. See *Prevention of Electrostatic Discharge Damage*.
- Ensure that you have the following parts and tools available to remove a JNP10K-PWR-DC power supply:
  - Electrostatic discharge (ESD) grounding strap

- Phillips (+) screwdriver, numbers 1 and 2
- 13/32 in. (10 mm) nut driver or socket wrench
- Replacement power supply or a cover for the power supply slot
- Heat-protective gloves

CAUTION: Before you remove a power supply, ensure that you have power supplies sufficient to power the router left in the chassis. See "PTX10008 Power Planning for JNP10008-SF3 Switch Fabric" on page 210 or "PTX10008 Power Planning for JNP10008-SF Switch Fabric" on page 187.

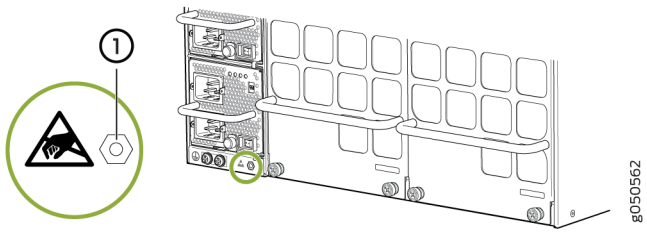
WARNING: Before performing DC power procedures, ensure that power is removed from the DC circuit. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the off (**O**) position, and tape the switch handle of the circuit breaker in the off position.

CAUTION: Do not leave the power supply slot empty for a long time while the router is operational. Either replace the power supply promptly or install a cover over the empty slot.

To remove a JNP10K-PWR-DC power supply from a PTX10008 router (see Figure 155 on page 338):

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to an ESD point on the chassis. There is an ESD point located next to the protective earthing terminal and below **PSU 5** on the rear of the PTX10008 (see Figure 154 on page 337).

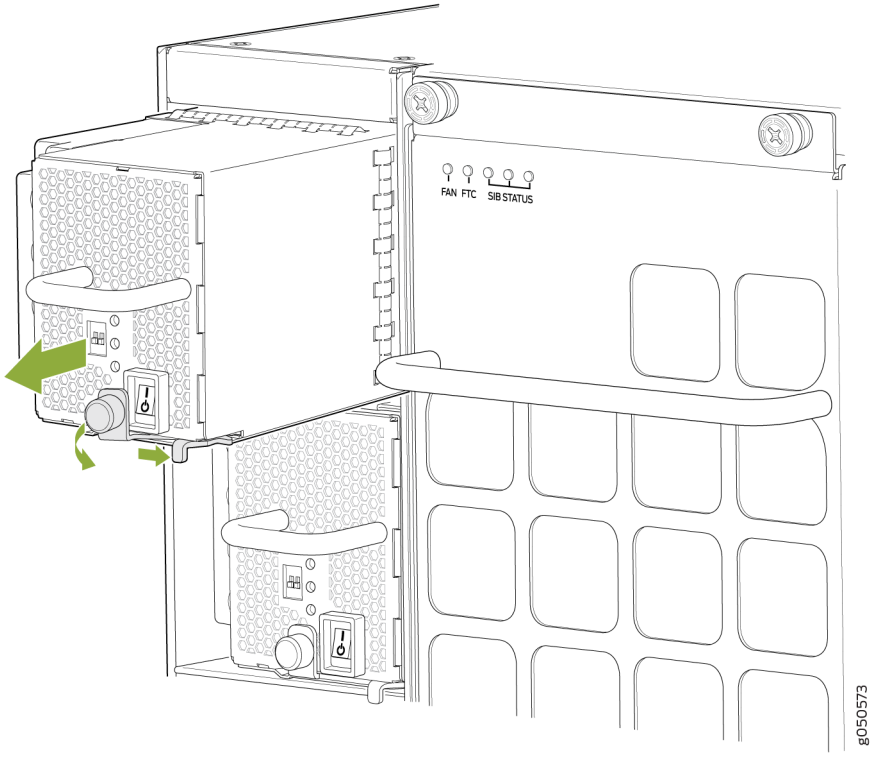
Figure 154: ESD Point on the Rear of the PTX10008



1– ESD point

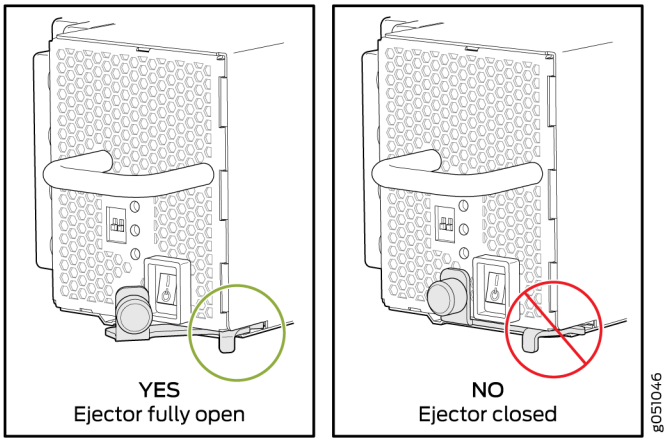
2. Make sure that the voltage across the DC power source cables leads is 0 V and that there is no chance that the cables might become active during the removal process.
3. Ensure that the black power supply output switch, to the right of the captive screw, is set to the standby position (**O**).
4. Unscrew the captive screw counterclockwise by using your fingers or by using the Phillips (+) screwdriver, number 1.
5. Rotate the captive screw away from the faceplate of the power supply to release the latch. See Figure 155 on page 338.

Figure 155: Remove a JNP10K-PWR-DC Power Supply from a PTX10008



NOTE: Ensure that the ejector is fully open to avoid scratching the chassis.

Figure 156: Power Supply Ejector



6. Taking care not to touch power supply components, pins, leads, or solder connections, place one gloved hand under the power supply to support it. Grasp the power supply handle with your other hand and pull the power supply completely out of the chassis.

CAUTION: See the heat symbol



. The power supply surfaces are hot. Allow a few minutes for the power supply to cool by pulling the power supply halfway out of the chassis, or wear heat-resistant gloves while removing the power supply.

7. If you are not replacing the power supply, install the cover over the slot. To install the cover, insert your thumb and forefinger into the finger holes of the cover, squeeze to retract the spring latches, and place the cover in the slot. Do not run the chassis without a power supply or cover in place.
8. Unscrew the screw on the plastic cable cover that shields the input terminal studs counterclockwise by using the number 2 Phillips (+) screwdriver.
9. Unscrew the nuts counterclockwise, using the 13/32 in. (10 mm) nut driver or socket wrench from the input terminal studs.

10. Remove the cable lugs from the input terminal studs.

Install a JNP10K-PWR-DC2 Power Supply

Before you install a JNP10K-PWR-DC2 power supply in the chassis:

- Ensure that you have followed all safety warnings and cautions:

> **WARNING**: Before performing 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 (**O**) position, and tape the switch handle of the circuit breaker in the off position.

> **WARNING**: Protect yourself from severe burns by wearing heat-protective gloves when removing a working JNP10K-PWR-DC2 power supply from the chassis. JNP10K-PWR-DC2 power supplies can reach temperatures between 158°F and 176°F (70°C to 80°C) under running conditions.

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

> **CAUTION**: Use the same type of power supply in all slots. Do not mix power supply models in a production chassis.

> **CAUTION**: To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect PTX10008 routers to earth ground before you connect them to power. For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the router chassis to connect to earth ground. For instructions on connecting a PTX10008 router to ground

using a separate grounding conductor, see "Connect the PTX10008 Router to Earth Ground" on page 268.

NOTE: The battery returns of the JNP10K-PWR-DC2 power supply must be connected as an isolated DC return (DC-I).

- Ensure that you understand how to prevent ESD damage. See *Prevention of Electrostatic Discharge Damage*.
- Ensure that you have the following parts and tools available to install a DC power supply:
  - Electrostatic discharge (ESD) grounding strap
  - Use high current cable assembly, CBL-PWR2-BARE (not provided) with the cable lugs (provided) attached.

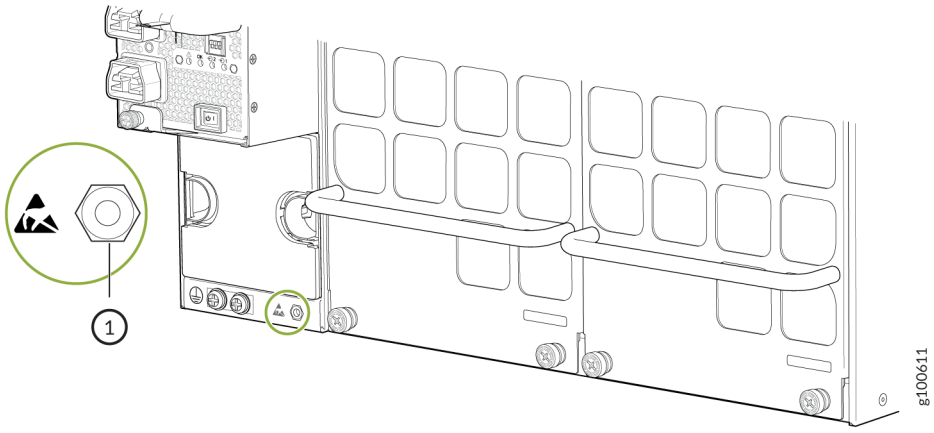
    The provided terminal lugs for the JNP10K-PWR-DC2 are Panduit LCD4-14A-L, or equivalent, and sized for 4 AWG (21.1 mm^2) power source cables. The 4 AWG (21.1 mm^2) stranded wire should be rated 75° C, or per local electrical code. We recommend that you install heat-shrink tubing insulation around the crimped section of the power cables and lugs.
  - 13/32 in. (10 mm) nut driver or socket wrench
  - Phillips (+) screwdrivers, numbers 1 and 2
  - Multimeter

To install a JNP10K-PWR-DC2 power supply in a PTX10008 router:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to an ESD point on the chassis. There is an ESD point located next to the

protective earthing terminal and below **PSU 5** on the rear of the PTX10008 (see Figure 157 on page 342).

Figure 157: ESD Point on Rear of the PTX10008

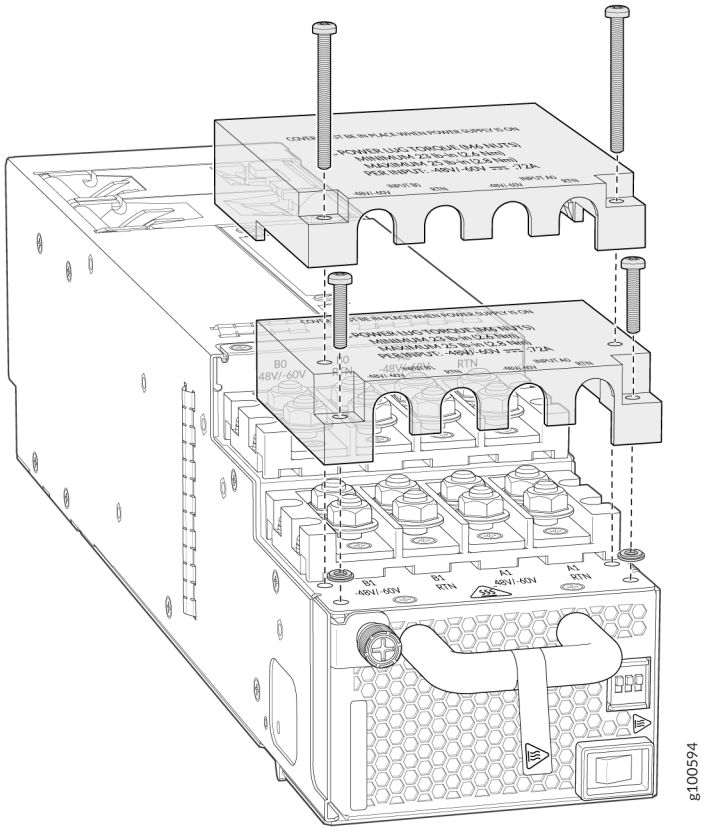


1– ESD point

2. Taking care not to touch power supply components, pins, leads, or solder connections, remove the power supply from its bag.
3. Peel back and remove the protective plastic wrap that covers all four sides of the power supply.
4. Ensure that the power switch is set to the standby (**O**) position. This switch turns off the output voltage; it does not interrupt DC.

5. Remove the plastic cable cover from the power input terminals by using the Phillips (+) screwdriver, number 2, to loosen the screws (see Figure 158 on page 343).

Figure 158: Remove the Plastic Cable Cover on a JNP10K-PWR-DC2 Power Supply



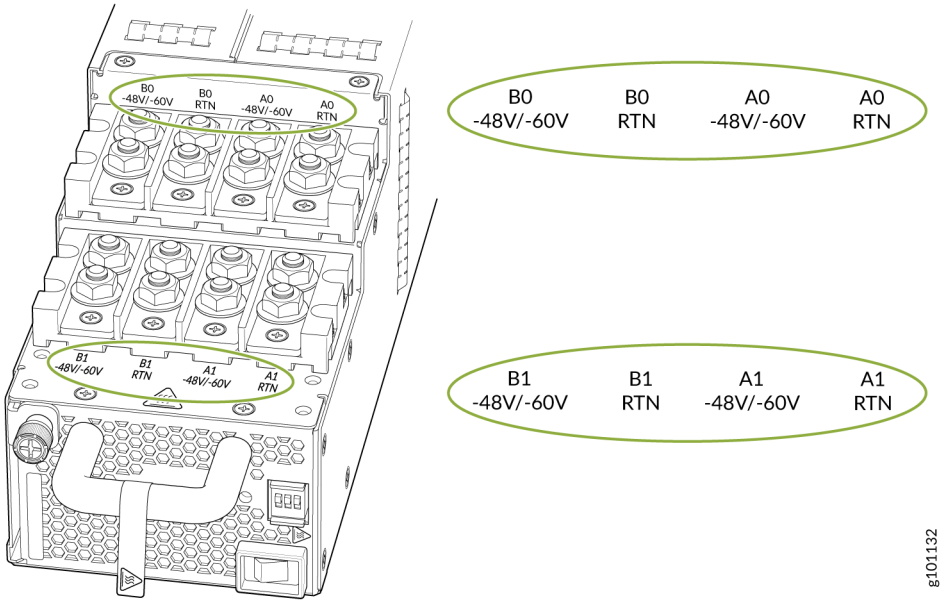
6. Remove the nuts from each DC power input terminal, using the 13/32 in. (10 mm) nut driver or socket wrench to loosen the nuts.
7. Ensure that the power source circuit breaker is open so that the voltage across the DC power source cable leads is 0 V and that the cable leads do not become active while you are connecting DC power.
8. Verify that the DC power cables are correctly labeled before making connections to the power supply. In a typical power distribution scheme where the return is connected to chassis ground at the battery plant, you can use a multimeter to verify the resistance of the **–48V** and **RTN** DC cables to chassis ground:
   - The cable with very high resistance (indicating an open circuit) to chassis ground is negative (–) and will be installed on the **–48V** (input) DC power input terminal.
   - The cable with very low resistance (indicating a closed circuit) to chassis ground is positive (+) and will be installed on the **RTN** (return) DC power input terminal.

The JNP10K-PWR-DC2 power supply is the equivalent of two power supplies in a single housing. Each JNP10K-PWR-DC2 has four independent sets of DC power input terminals:

- A0: **INPUT A0 RTN –48V/–60V**
- B0: **INPUT B0 RTN –48V/–60V**
- A1: **INPUT A1 RTN –48V/–60V**
- B1: **INPUT B1 RTN –48V/–60V**

We recommend source redundancy (source A and source B) to all inputs to ensure reliability of the system. If you not have two power sources available, then having two feeds from the same source provides power distribution reliability because there are two independent power distribution from the source to the system. See Figure 159 on page 344.

Figure 159: JNP10K-PWR-DC2 Input Terminal Marking



CAUTION: You must ensure that power connections maintain the proper polarity. The power source cables might be labeled **(+)** and **(–)** to indicate their polarity. There is no standard color coding for DC power cables.

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

   To install heat-shrink tubing:

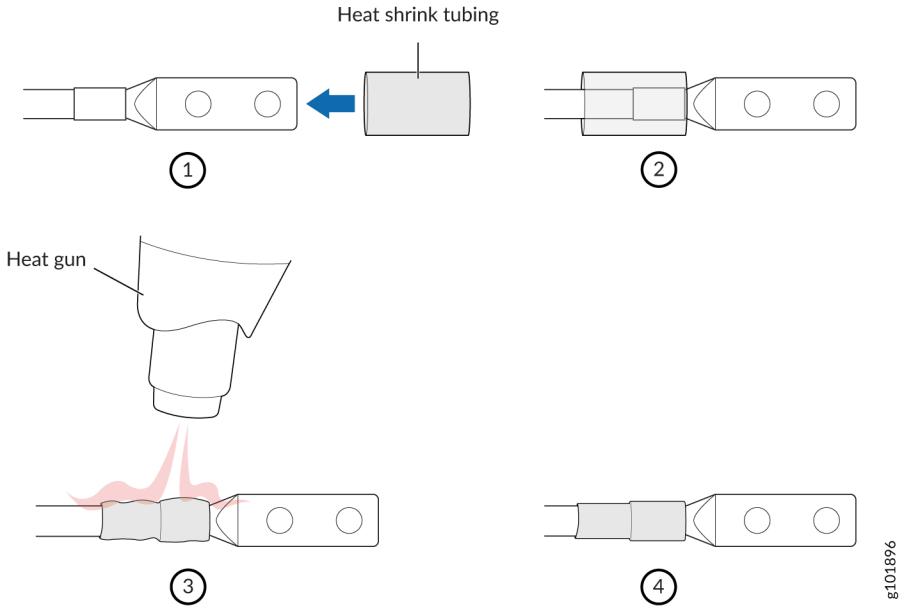
a. Slide the tubing over the portion of the cable where it is attached to the lug barrel. Ensure that tubing covers the end of the wire and the barrel of the lug attached to it.

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 160 on page 345 shows the steps to install heat-shrink tubing.

NOTE: Do not overheat the tubing.

Figure 160: How to Install Heat-Shrink Tubing

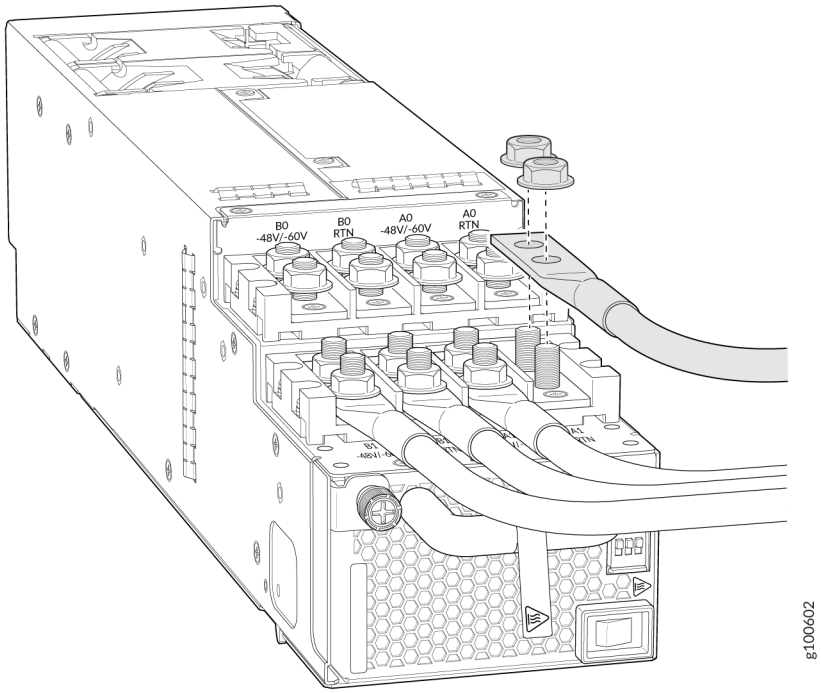


10. Install each power cable lug on the DC power input terminal, securing it with the nut (see Figure 161 on page 346). Apply between 23 lb-in. (2.6 Nm) and 25 lb-in. (2.8 Nm) of torque to each nut. (Use the 13/32 in. [10 mm] nut driver or socket wrench.)

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

b. Secure each negative **(–)** DC source power cable lug to the **–48V** (input) DC power input terminal.

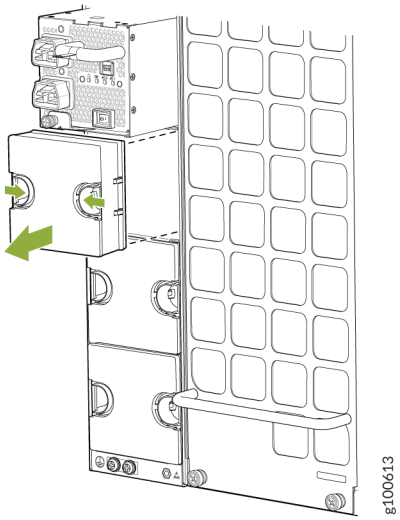
Figure 161: Connect the DC Power Source Cables to a JNP10K-PWR-DC2 Power Supply



11. Install the plastic cable cover over each set of power cables by using the Phillips (+) screwdriver, number 2, to tighten the screw.

12. If the power supply slot on the chassis has a cover on it, insert your thumb and forefinger into the finger holes, squeeze, and pull the cover out of the slot. Save the cover for later use (see Figure 162 on page 347).

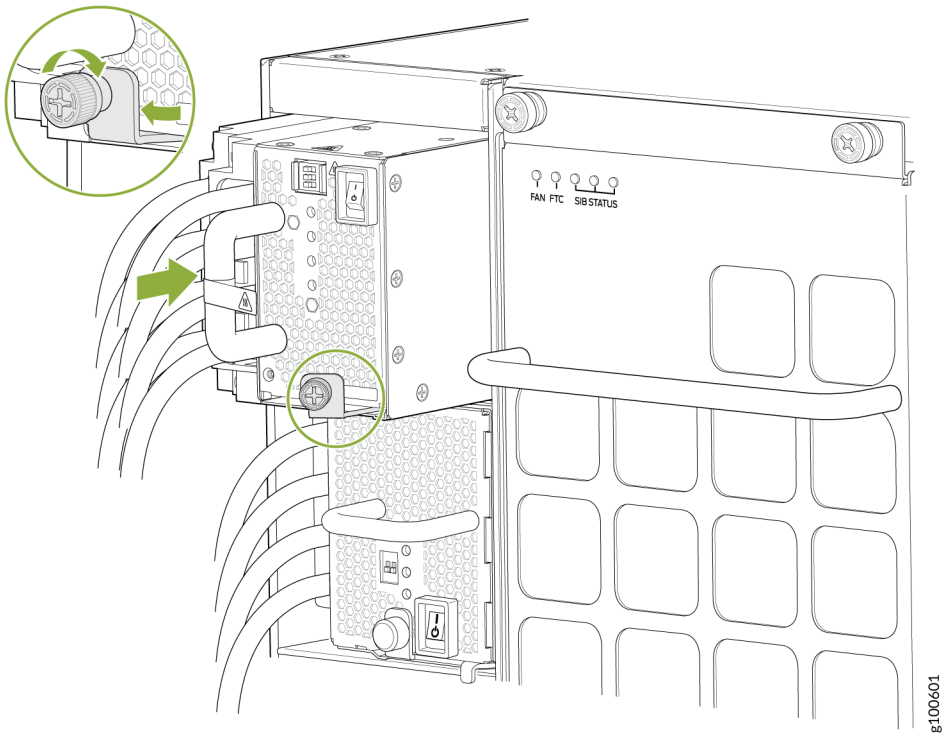
Figure 162: Remove the Power Supply Cover on a PTX10008



13. Unscrew the captive screw in the counterclockwise direction by using your fingers or by using the Phillips (+) screwdriver, number 1.
14. Rotate the captive screw away from the faceplate of the power supply to release the latch.
15. Using both hands, place the power supply in the power supply slot on the rear of the router. Slide the power supply straight into the chassis until the power supply is fully seated in the slot. The power supply will protrude from the chassis about 2 in. (5 cm) (see Figure 163 on page 348).
16. Push the captive screw into the power supply faceplate. Ensure that the screw is seated inside the corresponding hole on the faceplate.

17. Tighten the captive screw by turning it clockwise by using your fingers or by using the Phillips (+) screwdriver, number 1. Do not overtighten—do not apply more than 7.3 lb-in (0.82 Nm) of torque to the screws. When the screw is completely tight, the latch locks into the router chassis.

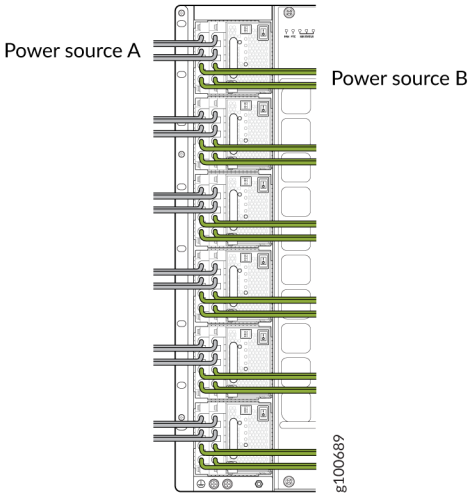
Figure 163: Install a JNP10K-PWR-DC2 in PTX10008



18. Route input A0 and A1 cables to a power source and input B0 and B1 cables to another power source. You must connect each input to a dedicated power distribution and protection. The

JNP10K-PWR-DC2 shares power, so if power dips on one input, the power supply is able to load-balance internally. See Figure 164 on page 349.

Figure 164: Proper Load Balancing for JNP10k-PWR-DC2 Power Cables on PTX10008



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

19. Set the three DIP switches to indicate the number of input sources and to indicate high or low power. See Table 108 on page 349 and Figure 165 on page 350.

    Set both enable switches to the **on** position when using both source inputs. When not using source redundancy, set the unused source to the off position. The LED turns red and indicates an error if a source input is not in use and the enable switch is **on**.

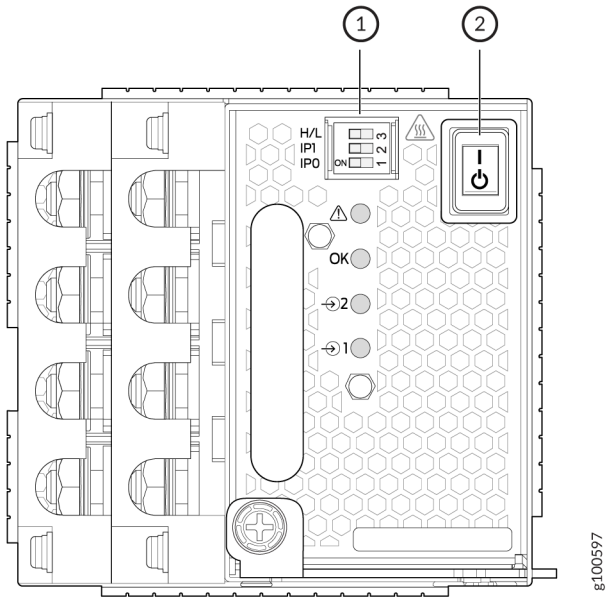
Table 108: Set the JNP10K-PWR-DC2 DIP Switches

Switch	State	Description
1	On	IP0 is present.
	Off	IP0 is not present.
2	On	IP1 is present.

Table 108: Set the JNP10K-PWR-DC2 DIP Switches *(Continued)*

Switch	State	Description
	Off	IP1 is not present
3	On	Enabled for 80-A feed; 2750 W for a single feed, 5500 W for dual feeds.
	Off	Enabled for 60-A feed; 2200 W for a single feed, 4400 W for dual feeds.

Figure 165: Set the Enable Switches for the Power Source



1– DIP switches	2– Power switch, on (|) and standby (**O**)

20. Verify that the input 1 and 2 LEDs on the power supply faceplate are lit and are on steadily.
21. Press the power switch to the on (|) position.

Remove a JNP10K-PWR-DC2 Power Supply

Before you remove a DC power supply from the router:

- Ensure that you understand how to prevent ESD damage. See *Prevention of Electrostatic Discharge Damage*.
- Ensure that you have the following parts and tools available to remove a JNP10K-PWR-DC2 power supply:
  - Heat-protective gloves able to withstand temperatures between 158°F to 176°F (70°C to 80°C)
  - Electrostatic discharge (ESD) grounding strap
  - Phillips (+) screwdriver, numbers 1 and 2
  - 13/32 in. (10 mm) nut driver or socket wrench
  - Replacement power supply or a cover for the power supply slot

CAUTION: A working JNP10K-PWR-DC2 power supply can reach temperatures of up to 158°F and 176°F (70°C and 80°C) under running conditions. In order to avoid injury, do not touch a running power supply with your bare hands.



CAUTION: Before you remove a power supply, ensure that you have power supplies sufficient to power the router left in the chassis. See "PTX10008 Power Planning for JNP10008-SF Switch Fabric" on page 187 and "PTX10008 Power Planning for JNP10008-SF3 Switch Fabric" on page 210.

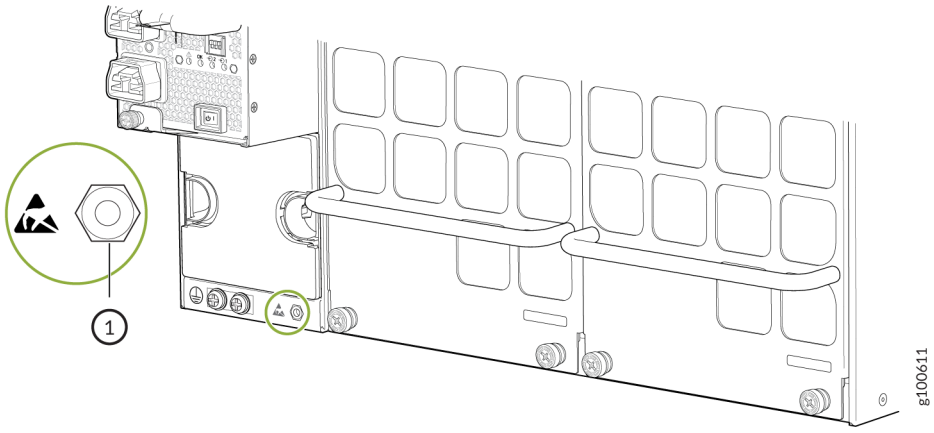
CAUTION: Do not leave the power supply slot empty for a long time while the router is operational. Either replace the power supply promptly or install a cover over the empty slot.

To remove a JNP10K-PWR-DC2 power supply from a PTX10008 router:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to an ESD point on the chassis. There is an ESD point located next to the

protective earthing terminal and below **PSU 5** on the rear of the PTX10008 (see Figure 166 on page 352).

Figure 166: ESD Point on the Rear of the PTX10008

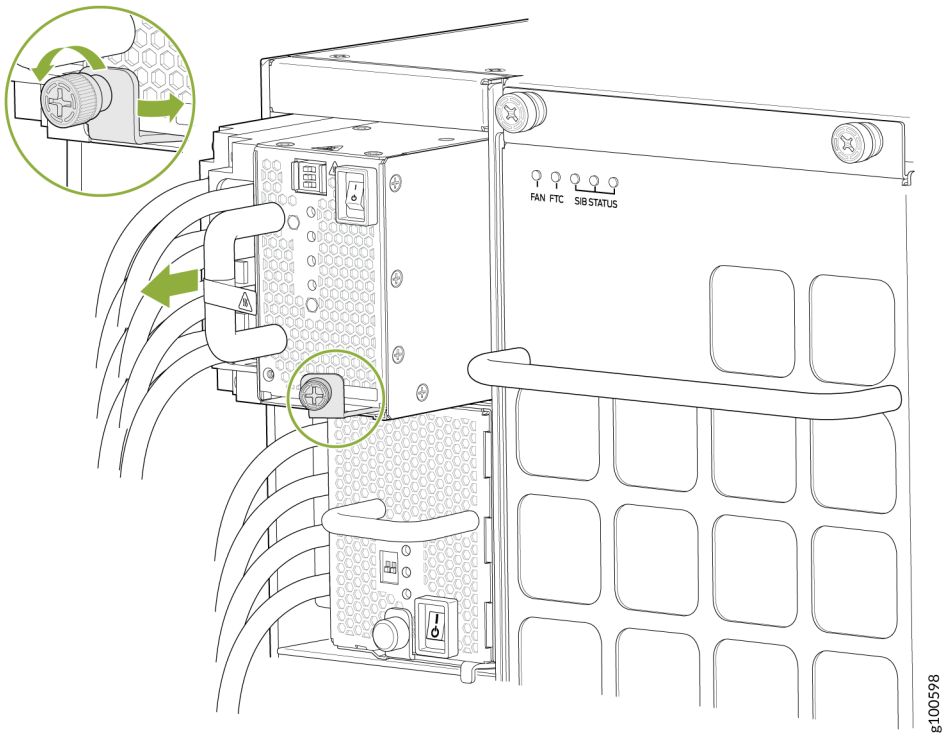


1– ESD point

2. Make sure that the voltage across the DC power source cables leads is 0 V and that there is no chance that the cables might become active during the removal process.
3. Ensure the black power supply output switch, to the right of the captive screw, is set to the standby position.
4. Unscrew the captive screw counterclockwise by using your fingers or by using the Phillips (+) screwdriver, number 1.

5. Rotate the captive screw away from the faceplate of the power supply to release the latch. (See Figure 167 on page 353.)

Figure 167: Remove a JNP10K-PWR-DC2 Power Supply on PTX10008



6. Wear the heat-resistant gloves to protect your hands from the hot power supply.
7. Taking care not to touch power supply components, pins, leads, or solder connections, place one gloved hand under the power supply to support it. Grasp the power supply handle with your other hand and pull the power supply completely out of the chassis.
8. If you are not replacing the power supply, install the cover over the slot. To install the cover, insert your thumb and forefinger into the finger holes of the cover, squeeze to retract the spring latches, and place the cover in the slot. Do not run the chassis without a power supply or cover in place.
9. Unscrew the screw on the plastic cable cover that shields the input terminal studs counterclockwise by using the Phillips (+) screwdriver, number 2.
10. Unscrew the nuts counterclockwise, using the 13/32 in. (10 mm) nut driver or socket wrench, from the input terminal studs.
11. Remove the cable lugs from the input terminal studs.

RELATED DOCUMENTATION

JNP10K-PWR-AC Power Supply | 61
JNP10K-PWR-DC Power Supply | 67
Connect AC Power to a PTX10008 | 271
Connect DC Power to a PTX10008 | 271
PTX10008 Field-Replaceable Units | 35

Install and Remove PTX10008 Switch Fabric Components

IN THIS SECTION

- How to Handle and Store PTX10008 Line Cards, RCBs, and SIBs | 354
- Install a PTX10008 Switch Interface Board | 358
- Remove a PTX10008 Switch Interface Board | 363

Each PTX10008 router contains five or six Switch Interface Boards (SIBs) that are installed vertically, mid-chassis, between the line cards and the Routing and Control Boards (RCBs) in the front and the fan trays in the rear. To install or remove the switch interface boards in a PTX10008 router, read the following sections.

How to Handle and Store PTX10008 Line Cards, RCBs, and SIBs

IN THIS SECTION

- How to Hold Line Cards and RCBs | 355
- How to Hold SIBs | 356
- How to Store Line Cards, RCBs, and SIBs | 358

The PTX10008 chassis have several field-replaceable units (FRUs) that have fragile components. To avoid damaging the line cards, Routing and Control Boards (RCBs), and Switch Interface Boards (SIBs), be sure you follow the following safe handling practices.

How to Hold Line Cards and RCBs

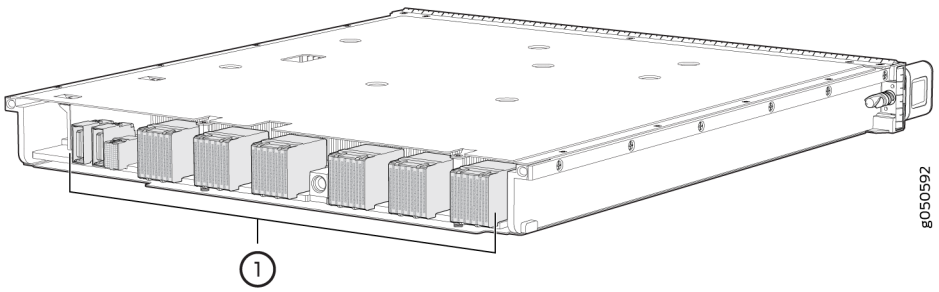
Pay proper attention to the way you are holding line cards and RCBs. Line cards and RCBs are installed horizontally and it is best to hold them by the sides of the units when they are not in the chassis.

When walking with a line card or RCB:

1. Orient the line card or the RCB so that the faceplate is toward you.
2. Grasp each side of the unit firmly as you slide the unit out of the chassis.
3. Take care not to strike the unit against any object as you carry it.

CAUTION: Never hold the line card or RCB by the connector edge. The connectors are fragile and the line card or RCB will not seat properly if the connector is damaged. See Figure 1.

Figure 168: Connector Edge of a Line Card



1– Connectors

4. If you must rest a line card or an RCB on an edge, place a cushion between the edge and the surface.

CAUTION: Do not stack line cards or RCBs on top of one another or on top of any other component.

5. Place each line card separately in an electrostatic bag or on an antistatic mat placed on a flat, stable surface.

How to Hold SIBs

SIBs are installed vertically and should be held vertically until they are clear of the router before rotating them 90 degrees and placing them on an antistatic mat or placing them in an antistatic bag for storage. See Figure 169 on page 356 and Figure 170 on page 357.

Figure 169: JNP10008-SF SIB

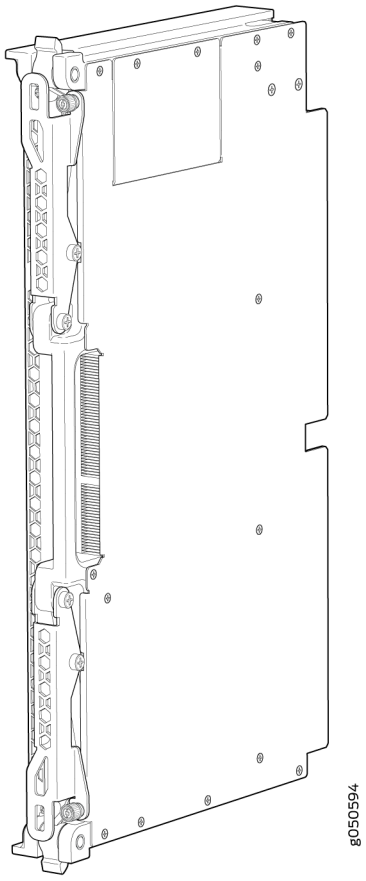
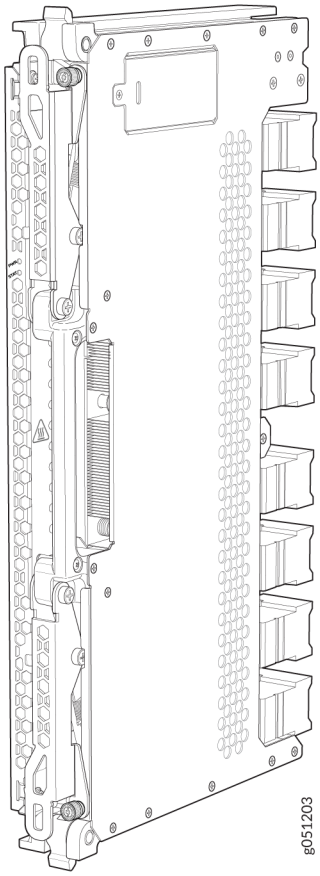


Figure 170: JNP10008-SF3 SIB



The proper method of holding a SIB is to:

1. Hold the SIB by the ejectors while you keep the SIB vertical, and slide the SIB about three-quarters of the way out of the chassis.
2. Place one hand underneath the SIB to support it, and slide it completely out of the chassis.

CAUTION: Never hold the SIB by the connector edge. The connectors are fragile and the SIB will not align and seat properly if the connector is damaged.

CAUTION: Do not stack SIBs on top of one another or on top of any other component.

How to Store Line Cards, RCBs, and SIBs

You must store line cards, RCBs, and SIBs either in the chassis or in a spare shipping container, horizontally and sheet metal side down. Do not stack these units on top of one another or on top of any other component. Place each unit separately in an antistatic bag or on an antistatic mat placed on a flat, stable surface.

> **NOTE**: Because these units are heavy, and because antistatic bags are fragile, inserting the line card into the bag is best done with two people.

To insert a line card, RCB, or SIB into an antistatic bag:

1. Hold the unit horizontally with the faceplate toward you.
2. Slide the opening of the bag over the connector edge.

If you must insert the line card, RCB, or SIB into a bag by yourself:

1. Lay the unit horizontally on an antistatic mat that is on a flat, stable surface with the sheet metal side down.
2. Orient the unit with the faceplate toward you.
3. Carefully insert the connector edge into the opening of the bag and pull the bag toward you to cover the unit.

Install a PTX10008 Switch Interface Board

A PTX10008 router has up to six Switch Interface Boards (SIBs) that are located in the middle of the chassis behind the fan trays. **SIB 0** through **SIB 2** are located behind the left fan tray, and **SIB 3** through **SIB 5** are located behind the right fan tray. You must remove the appropriate fan tray to install a SIB. See "Remove a PTX10008 Fan Tray" on page 298.

Ensure you have the following equipment with you before installing a SIB:

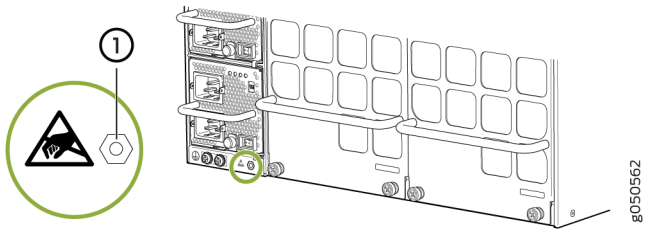
- Antistatic bag or antistatic mat
- Electrostatic discharge (ESD) grounding strap

To install a SIB:

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

protective earthing terminal and below **PSU 5** on the rear of the PTX10008 (see Figure 171 on page 359).

Figure 171: ESD Point on the Rear of the PTX10008

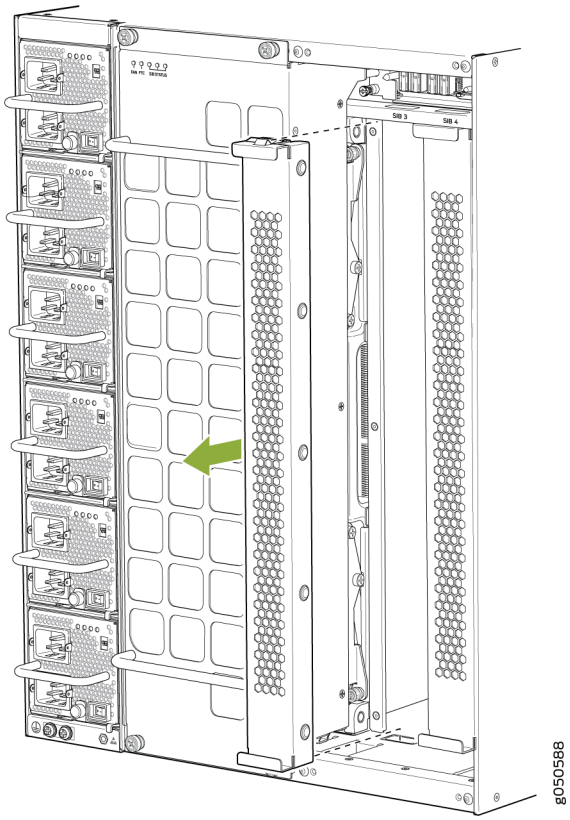


1– ESD point

3. Remove the appropriate fan tray (see "Remove a PTX10008 Fan Tray" on page 298).

4. Either remove the failing SIB (see "Remove a PTX10008 Switch Interface Board" on page 363) or remove the cover by grasping each side of the plate and pulling straight out (see Figure 172 on page 360.

Figure 172: Remove a SIB Cover on a PTX10008

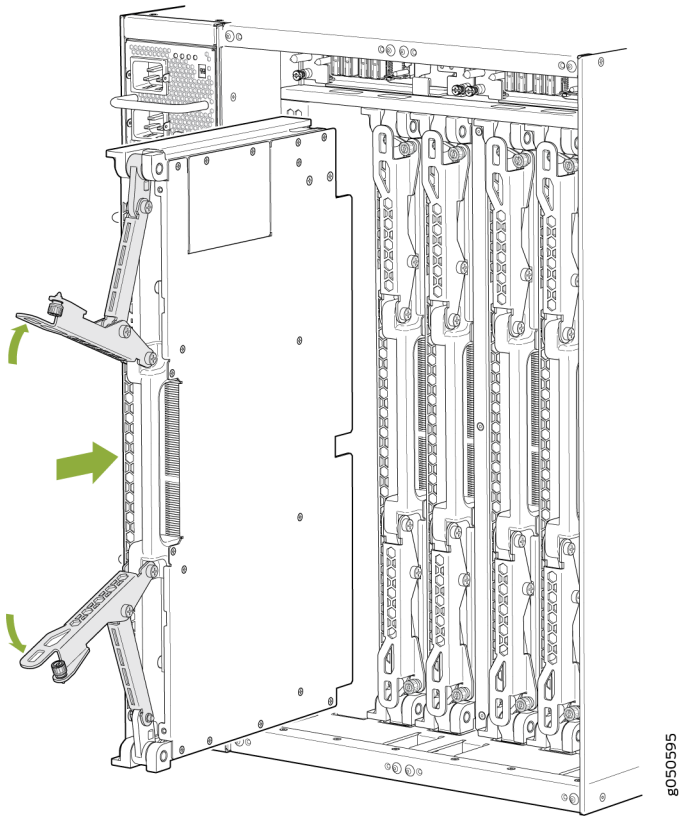


5. Lift the SIB by the handle with one hand and support the lower edge with the other hand.
6. Holding the SIB vertically, slide the SIB into the open slot until the ejector handles engage and start to close.

   If you are installing multiple SIBs, such as during a hardware upgrade, install the SIBs from the lowest slot number **0** to the highest **5**. Do not skip slots.

7. Grasp the two ejector handles and fold them inward until they latch to seat the SIB (see Figure 173 on page 361 for the PTX10008).

Figure 173: Install a PTX10008 SIB



8. Hand-tighten the captive screws.
9. Ensure you have SIBs and covers installed in the appropriate slots for your configuration. See Table 109 on page 361.

Table 109: SIB Slot and Cover Assignments

Configuration	SIBs/Slots	Covers/Slots
PTX10008-BASE	5 SIBs in slots 1, 2, 3, 4, and 5	1 cover in slot 0
PTX10008-BASE3	3 SIBs in slots 1, 3, and 5	3 covers in slots 0, 2, and 4
PTX10008-PREMIUM	6 SIBs in slots 0, 1, 2, 3, 4, and 5	0 covers

Table 109: SIB Slot and Cover Assignments *(Continued)*

Configuration	SIBs/Slots	Covers/Slots
PTX10008-PREM2	4 SIBs in slots 1, 2, 4 and 5	2 covers in slots 0 and 3
PTX10008-PREM3	6 SIBs in slots 0, 1, 2, 3, 4, and 5	0 covers

10. Bring the SIB online using the `request chassis sib slot` *`slot number`* `online` command.

    You can check the status of the SIB using the `show chassis fabric sibs` and the `show chassis fabric plane-location` commands. For example:

```
root> show chassis fabric sibs
Fabric management SIB state:
SIB #0  Online
    FASIC #0 (plane 0) Active
        FPC #0
            PFE #0  : OK
            PFE #1  : OK
            PFE #2  : OK
            PFE #3  : OK
            PFE #4  : OK
            PFE #5  : OK
        FPC #3
            PFE #0  : OK
            PFE #1  : OK
            PFE #2  : OK
            PFE #3  : OK
            PFE #4  : OK
            PFE #5  : OK
    FASIC #1 (plane 1) Active
        FPC #0
            PFE #0  : OK
            PFE #1  : OK
            PFE #2  : OK
            PFE #3  : OK
            PFE #4  : OK
            PFE #5  : OK
        FPC #3
            PFE #0  : OK
```

```
            PFE #1  : OK
            PFE #2  : OK
            PFE #3  : OK
            PFE #4  : OK
            PFE #5  : OK
SIB #1  Empty
SIB #2  Empty
SIB #3  Empty
SIB #4  Empty
SIB #5  Empty


root> show chassis fabric plane-location
------------Fabric Plane Locations-------------
SIB            Planes
 0             0    1
 1             2    3
 2             4    5
 3             6    7
 4             8    9
 5            10   11
```

NOTE: If you completely powered off the SIB using the `set chassis sib power-off slot` *slot* command, you must delete the configuration in order to bring the SIB online. To delete the configuration and bring a replacement SIB online, use the `delete chassis sib power-off slot` *slot number* command.

Remove a PTX10008 Switch Interface Board

A PTX10008 router has up to six Switch Interface Boards (SIBs) that are located in the middle of the chassis behind the fan trays. **SIB 0** through **SIB 2** are located behind the left fan tray and **SIB 3** through **SIB 5** are located behind the right fan tray. You must remove the appropriate fan tray to access the failing SIB. See "Remove a PTX10008 Fan Tray" on page 298.

Ensure you have the following equipment on hand before replacing a SIB:

- Antistatic bag or antistatic mat
- Electrostatic discharge (ESD) grounding strap

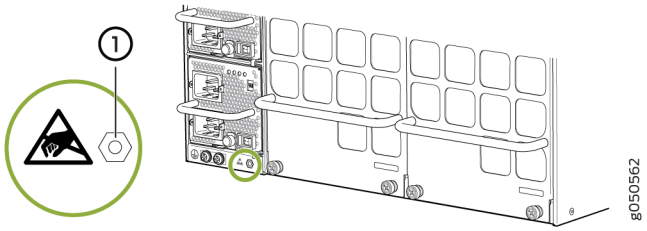
To remove a SIB (see Figure 176 on page 366):

1. Take the SIB offline using the `request chassis sib slot slot number offline` command.

   NOTE: If you suspect the SIB is faulty and want to ensure that packets do not flow through the SIB, power off the SIB instead of taking the SIB offline. To power down the SIB, use the `set chassis sib power-off slot slot number` command. Before you bring a new SIB in that slot online, you must delete the old configuration using the `delete chassis sib power-off slot slot number` command.

2. Place an antistatic bag or an antistatic mat on a flat, stable surface.
3. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to an ESD point on the chassis. There is an ESD point located next to the protective earthing terminal and below **PSU 5** on the rear of the PTX10008 (see Figure 174 on page 364).

Figure 174: ESD Point on Rear of the PTX10008

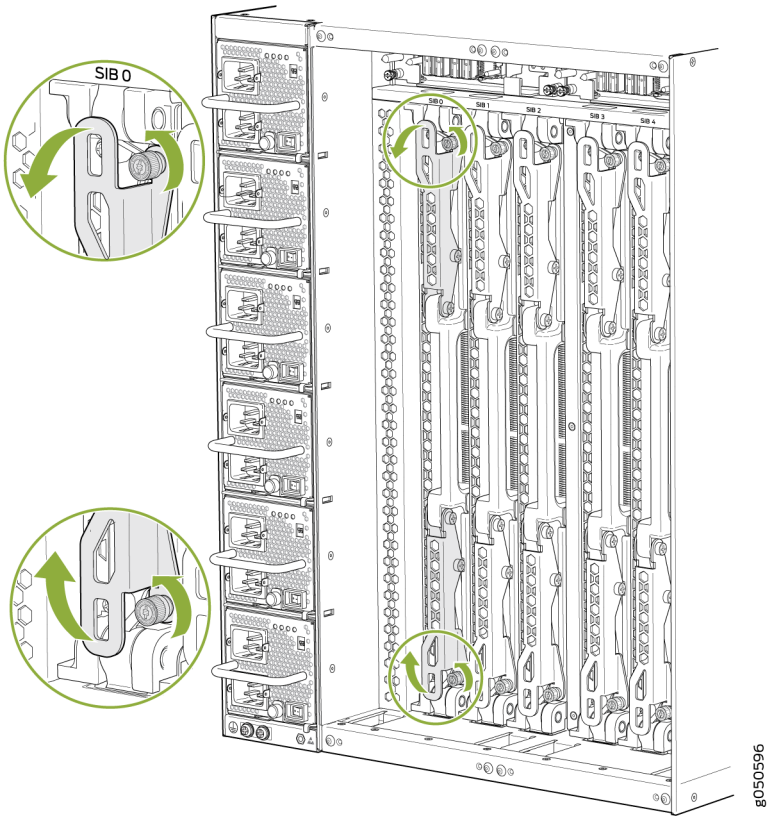


1– ESD point

4. Remove the appropriate fan tray (see "Remove a PTX10008 Fan Tray" on page 298).
5. Using your fingers, loosen the captive screws at the top and bottom of the SIB.

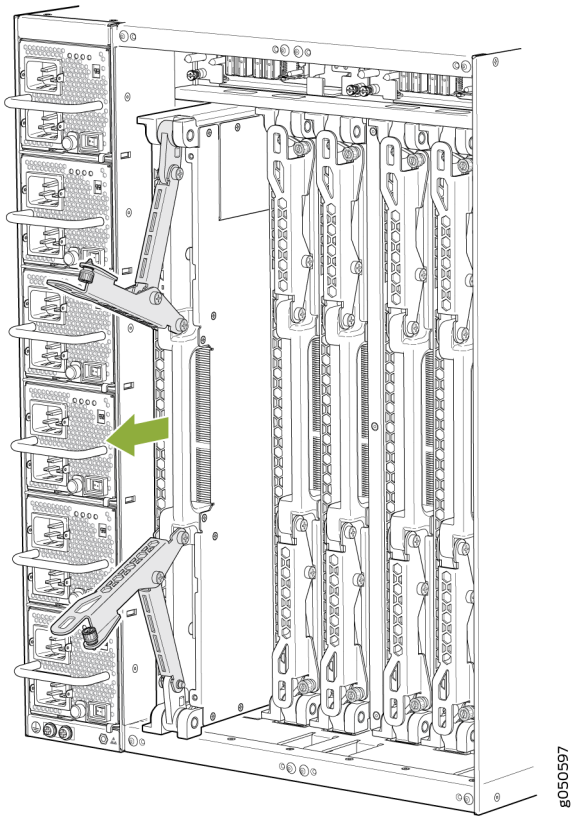
6. Grasp both ejector handles and spread them apart. The SIB slides about a quarter of the way out of the slot. See Figure 175 on page 365.

Figure 175: Loosen the Captive Screws and Spread the Ejector Handles



7. Grasp the ejector handle with one hand and place your other hand under the SIB for support as you slide the SIB out of the slot (see Figure 176 on page 366).

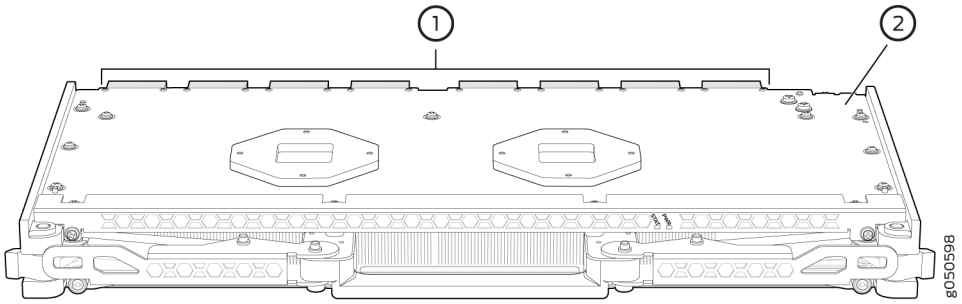
Figure 176: Removing the SIB from a PTX10008 Chassis



8. Support the SIB as you rotate the SIB 90 degrees and place it on the antistatic mat with the printed circuit board (PCB) facing upward. Be careful not to bump or handle the SIB by the connectors. If you do not have an antistatic mat, have another person help you slide the antistatic bag over the SIB before placing it on a stable surface. See Figure 177 on page 367.

CAUTION: Do not stack hardware components on top of one another after you remove them. Place each component on an antistatic mat resting on a stable, flat surface.

Figure 177: Extracted SIB



1– Connectors	2– Printed circuit board

RELATED DOCUMENTATION

PTX10008 Switch Interface Board Description | 95

PTX10008 Switch Interface Board LEDs | 100

Install and Remove PTX10008 Line Card Components

IN THIS SECTION

- Install a PTX10008 Line Card | 368
- Remove a PTX10008 Line Card | 371
- Install the PTX10008 Cable Management System | 373

Line cards on the PTX10008 are field-replaceable units (FRUs) that can be installed in any of the line card slots on the front of the chassis. The line cards are hot-insertable and hot-removable: you can remove and replace them without powering off the router or disrupting router functions.

The line cards fall into two categories: line cards with the JNP10008-SF connector and line cards with the JNP10008-SF3 connector for 14.4 Tbps support. The two types of line cards are designed to only work with the matching type of SIB that has the mating connector. You can't mix the two types of line cards in the same chassis. See Table 110 on page 368.

Table 110: Line Cards and Matching SIBs

Line Cards Using SIB JNP10008-SF	Line Cards Using SIB JNP10008-SF3
1. PTX10K-LC1101 2. PTX10K-LC1102 3. PTX10K-LC1104 4. PTX10K-LC1105 5. QFX10000-60S-6Q	PTX10K-LC1201 PTX10K-LC1202-36MR

You can use the `show chassis hardware models` CLI command to determine which type of SIB is installed.

Install a PTX10008 Line Card

Before you install a line card in the router chassis:

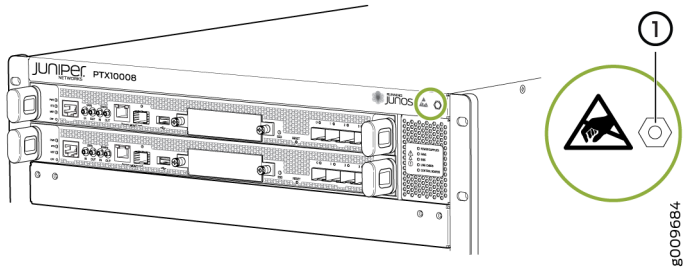
- Ensure you have the right SIBs installed for the new line card. The PTX10K-LC1201 is only compatible with the JNP10008-SF3 SIB; other line cards are compatible with the JNP10008-SF SIB. You cannot mix SIBs in the same chassis. See "PTX10008 Switch Fabric" on page 95.
- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.
- Ensure that you know how to handle and store the line card. See "How to Handle and Store PTX10008 Line Cards, RCBs, and SIBs" on page 354.
- Inspect the connector edge of the line card for physical damage. Installing a damaged line card might damage the router.

- Ensure that the router has sufficient power to power the line card while maintaining its *n*+1 power redundancy. To determine whether the router has enough power available for the line card, use the `show chassis power-budget-statistics` command.
- Ensure that you have the following parts and tools available to install a line card in the router:
  - ESD grounding strap
  - Phillips (+) screwdriver, number 2

To install a line card in the router chassis:

1. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to one of the ESD points on the chassis. The ESD point is located above the status LED panel on the front of the router chassis. See Figure 178 on page 369.

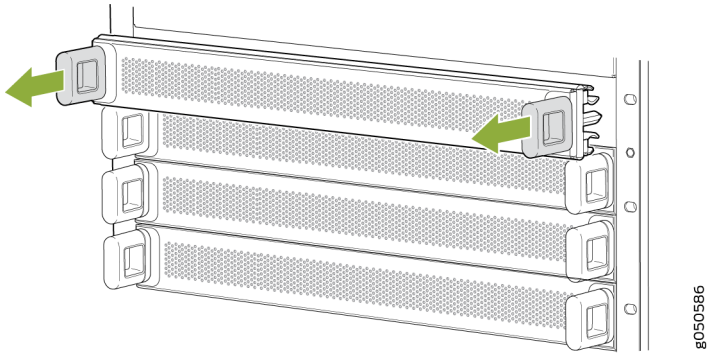
Figure 178: ESD Point on the Front of the PTX10008



1– ESD point

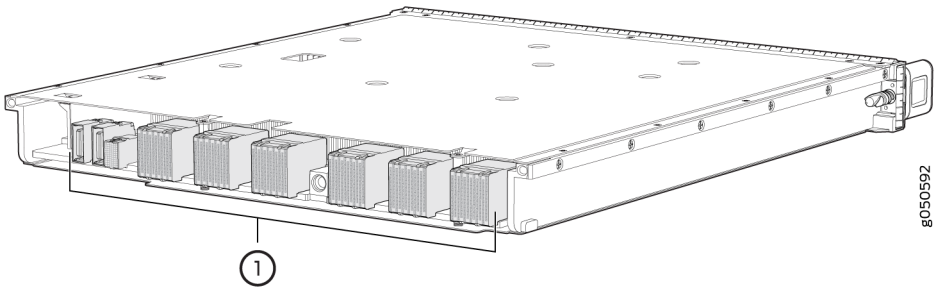
2. Remove the line card cover by grasping the handles and pulling straight out to expose the slot for the line card. See Figure 179 on page 369.

Figure 179: Remove the Cover for a Line Card



CAUTION: Do not lift the line card by holding the edge connectors or the handles on the faceplate. Neither the handles nor the edge connectors can support the weight of the line card. Lifting the line card by the handles or edge connectors might bend them, which would prevent the line cards from being properly seated in the chassis. See Figure 180 on page 370.

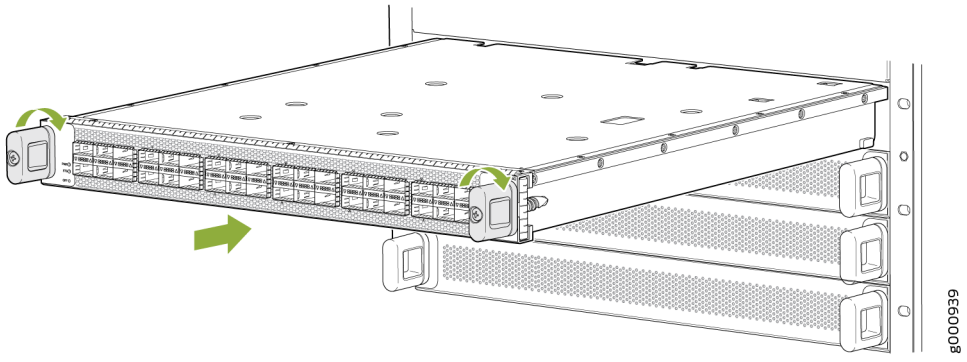
Figure 180: Line Card Connectors



1– Connectors

3. Remove the line card from the antistatic bag and inspect it for any damage before installing it into the chassis.
4. Grasp and lift the line card by the sides.
5. Slide the line card all the way into the slot until the handle holes align. See Figure 181 on page 370.

Figure 181: Insert the Line Card into the Slot and Rotate the Handles



6. Rotate the handles simultaneously into the chassis until the card is fully seated and the handles are vertical.

7. Bring the line card online by using the request-chassis-fpc slot *slot-number* online command. If you are unable to use the command, press the online/offline button labeled OFF by using a non-conductive pin tool, such as a toothpick, for one second, and wait for about 15 seconds until the PWR LED turns on and the STS LED blinks. The online/offline button is recessed below the faceplate directly below the status (STS) LED. Verify the status information by using the show chassis fpc command.

You can install the optional cable management kit after the card is installed.

Remove a PTX10008 Line Card

If you have the optional line-card cable management system, it is not necessary to remove the cable management system before removing the line card.

Before you remove a line card from the router chassis:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.
- If there are any optical cables (including transceivers installed in the line card), remove them before you remove the line card. See "Remove a Transceiver From a PTX0008" on page 379.
- Ensure that you know how to handle and store the line card. See "How to Handle and Store PTX10008 Line Cards, RCBs, and SIBs" on page 354.
- Ensure that you have the following parts and tools available to remove a line card from a PTX10008 chassis:
  - ESD grounding strap
  - An antistatic bag or an antistatic mat

    NOTE: Placing a line card in an electrostatic bag might require a second person to assist with sliding the line card into the bag.

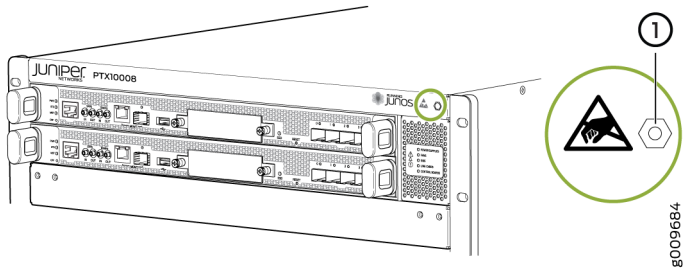
  - Replacement line card or a cover for the empty slot

To remove a line card from a PTX10008 router chassis:

1. Place the antistatic bag or antistatic mat on a flat, stable surface.

2. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to one of the ESD points on the chassis. An ESD point is located above the status LED panel on the front of the router chassis. See Figure 182 on page 372).

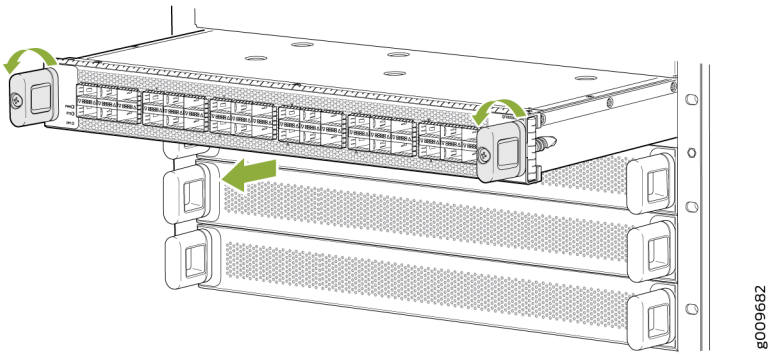
Figure 182: ESD Point on the Front of the PTX10008



1– ESD point

3. Label the cables connected to each port on the line card so you can reconnect the cables to the correct ports.
4. Take the line card offline by using the request chassis fpc slot *slot-number* offline command. If you are unable to use the command, press the online/offline button labeled OFF by using a non-conductive pin tool, such as a toothpick, for one second, and wait for about 5 seconds until the STS LED is off. The online/offline button is recessed below the faceplate directly below the status (STS) LED. Verify the status information by using the show chassis fpc command.
5. Unscrew the line card from the chassis by continually turning the handles to the left until the line card is fully unseated. See Figure 183 on page 372.

Figure 183: Remove a PTX10008 Line Card



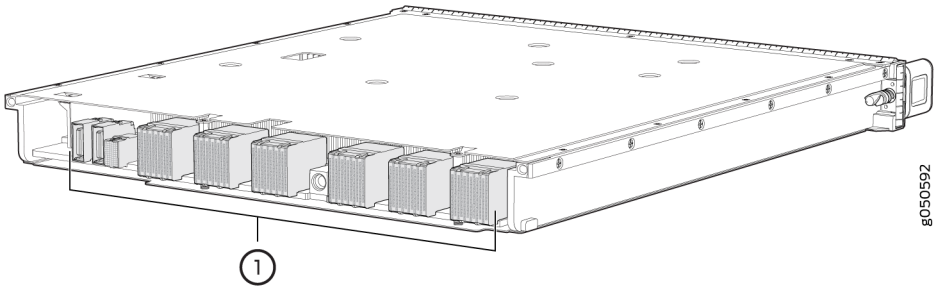
6. Using the handles, slide the line card halfway out of the chassis.

CAUTION: Do not stack line cards on top of one another or on top of any other component. Place each line card separately in the antistatic bag or on the antistatic mat placed on a flat, stable surface.

CAUTION: Each PTX10008 line card weighs between 20.9 lb (9.5 kg) and 27.3 lb (12.4 kg). Be prepared to support the full weight as you slide the line card out of the chassis.

7. Grasp both sides of line card at midpoint and remove the line card from the chassis. Either have someone assist you in putting the line card into the antistatic bag or rest the card on the antistatic mat. Take care not to bump or store the line cards on the connectors. See Figure 184 on page 373.

Figure 184: PTX10008 Line Card Connectors



1– Connectors

8. If you are not installing a line card in the emptied line-card slot within a short time, install a cover over the slot. Do this to protect the interior of the chassis from dust or other foreign substances and to ensure that the airflow inside the chassis is not disrupted.

Install the PTX10008 Cable Management System

The PTX10008 cable management system is an optional, orderable kit (JLC-CBL-MGMT-KIT) that organizes and protects optical cabling attached to the line cards. After a line card is installed, you can still remove the line card without needing to remove the cable management system.

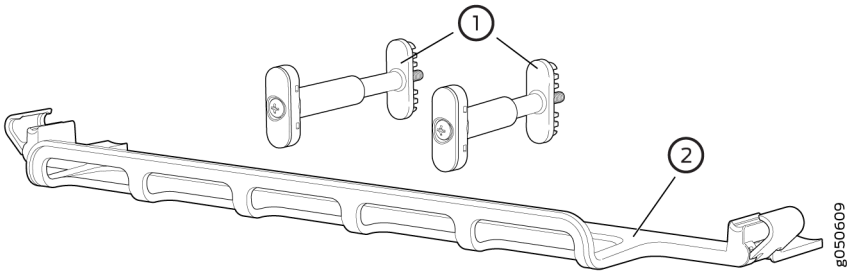
Ensure that you have the following parts and tools available to install the PTX10008 cable management system on a line card:

- Phillips (+) screwdriver, number 2

To install the cable management system (see Figure 185 on page 374):

1. Open the shipping carton for cable management system and check that you have:
   - Two handle extensions
   - One cable tray

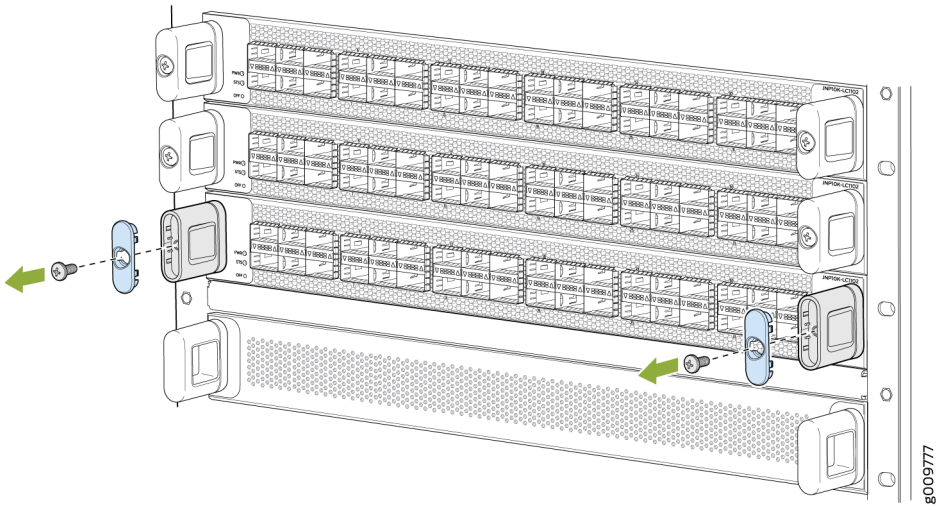
Figure 185: Cable Management System Components



1– Handle extensions	2– Cable tray

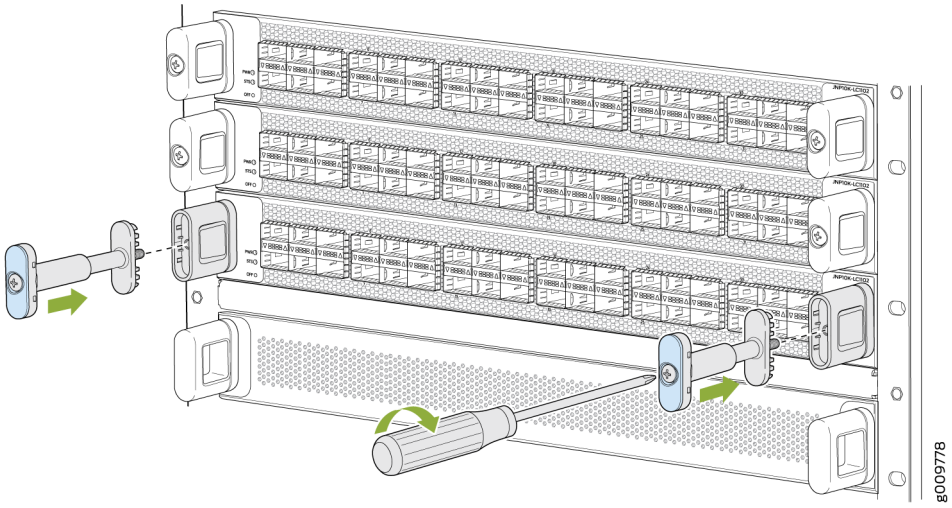
2. Use the Phillips screwdriver to loosen and remove the screws on the two line-card handles (see Figure 186 on page 374).

Figure 186: Remove the Handle Screws



3. Replace the blue cap on the line-card handle with the two handle extensions (see Figure 187 on page 375).

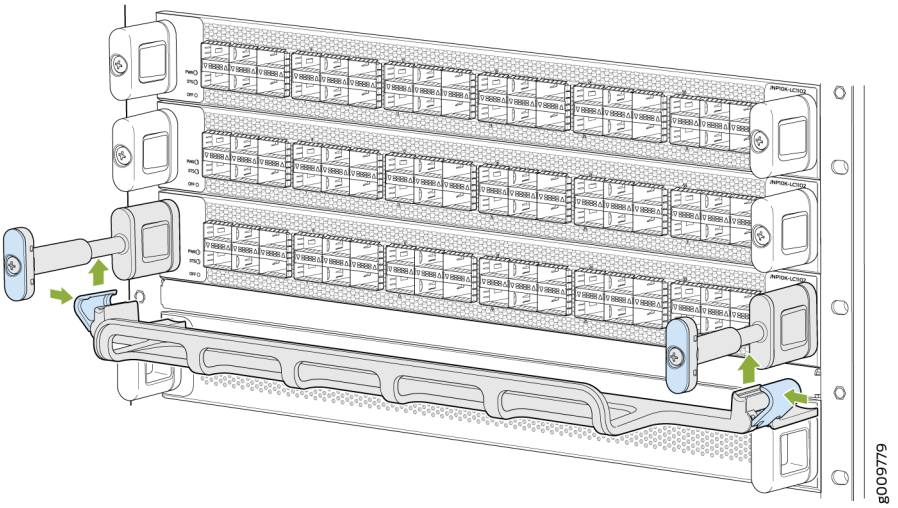
Figure 187: Attach the Handle Extensions



4. Tighten the screws into the handle extensions.
5. Snap open the blue clips on the ends of the cable tray with your hands.
6. Place the cable tray across the front of the line card so that the two ends of the cable tray are under the handle extensions.

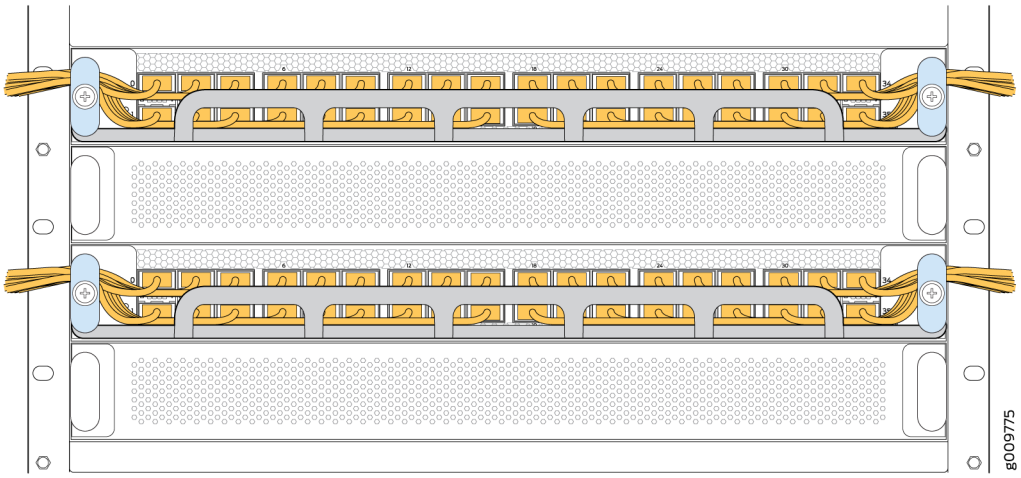
7. Snap to close the blue clips of the cable tray around the handle extensions (see Figure 188 on page 376).

Figure 188: Add the Cable Tray



8. Drape and tie the optical cables to the side (see Figure 189 on page 376). Another option is to drape some of the cables under the handle extension and some cables over the handle extension.

Figure 189: Completed Cable Management System



RELATED DOCUMENTATION

PTX10008 Optional Equipment | 41

How to Handle and Store PTX10008 Line Cards, RCBs, and SIBs | 354

PTX10008 Transceiver and Fiber Optic Cable Installation and Removal

IN THIS SECTION

- Install a PTX10008 Transceiver | 377
- Remove a Transceiver From a PTX0008 | 379
- Connect a Fiber-Optic Cable from a Transceiver on a PTX10008 Router | 381
- Disconnect a Fiber-Optic Cable from a Transceiver on a PTX10008 Router | 382
- Fiber-Optic Cable Maintenance for a PTX10008 Router | 383

The transceivers for the PTX10008 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 PTX10008 router read the following sections.

Install a PTX10008 Transceiver

Before you begin installing a transceiver in a PTX10008 line card or RCB, 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.

To install a transceiver in the PTX10008 line card or RCB:

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

1. Remove the transceiver from its bag.
2. Check to see whether the transceiver is covered by a rubber safety cap. If it is not, cover the transceiver with a rubber safety cap.

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

3. 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.
4. Using both hands, carefully place the transceiver in the empty port. The connectors must face the device 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. On PTX10008 line cards, the ports are designed belly-to-belly, which requires you to turn the transceiver over on the bottom port row. See Figure 190 on page 379 and Figure 191 on page 379 for the correct orientation for your device.

5. Slide the transceiver in gently until it is fully seated.
6. Remove the rubber safety cap when you are ready to connect the cable to the transceiver.

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

Figure 190: Install an SFP Transceiver

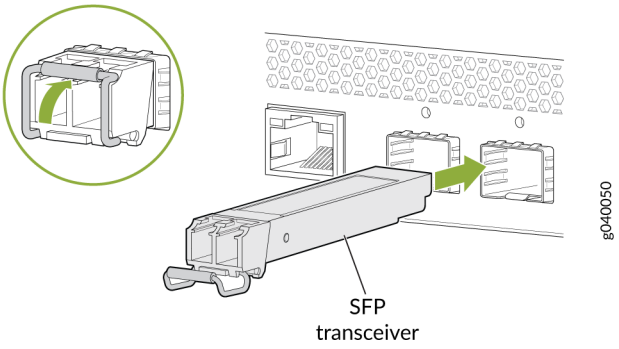
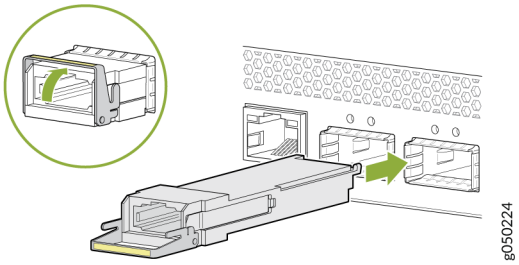


Figure 191: Install a QSFP+, QSFP28 , or QSFP56-DD Transceiver



Remove a Transceiver From a PTX0008

Before you begin removing a transceiver from the PTX10008 line card or RCB, ensure that you have taken the necessary precautions for safe handling of lasers (see *Laser and LED Safety Guidelines and Warnings*).

Ensure that you have the following parts and tools available:

- Antistatic bag or an antistatic mat

- Rubber safety caps to cover the transceiver and fiber-optic cable connector
- Dust cover to cover the port

To remove a transceiver from the PTX10008 line card or RCB:

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 prevents accidental exposure to laser light.



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.

4. Remove the cable connected to the transceiver (see "Disconnect a Fiber-Optic Cable from a Transceiver on a PTX10008 Router" on page 382). 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. Using your fingers, pull the ejector lever away from the transceiver to unlock the transceiver.



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

6. 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 electrostatic discharge (ESD) damage to the transceiver, do not touch the connector pins at the end of the transceiver.

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

Connect a Fiber-Optic Cable from a Transceiver on a PTX10008 Router

Before you connect a fiber-optic cable to an optical transceiver installed in the PTX10008 router, ensure that you have taken the necessary precautions for safe handling of lasers (see *Laser and LED Safety Guidelines and Warnings*).

To connect a fiber-optic cable to an optical transceiver installed in the PTX10008 router:

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

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

CAUTION: Do not bend fiber-optic cables beyond their minimum bend radius. 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.

Disconnect a Fiber-Optic Cable from a Transceiver on a PTX10008 Router

Before you disconnect a fiber-optic cable from an optical transceiver installed in the PTX10008 router, ensure that you have taken the necessary precautions for safe handling of lasers (see *Laser and LED Safety Guidelines and Warnings*).

Ensure that you have the following parts and tools available:

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

To disconnect a fiber-optic cable from an optical transceiver installed in the PTX10008 Router:

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.

   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.

Fiber-Optic Cable Maintenance for a PTX10008 Router

To maintain fiber-optic cables in the PTX10008 router:

- When you unplug a fiber-optic cable from a transceiver, place rubber safety caps over the transceiver and on the end of the cable.
- Anchor fiber-optic cable 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 is not supporting 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.

RELATED DOCUMENTATION

PTX10008 Transceiver and Cable Specifications | 222

Remove the PTX10008 Router

IN THIS SECTION

- Power Off a PTX10008 | 384
- Remove a PTX10008 from a Four-Post Rack Using a Mechanical Lift | 387
- Remove a PTX10008 Manually from a Four-Post Rack | 389

To power off and remove a PTX10008 router, read the following sections:

Power Off a PTX10008

Before you power off a PTX10008 router:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.
- Ensure that you do not need to forward traffic through the router.
- Ensure that you have the following parts and tools available to power off the router:
  - 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 on one of the RCBs

To power off a PTX10008 router:

1. Connect to the router using one of the following methods:
   - Connect a management device to the console (**CON**) port on a RCB by following the instructions in "Connect a PTX10008 Router to a Management Console" on page 274.
   - Connect a management device to one of the two management (**MGMT**) ports on the control board by following the instructions in "Connect a PTX10008 Router to a Network for Out-of-Band Management" on page 273.

2. Shut down Junos OS from the external management device. On standard Junos OS systems, you can use the `request vmhost halt` operational mode CLI command. On Junos OS Evolved systems use the `request system shutdown power-off` operational mode CLI command. These command shuts down the router gracefully and preserves system state information. A message appears on the console, confirming that the operating system has halted.

   You see the following output (or something similar, depending on the hardware being shut down) after entering the command:

```
Shutdown NOW!
System going down IMMEDIATELY


Terminated
Poweroff for hypervisor to respawn
Oct 25 10:35:05 init: event-processing (PID 1114) exited with status=1
Oct 25 10:35:05 init: packet-forwarding-engine (PID 1424) exited with status=8
.
Waiting (max 60 seconds) for system process `vnlru_mem' to stop...done
Waiting (max 60 seconds) for system process `vnlru' to stop...done
Waiting (max 60 seconds) for system process `bufdaemon' to stop...done
Waiting (max 60 seconds) for system process `syncer' to stop...
Syncing disks, vnodes remaining...0 0 0 0 done

syncing disks... All buffers synced.
Uptime: 11h0m30s
Normal shutdown (no dump device defined)
unloading fpga driver
unloading fx-scpld
Powering system off using ACPI
kvm: 28646: cpu0 disabled perfctr wrmsr: 0xc1 data 0xabcd
pci-stub 0000:01:00.2: transaction is not cleared; proceeding with reset anyway
pci-stub 0000:01:00.1: transaction is not cleared; proceeding with reset anyway
hub 1-1:1.0: over-current change on port 1
Stopping crond: [  OK  ]
Stopping libvirtd daemon: [  OK  ]
Shutting down ntpd: [  OK  ]
Shutting down system logger: [  OK  ]
Shutting down sntpc: [  OK  ]
Stopping sshd: [  OK  ]
Stopping vehostd: [  OK  ]
Stopping watchdog: [  OK  ]
Stopping xinetd: [  OK  ]
```

```
Sending all processes the TERM signal... [  OK  ]
Sending all processes the KILL signal... [  OK  ]
Saving random seed:  [  OK  ]
Syncing hardware clock to system time [  OK  ]
Turning off swap:  [  OK  ]
Unmounting file systems:  [  OK  ]
init: Re-executing /sbin/init
Halting system...
System halted.
```

CAUTION: The final output of any version of the `request vmhost halt` command is the `"The operating system has halted."` message. Wait at least 60 seconds after first seeing this message before following the instructions in Step 4 and Step 5 to power off the router.

3. Wrap and fasten one end of the ESD grounding strap around your bare wrist and connect the other end of the strap to one of the ESD points on the chassis. One ESD point is located above the status LED panel on the front of the router chassis, and the other ESD point is located in the rear below the power supplies.
4. Disconnect power to the router by performing one of the following tasks:
   - AC power supply—Set the enable router switch to the off (**O**) position and gently pull out the coupler for the power cord from the faceplate.
   - DC power supply—Switch the circuit breaker on the panel board that services the DC circuit to the off position.
5. Remove the power source cable from the power supply faceplate:
   - AC power supply—Remove the power cord from the power supply faceplate by detaching the power cord retainer and gently pulling out the plug end of the power cord connected to the power supply faceplate.
   - DC power supply—Loosen the thumbscrews securing the DC power connector on the power source cables. Remove the power source cables from the power supply.
6. Remove any remaining cables and optics before removing it from the rack.

SEE ALSO

Connect AC Power to a PTX10008 | 271

Connect DC Power to a PTX10008 | 271

Remove a PTX10008 from a Four-Post Rack Using a Mechanical Lift

Before you remove the router using a lift:

- Ensure that the rack is stable and secured to the building.
- Ensure there is enough space to place the removed router in its new location and along the path to the new location. See "PTX10008 Clearance Requirements for Airflow and Hardware Maintenance" on page 185.
- Review *General Safety Guidelines and Warnings*.
- Review the chassis lifting guidelines described in "PTX10008 Chassis Lifting Guidelines" on page 427.
- Ensure that the router is safely powered off (see "Power Off a PTX10008" on page 384).
- Ensure that you have the following parts and tools with you to remove the router:
  - A mechanical lift rated for 500 lbs (226.8 kg)
  - A Phillips (+) screwdriver, number 2 or number 3, depending on the size of your rack mount screws



CAUTION: When removing more than one router chassis from a rack, remove the routers in order from top to bottom.

The router chassis weighs approximately 145 lb (66 kg) with only the fan tray controllers installed. Because of the router's size and weight, we strongly recommend that you use a mechanical lift to remove the PTX10008. Lifting the chassis and removing it from a rack or cabinet requires at least three people.

Make sure the chassis is empty (contains only the fan tray controllers) before you lift it.

NOTE: For instructions on installing a router without using a mechanical lift, see "Remove a PTX10008 Manually from a Four-Post Rack" on page 389.

To remove the router using a mechanical lift (see Figure 192 on page 389):

1. Remove all line cards, RCBs, power supplies, fan trays, SIBs, and optics before attempting to move the router chassis.
   - "Remove a PTX10008 Line Card" on page 371
   - "Remove a PTX10008 Routing and Control Board" on page 293

- "Remove a JNP10K-PWR-AC Power Supply" on page 315
- "Remove a JNP10K-PWR-DC Power Supply" on page 336
- "Remove a JNP10K-PWR-AC2 Power Supply" on page 323
- "Remove a JNP10K-PWR-DC2 Power Supply" on page 351
- "Remove a PTX10008 Fan Tray" on page 298
- "Remove a PTX10008 Switch Interface Board" on page 363

Ensure that all of the removed components are stored in antistatic bags.

2. Use the appropriate Phillips (+) screwdriver to remove the screws that attach the chassis to the rack.
3. Move the lift to the rack and position it so that its platform is centered about 0.5 in. (1.27 cm) below the bottom of the router chassis and as close to it as possible.
4. Carefully slide the router from the mounting tray or the mounting brackets attached to the rack onto the lift.
5. Move the lift away from the rack and lower the platform on the lift.
6. Use the lift to transport the router to its new location.

After moving the router to its new location, install the components in the chassis or store the components in antistatic bags.

Figure 192: Move the PTX10008 Using a Mechanical Lift



SEE ALSO

Power Off a PTX10008

Remove a PTX10008 Manually from a Four-Post Rack

Before you manually remove the router from a rack:

- Ensure that the rack is stable and secured to the building.
- Ensure there is enough space to place the removed router in its new location and along the path to the new location. See "PTX10008 Clearance Requirements for Airflow and Hardware Maintenance" on page 185.
- Review *General Safety Guidelines and Warnings*.
- Review the chassis lifting guidelines described in "PTX10008 Chassis Lifting Guidelines" on page 427.
- Ensure that the router is safely powered off (see "Power Off a PTX10008" on page 384).
- Ensure you have a Phillips (+) screwdriver, number 2 or number 3, depending on the size of your rack mount screws.

If you cannot use a mechanical lift to remove the router (the preferred method), you can remove it manually.



CAUTION: The chassis weighs approximately 145 lb (66 kg) with only the fan tray controllers installed. Because of the router's size and weight, we strongly recommend that you use a mechanical lift to remove the PTX10008. Lifting the chassis and mounting it in a rack or cabinet requires at least three people.

Make sure the chassis is empty (contains only the backplane) before you lift it.



CAUTION: When removing more than one router chassis from a rack, remove the routers in order from top to bottom.

To manually remove a PTX10008 from a rack:

1. Remove all line cards, RCBs, power supplies, fan trays, SIBs, and optics before attempting to move the router chassis.
   - "Remove a PTX10008 Line Card" on page 371
   - "Remove a PTX10008 Routing and Control Board" on page 293
   - "Remove a JNP10K-PWR-AC Power Supply" on page 315
   - "Remove a JNP10K-PWR-DC Power Supply" on page 336
   - "Remove a JNP10K-PWR-AC2 Power Supply" on page 323
   - "Remove a JNP10K-PWR-DC2 Power Supply" on page 351
   - "Remove a PTX10008 Fan Tray" on page 298

- "Remove a PTX10008 Switch Interface Board" on page 363

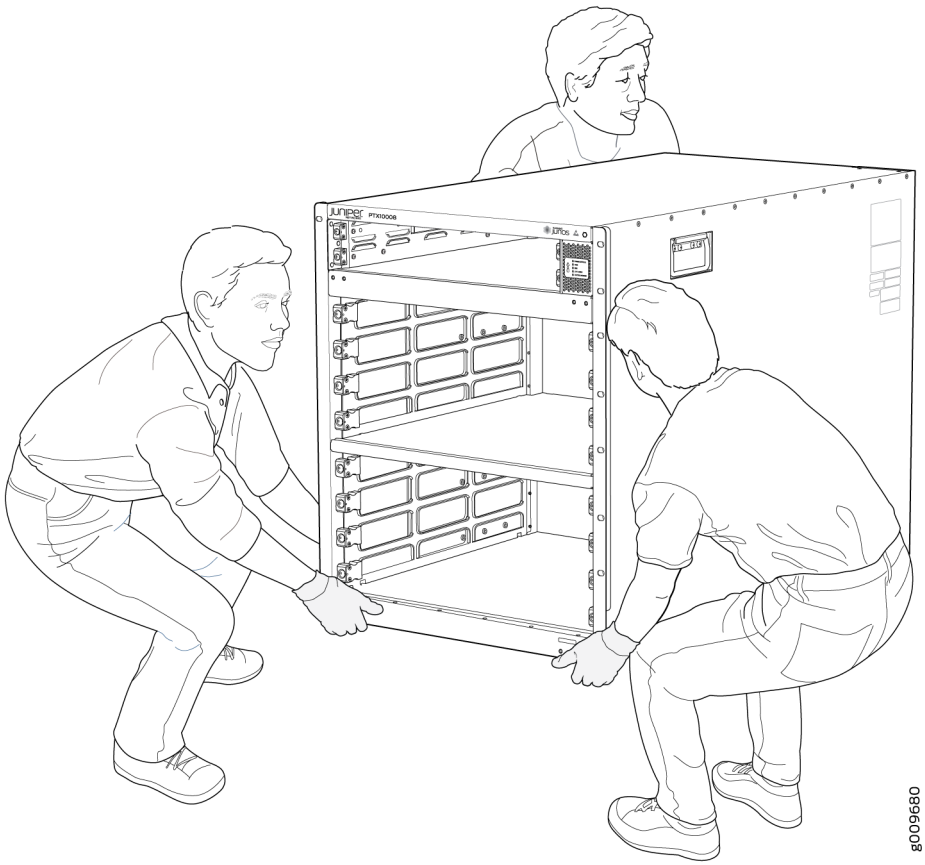
Ensure that all of the removed components are stored in antistatic bags.

2. Use the appropriate Phillips (+) screwdriver to remove the screws that attach the chassis to the rack.

> **WARNING**: To prevent injury, keep your back straight and lift with your legs, not your back. Do not twist your body as you lift. Balance the load evenly and be sure that your footing is firm.

3. Position one person on each side and another in the rear of the chassis. There are two handles on the side, but these handles are only meant to help guide the empty chassis out of the rack.
4. On each side, hold the bottom of the chassis and carefully lift it up from the mounting tray or mounting brackets.
5. Carefully lift it out of the rack. If you have a pallet jack, move the router onto the pallet jack. See Figure 193 on page 391.

Figure 193: Lift the PTX10008 Without Using a Mechanical Lift



6. Carefully move the chassis to its new location.

   After moving the router to its new location, install the components in the chassis or store the components in antistatic bags.

SEE ALSO

- Remove a PTX10008 from a Four-Post Rack Using a Mechanical Lift | **387**
- Connect the PTX10008 Router to Earth Ground | **268**
- Connect AC Power to a PTX10008 | **271**
- Connect DC Power to a PTX10008 | **271**

6

CHAPTER

Troubleshoot Hardware

Alarm Messages | 394

Alarm Messages

IN THIS SECTION

- Alarms – A Glossary | 394
- Interface Alarm Messages | 395

The following sections contain PTX10008 and PTX10016 alarm information.

Alarms – A Glossary

The PTX10008 and PTX10016 routers support different alarm types and severity levels. Table 111 on page 394 provides a list of alarm terms and definitions that may help you in monitoring the device.

Table 111: Alarm Terms and Definitions

Term	Definition
Alarm	Signal alerting you to conditions that might prevent normal operation. On the device, alarm indicators might include the LCD panel and LEDs on the device. The LCD panel (if present on the device) displays the chassis alarm message count. Blinking amber LEDs indicate yellow alarm conditions for chassis components.
Alarm condition	Failure event that triggers an alarm.

Table 111: Alarm Terms and Definitions *(Continued)*

Term	Definition

Alarm severity levels	Seriousness of the alarm. The level of severity can be either major (red) or minor (yellow).
	• Major (red)—Indicates a critical situation on the device that has resulted from one of the following conditions. A red alarm condition requires immediate action.
	  • One or more hardware components have failed.
	  • One or more hardware components have exceeded temperature thresholds.
	  • An alarm condition configured on an interface has triggered a critical warning.
	• Minor (yellow or amber)—Indicates a noncritical condition on the device that, if left unchecked, might cause an interruption in service or a degradation in performance. A yellow alarm condition requires monitoring or maintenance. For example, a missing rescue configuration generates a yellow system alarm.

Alarm types	Alarms include the following types: • Chassis alarm—Predefined alarm triggered by a physical condition on the device such as a power supply failure or excessive component temperature. • Interface alarm—Alarm you configure to alert you when an interface link is down. Applies to `ethernet`, `fibre-channel`, and `management-ethernet` interfaces. You can configure a red (major) or yellow (minor) alarm for the link-down condition, or have the condition ignored. • System alarm—Predefined alarm that might be triggered by a missing rescue configuration, failure to install a license for a licensed software feature, or high disk usage.

Interface Alarm Messages

Interface alarms are alarms that you configure to alert you when an interface is down.

To configure an interface link-down condition to trigger a red or yellow alarm, or to configure the link-down condition to be ignored, use the `alarm` statement at the [`edit chassis`] hierarchy level. You can specify the `ethernet`, `fibre-channel`, or `management-ethernet` interface type.

By default, major alarms are configured for interface link-down conditions on the control plane and management network interfaces. The link-down alarms indicate that connectivity to the control plane

network is down. You can configure these alarms to be ignored using the `alarm` statement at the [`edit chassis`] hierarchy level.

RELATED DOCUMENTATION

- *show chassis alarms*
- *show system alarms*

CHAPTER 7

Contact Customer Support and Return the Chassis or Components

Contact Customer Support | 398

Return Procedures for the PTX10008 Chassis or Components | 399

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 Procedures for the PTX10008 Chassis or Components

IN THIS SECTION

- Return a PTX10008 Router or Component for Repair or Replacement | 399
- Locate the Serial Number on a PTX10008 Router or Component | 400
- Contact Customer Support to Obtain a Return Materials Authorization for a PTX10008 Router or Component | 412
- How to Pack a PTX10008 or Component for Shipping | 413

To return a PTX10008 router or component, read the following sections:

Return a PTX10008 Router or Component for Repair or Replacement

If you need to return a PTX10008 router, or a 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 PTX10008 Router or Component" on page 400.
2. Obtain a Return Materials Authorization (RMA) number from the Juniper Technical Assistance Center (JTAC), as described in "Contact Customer Support to Obtain a Return Materials Authorization for a PTX10008 Router or Component" on page 412.

   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 PTX10008 or Component for Shipping" on page 413.

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

SEE ALSO

PTX10008 Hardware Overview | 2

How to Pack a PTX10008 or Component for Shipping | 413

Locate the Serial Number on a PTX10008 Router or Component

IN THIS SECTION

- List the PTX10008 Chassis and Component Details Using the CLI | 401
- Locate the Chassis Serial Number ID Label on a PTX10008 | 405
- Locate the Serial Number ID Labels on PTX10008 Power Supplies | 405
- Locate the Serial Number ID Labels on PTX10008 Fan Trays and Fan Tray Controllers | 408
- Locate the Serial Number ID Labels on PTX10008 Routing and Control Boards | 410
- Locate the Serial Number ID Labels on a PTX10008 Line Card | 411
- Locate the Serial Number ID Labels on a PTX10008 Switch Interface Board (SIB) | 411
- Locate the Serial Number ID Label on a PTX10008 SATA SSD | 412

If you are returning a router or component to Juniper Networks for repair or replacement, you must locate the serial number of the router or component. 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 Materials Authorization for a PTX10008 Router or Component" on page 412.

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

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

List the PTX10008 Chassis and Component Details Using the CLI

To list the PTX10008 chassis and the components and their serial numbers, use the `show chassis hardware` CLI operational mode command. See the following examples for different types of configurations and the related output.

1. This example shows a PTX10008 with a JNP10008-SF fabric running standard Junos OS.

```
user@device> show chassis hardware

Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                DE519             JNP10008 [PTX10008]
Midplane         REV 27   750-071974   ACPD6951          Midplane 8
Routing Engine 1          BUILTIN      BUILTIN           RE-PTX-2X00x4
CB 1             REV 31   750-052688   ACPB6939          Control Board
FPC 0            REV 35   750-071976   ACNS6795          LC1101 - 30C / 30Q / 96X
  CPU                     BUILTIN      BUILTIN           FPC CPU
  PIC 0                   BUILTIN      BUILTIN           30x100GE/30x40GE/96x10GE
    Xcvr 0       REV 01   740-061405   1ACQ103601D       QSFP-100GBASE-SR4
FPC 1            REV 35   750-071976   ACPD2139          LC1101 - 30C / 30Q / 96X
  CPU                     BUILTIN      BUILTIN           FPC CPU
  PIC 0                   BUILTIN      BUILTIN           30x100GE/30x40GE/96x10GE
FPC 2            REV 37   750-071976   ACNP1701          LC1101 - 30C / 30Q / 96X
  CPU                     BUILTIN      BUILTIN           FPC CPU
  PIC 0                   BUILTIN      BUILTIN           30x100GE/30x40GE/96x10GE
    Xcvr 0       REV 01   740-061405   1ACQ12110AU       QSFP-100GBASE-SR4
    Xcvr 1       REV 01   740-061405   1ACQ12110NW       QSFP-100GBASE-SR4
    Xcvr 2       REV 01   740-061405   1ACQ12110NV       QSFP-100GBASE-SR4
    Xcvr 3       REV 01   740-061405   1ACQ12110AE       QSFP-100GBASE-SR4
    Xcvr 4       REV 01   740-061405   1ACQ12110HA       QSFP-100GBASE-SR4
    Xcvr 5       REV 01   740-061405   1ACQ12110NY       QSFP-100GBASE-SR4
    Xcvr 6       REV 01   740-061405   1ACQ12110GX       QSFP-100GBASE-SR4
    Xcvr 7       REV 01   740-061405   1ACQ121107B       QSFP-100GBASE-SR4
    Xcvr 8       REV 01   740-061405   1ACQ12110AD       QSFP-100GBASE-SR4
    Xcvr 9       REV 01   740-061405   1ACQ12110NC       QSFP-100GBASE-SR4
FPC 3            REV 32   750-071976   ACNS7312          LC1101 - 30C / 30Q / 96X
  CPU                     BUILTIN      BUILTIN           FPC CPU
  PIC 0                   BUILTIN      BUILTIN           30x100GE/30x40GE/96x10GE
FPC 4            REV 35   750-071976   ACPH7094          LC1101 - 30C / 30Q / 96X
  CPU                     BUILTIN      BUILTIN           FPC CPU
  PIC 0                   BUILTIN      BUILTIN           30x100GE/30x40GE/96x10GE
    Xcvr 0       REV 01   740-054053   QF3208KQ          QSFP+-4X10G-SR
```

```
    Xcvr 1       REV 01   740-054053   QF4605YH          QSFP+-4X10G-SR
    Xcvr 2       REV 01   740-054053   QG1500SJ          QSFP+-4X10G-SR
    Xcvr 3       REV 01   740-054053   QF4605YM          QSFP+-4X10G-SR
FPC 5            REV 35   750-071976   ACPD3055          LC1101 - 30C / 30Q / 96X
  CPU                     BUILTIN      BUILTIN           FPC CPU
  PIC 0                   BUILTIN      BUILTIN           30x100GE/30x40GE/96x10GE
FPC 6            REV 35   750-071976   ACPD1831          LC1101 - 30C / 30Q / 96X
  CPU                     BUILTIN      BUILTIN           FPC CPU
  PIC 0                   BUILTIN      BUILTIN           30x100GE/30x40GE/96x10GE
FPC 7            REV 35   750-071976   ACPD2168          LC1101 - 30C / 30Q / 96X
  CPU                     BUILTIN      BUILTIN           FPC CPU
  PIC 0                   BUILTIN      BUILTIN           30x100GE/30x40GE/96x10GE
    Xcvr 28      REV 01   740-058734   1ECQ113834H       QSFP-100GBASE-SR4
    Xcvr 29      REV 01   740-032986   QF4303FE          QSFP+-40G-SR4
FPD Board        REV 07   711-054687   ACPC7192          Front Panel Display
Power Supply 0   REV 01   740-073147   1EDM6130223       Power Supply DC
Power Supply 1   REV 01   740-073147   1EDM6130145       Power Supply DC
Power Supply 2   REV 01   740-073147   1EDM6130205       Power Supply DC
Power Supply 3   REV 01   740-073147   1EDM6130288       Power Supply DC
Power Supply 4   REV 01   740-073147   1EDM6171060       Power Supply DC
Power Supply 5   REV 01   740-073147   1EDM6130352       Power Supply DC
FTC 0            REV 14   750-072657   ACNZ3483          Fan Controller 8
FTC 1            REV 14   750-072657   ACPE3951          Fan Controller 8
Fan Tray 0       REV 09   760-072656   ACNX9388          Fan Tray 8
Fan Tray 1       REV 09   760-072656   ACNV1977          Fan Tray 8
SIB 0            REV 24   750-072655   ACNZ2090          Switch Fabric 8
SIB 1            REV 24   750-072655   ACNZ2155          Switch Fabric 8
SIB 2            REV 24   750-072655   ACNY6520          Switch Fabric 8
SIB 3            REV 24   750-072655   ACNX7482          Switch Fabric 8
SIB 4            REV 24   750-072655   ACNZ2246          Switch Fabric 8
SIB 5            REV 24   750-072655   ACNZ2234          Switch Fabric 8
```

2. This example shows a PTX10008 with a JNP10008-SF3 fabric running Junos OS Evolved.

```
user@device> show chassis hardware
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                               JN001             JNP10008 [PTX10008]
Midplane 0       REV 06   750-054097   ACAM4922          Midplane 8
PSM 0            Rev 02   740-069994   1F219110277       JNP10K 5500W AC/HVDC Power Supply
Unit
PSM 1            Rev 03   740-069994   1F269200064       JNP10K 5500W AC/HVDC Power Supply
```

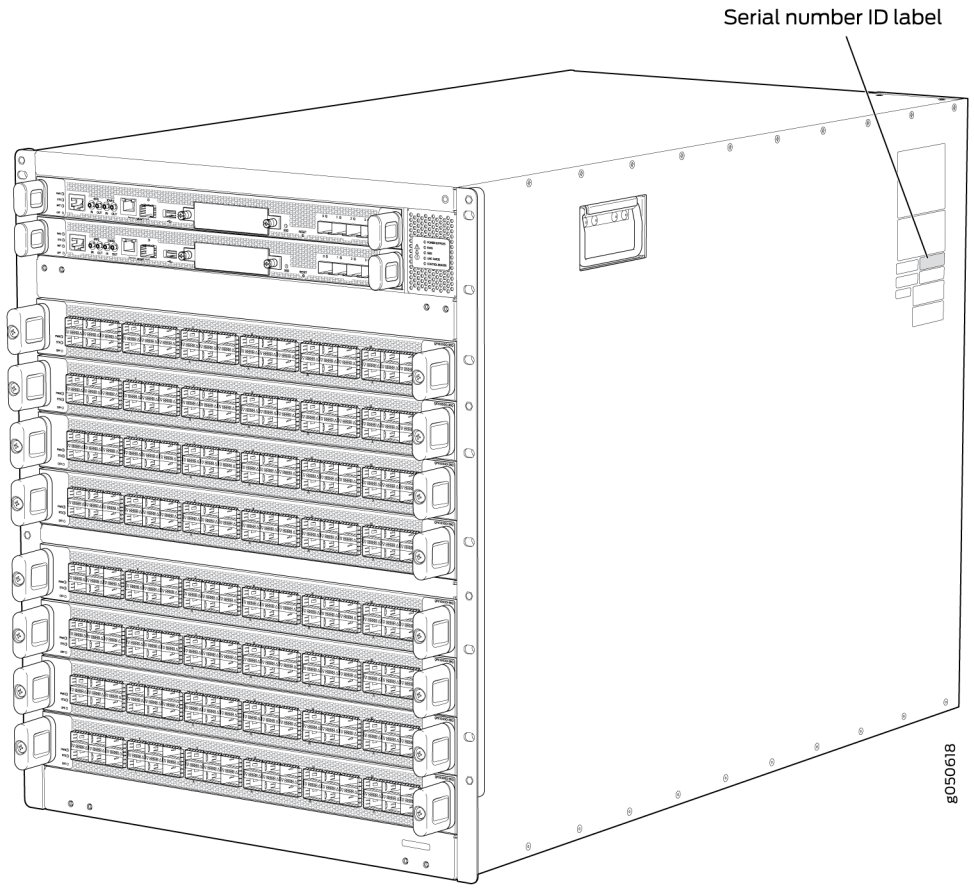
```
Unit
PSM 2            Rev 02   740-069994   1F219110456       JNP10K 5500W AC/HVDC Power Supply
Unit
PSM 3            Rev 02   740-069994   1F219110340       JNP10K 5500W AC/HVDC Power Supply
Unit
PSM 4            Rev 02   740-069994   1F219110310       JNP10K 5500W AC/HVDC Power Supply
Unit
PSM 5            Rev 02   740-069994   1F219110329       JNP10K 5500W AC/HVDC Power Supply
Unit
Routing Engine 0          BUILTIN      BUILTIN           JNP10K-RE1-E
Routing Engine 1          BUILTIN      BUILTIN           JNP10K-RE1-E
CB 0             REV 14   750-079562   CAKY1871          Control Board
CB 1             REV 14   750-079562   CAKY1881          Control Board
FPC 0            REV 07   750-093524   BCBA1286          JNP10K-LC1201
  CPU            REV 03   711-072984   CALJ4961          JNP10K-LC1201 PMB Board
  PIC 0                   BUILTIN      BUILTIN           JNP10K-36QDD-LC-PIC
    Xcvr 0       XXXX     NON-JNPR     1829730235        QSFP56-DD-400G-CR8-CU-1M
    Xcvr 1       REV 01   720-087756   1J1C45A414100     QSFP56-DD-400G-CR8-CU-1M
    Xcvr 2       REV 01   720-087756   1J1C45A414100     QSFP56-DD-400G-CR8-CU-1M
    Xcvr 3       REV 01   720-087756   1J1C45A414048     QSFP56-DD-400G-CR8-CU-1M
    Xcvr 4       REV 01   720-087756   1J1C45A414048     QSFP56-DD-400G-CR8-CU-1M
    Xcvr 5       REV 01   720-087756   1J1C45A414107     QSFP56-DD-400G-CR8-CU-1M
  MEZZ 0         REV 03   711-084968   BCAY0470          JNP10K-LC1201 MEZZ Board
FPC 1            REV 07   750-093524   BCAY8271          JNP10K-LC1201
  CPU            REV 03   711-072984   CALJ4968          JNP10K-LC1201 PMB Board
  PIC 0                   BUILTIN      BUILTIN           JNP10K-36QDD-LC-PIC
    Xcvr 32      REV 01   720-087756   1J1C45A414140     QSFP56-DD-400G-CR8-CU-1M
    Xcvr 33      REV 01   720-087756   1J1C45A414137     QSFP56-DD-400G-CR8-CU-1M
    Xcvr 34      REV 01   720-087756   1J1C45A414137     QSFP56-DD-400G-CR8-CU-1M
    Xcvr 35      XXXX     NON-JNPR     1829730171        QSFP56-DD-400G-CR8-CU-1M
  MEZZ 0         REV 03   711-084968   CALS8492          JNP10K-LC1201 MEZZ Board
FPC 2            REV 07   750-093524   BCAZ2821          JNP10K-LC1201
  CPU            REV 03   711-072984   BCAY0404          JNP10K-LC1201 PMB Board
  PIC 0                   BUILTIN      BUILTIN           JNP10K-36QDD-LC-PIC
  MEZZ 0         REV 03   711-084968   BCAY0449          JNP10K-LC1201 MEZZ Board
FPC 3            REV 07   750-093524   BCAY8286          JNP10K-LC1201
  CPU            REV 03   711-072984   CALJ4944          JNP10K-LC1201 PMB Board
  PIC 0                   BUILTIN      BUILTIN           JNP10K-36QDD-LC-PIC
FPC 4            REV 07   750-093524   BCAY8278          JNP10K-LC1201
  CPU            REV 03   711-072984   CALJ4964          JNP10K-LC1201 PMB Board
  PIC 0                   BUILTIN      BUILTIN           JNP10K-36QDD-LC-PIC
  MEZZ 0         REV 03   711-084968   CALS8503          JNP10K-LC1201 MEZZ Board
FPC 6            REV 07   750-093524   BCBA1277          JNP10K-LC1201
```

```
  CPU            REV 03   711-072984   BCAY0388          JNP10K-LC1201 PMB Board
  PIC 0                   BUILTIN      BUILTIN           JNP10K-36QDD-LC-PIC
  MEZZ 0         REV 03   711-084968   BCAY0456          JNP10K-LC1201 MEZZ Board
FPC 7            REV 07   750-093524   BCAY8288          JNP10K-LC1201
  CPU            REV 03   711-072984   BCAW3545          JNP10K-LC1201 PMB Board
  PIC 0                   BUILTIN      BUILTIN           JNP10K-36QDD-LC-PIC
  MEZZ 0         REV 03   711-084968   CALS8484          JNP10K-LC1201 MEZZ Board
SIB 0            REV 11   750-083423   BCAY0351          SIB-JNP10008
SIB 1            REV 06   750-083423   BCAN8992          SIB-JNP10008
SIB 2            REV 11   750-083423   BCAY0349          SIB-JNP10008
SIB 3            REV 06   750-083423   BCAN8990          SIB-JNP10008
SIB 4            REV 06   750-083423   BCAP3582          SIB-JNP10008
SIB 5            REV 06   750-083423   BCAP3563          SIB-JNP10008
FTC 0            REV 02   750-083435   BCAJ6881          Fan Controller 8
FTC 1            REV 02   750-083435   BCAJ3351          Fan Controller 8
Fan Tray 0       REV 05   760-086563   BCAF4564          Fan Tray 8
Fan Tray 1       REV 05   760-086563   BCAF4569          Fan Tray 8
```

Locate the Chassis Serial Number ID Label on a PTX10008

The serial number ID label is located on a label on the right side of the chassis. See Figure 194 on page 405 for the location on a PTX10008.

Figure 194: PTX10008 Serial Number Label

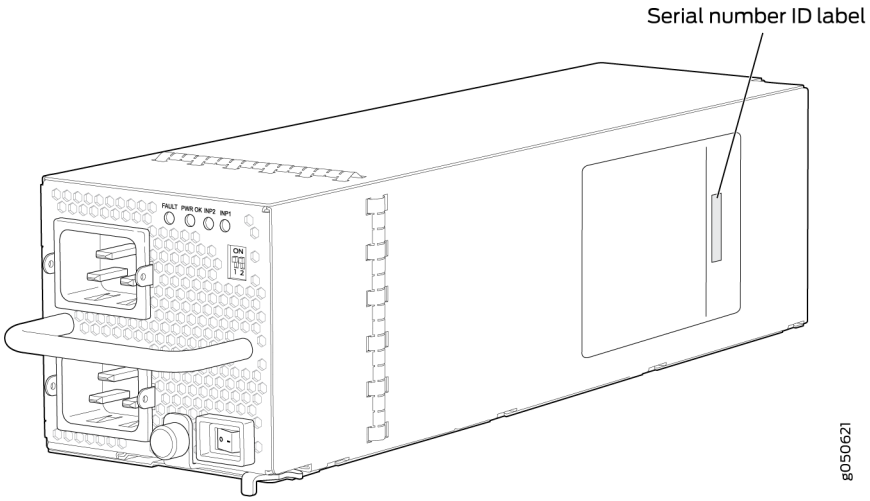


Locate the Serial Number ID Labels on PTX10008 Power Supplies

The power supplies installed in a PTX10008 are field-replaceable units (FRUs). For each FRU, you must remove the FRU from the router chassis to see the FRU serial number ID label.

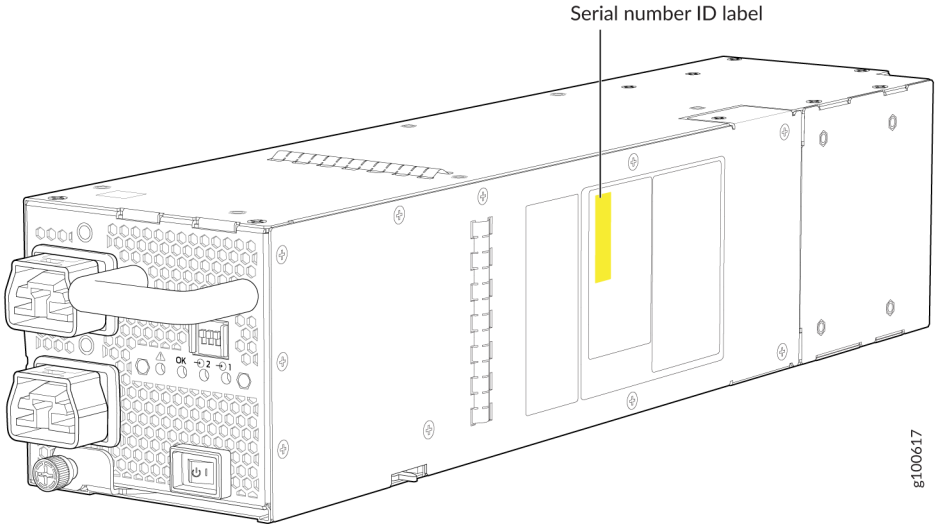
- JNP10K-PWR-AC power supply—The serial number ID label is on the right side of the JNP10K-PWR-AC power supply. See Figure 195 on page 406.

Figure 195: JNP10K-PWR-AC Power Supply Serial Number Location



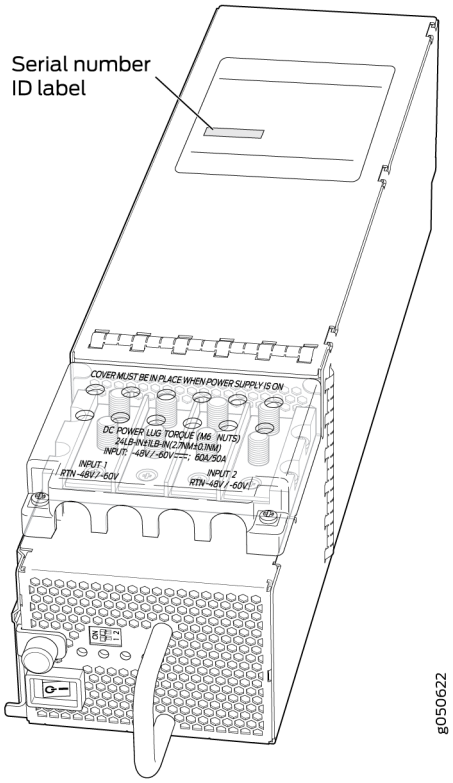
- JNP10K-PWR-AC2 power supply—The serial ID label is on the right side of the power supply. See Figure 196 on page 406.

Figure 196: JNP10K-PWR-AC2 Power Supply Serial Number Location



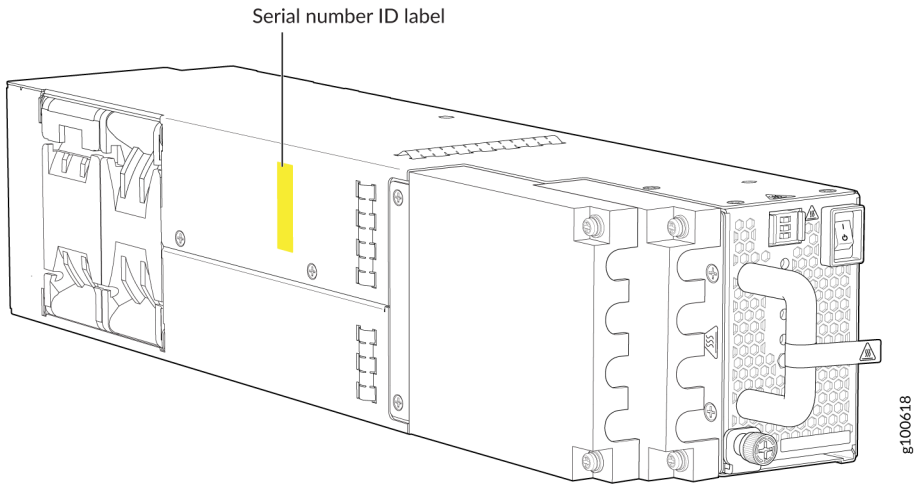
- JNP10K-PWR-DC power supply—The serial number ID label is on the left side of the DC power supply. See Figure 197 on page 407.

Figure 197: JNP10K-PWR DC Power Supply Serial Number Location



- JNP10K-PWR-DC2 power supply—The serial number ID label is on the left side of the power supply. See Figure 198 on page 408.

Figure 198: JNP10K-PWR-DC2 Power Supply Serial Number Location

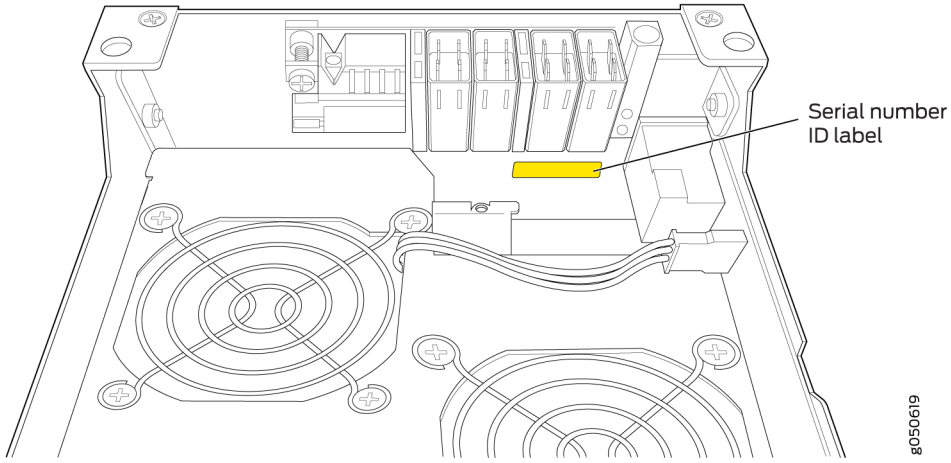


Locate the Serial Number ID Labels on PTX10008 Fan Trays and Fan Tray Controllers

The two fan trays and their associated fan tray controllers installed in a PTX10008 are field-replaceable units (FRUs). For each FRU, you must remove the FRU from the router chassis to see the FRU serial number ID label.

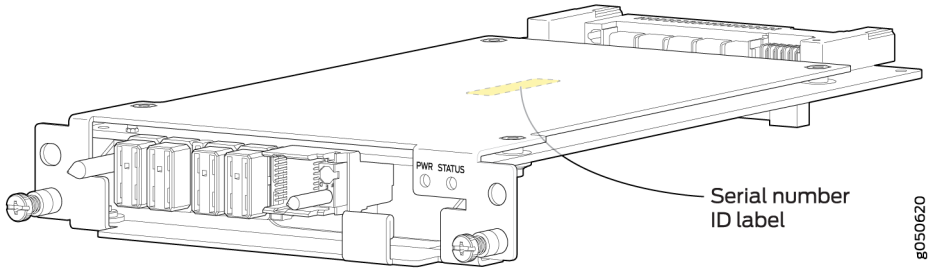
- Fan tray—The serial number ID label for all fan tray models (JNP10008-FAN and JNP10008-FAN2) is located on the inside of the fan tray at the base of the fan tray Control Board. See Figure 199 on page 409.

Figure 199: PTX10008Fan Tray Serial Number Location



- Fan tray controller—The serial number ID label for all fan tray controller models (JNP10008-FAN-CTRL and JNP10008-FTC2) is located on the top of the fan tray controller. See Figure 200 on page 409.

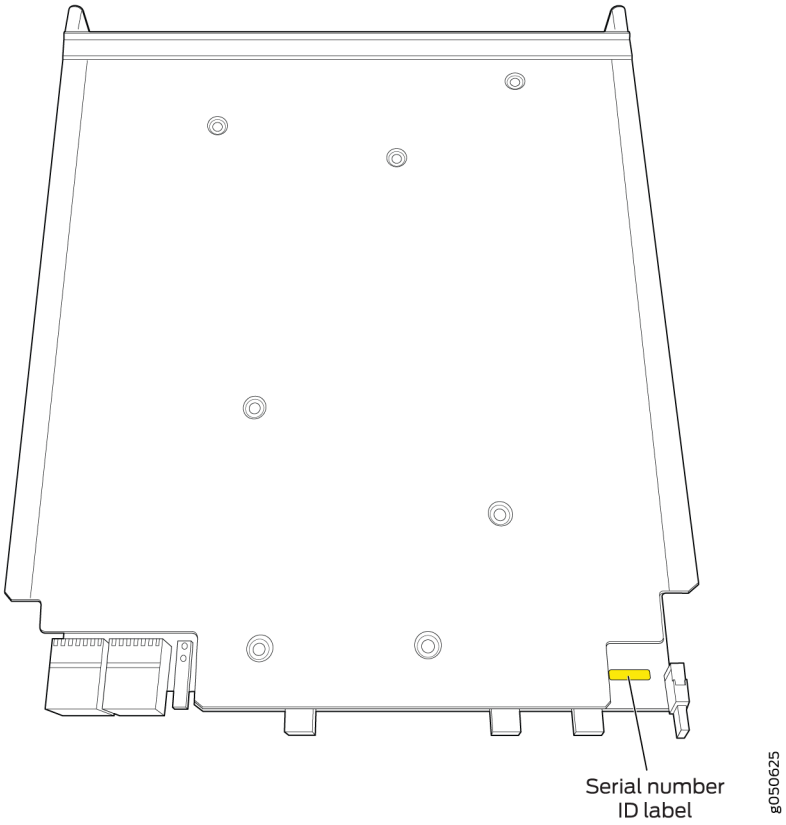
Figure 200: PTX10008 Fan Tray Controller Serial Number Location



Locate the Serial Number ID Labels on PTX10008 Routing and Control Boards

The serial number ID label for a Routing and Control Board (RCB) is located on the connector end of the unit. See Figure 201 on page 410.

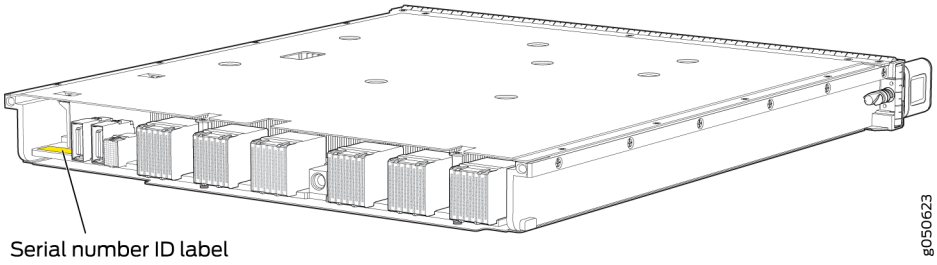
Figure 201: PTX10008 Routing and Control Board Serial Number Location



Locate the Serial Number ID Labels on a PTX10008 Line Card

The serial number ID label for a line card is located on the connector end of the card. See Figure 202 on page 411.

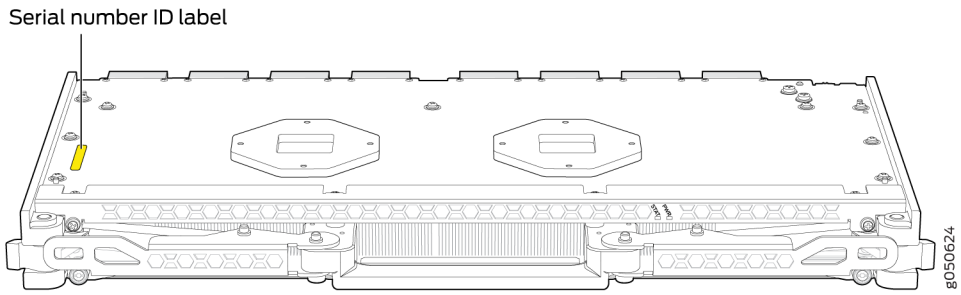
Figure 202: PTX10008 Line Card Serial Number Location



Locate the Serial Number ID Labels on a PTX10008 Switch Interface Board (SIB)

The serial number ID label for a SIB is located on the printed circuit board. See Figure 203 on page 411.

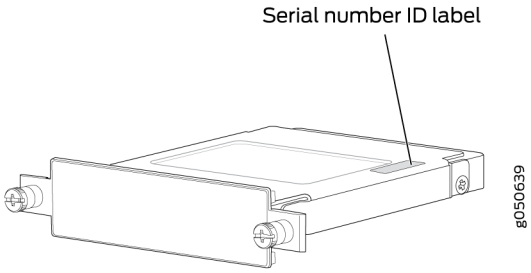
Figure 203: PTX10008 SIB Serial Number Location



Locate the Serial Number ID Label on a PTX10008 SATA SSD

The serial number for a SATA SSD is located on top of the drive. See Figure 204 on page 412.

Figure 204: PTX10008 SATA SSD Serial Number Location



RELATED DOCUMENTATION

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Contact Customer Support to Obtain a Return Materials Authorization for a PTX10008 Router or Component

If you are returning a PTX10008 router or component to Juniper Networks for repair or replacement, you must first obtain a Return Materials Authorization (RMA) from the Juniper Networks Technical Assistance Center (JTAC).

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

For instructions on locating the serial number of the device or component you want to return, see the following device instructions:

- "Locate the Serial Number on a PTX10008 Router or Component" on page 400

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

- Your existing service request number, if you have one
- Serial number of the 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 the USA, Canada, and Mexico

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

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 PTX10008 or Component for Shipping

IN THIS SECTION

- How to Pack a PTX10008 Chassis for Shipping | **415**
- How to Pack PTX10008 Components for Shipping | **417**

Follow this procedure if you are returning a PTX10008 chassis or component to Juniper Networks for repair or replacement.

Before you pack a PTX10008 or component:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.
- Pack your chassis or component using one of these materials:

- Use the packing material from the replacement chassis or component
- 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 to Obtain a Return Materials Authorization for a PTX10008 Router or Component" on page 412.

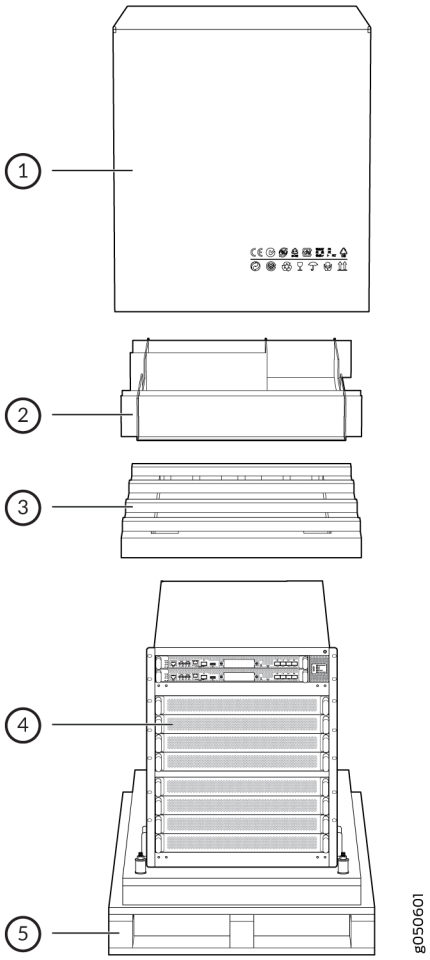
Ensure that you have the following parts and tools available:

- ESD grounding strap.
- Electrostatic bag, one for each component.
- If you are returning the chassis:
  - A 13/32-in. or 10-mm open-end or socket wrench to install the bracket bolts on the chassis and shipping pallet
  - An appropriate screwdriver for the mounting screws used on your rack.

How to Pack a PTX10008 Chassis for Shipping

The PTX10008 is shipped in a cardboard box that has a two-layer wooden pallet base with foam cushioning between the layers. The router chassis is bolted to the pallet base with four pallet fasteners, two on each side of the chassis. See Figure 12 for the stacking configuration of the PTX10008.

Figure 205: Stacking Configuration for Packing the PTX10008 Chassis



To pack a PTX10008 for shipping:

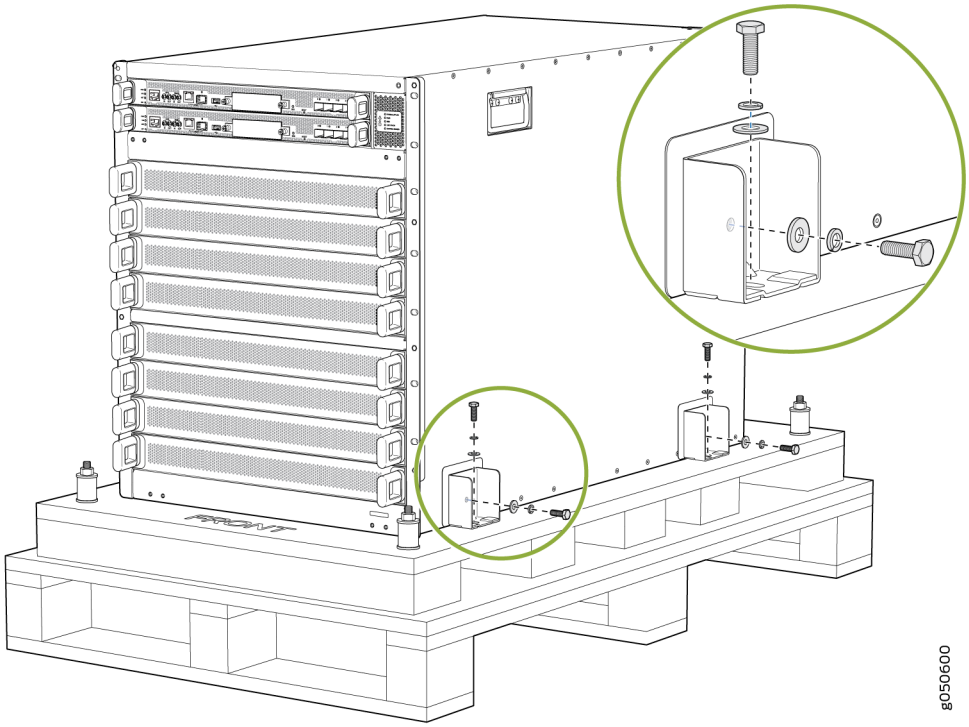
1. Power down the chassis and remove the power cables. See "Power Off a PTX10008" on page 384.
2. Remove the cables that connect the PTX10008 to all external devices.
3. Remove all line cards and pack them in their original shipping containers. See "How to Pack a PTX10008 or Component for Shipping" on page 413.
4. Install covers over blank slots.

Leave components that came installed in the chassis, such as the Routing Control Boards or power supplies.

5. Move the wooden pallet and packing material to a staging area as close to the router as possible. Make sure there is enough space to move the chassis from the rack to the wooden pallet.
6. Position a mechanical lift under the device. If a mechanical lift is not available, have three people support the weight of the router while another person uses the screwdriver to remove the front mounting screws that attach the chassis mounting brackets to the rack. For PTX10008 removal, see "Remove a PTX10008 from a Four-Post Rack Using a Mechanical Lift" on page 387 or "Remove a PTX10008 Manually from a Four-Post Rack" on page 389.
7. Remove the router from the rack (see "PTX10008 Chassis Lifting Guidelines" on page 427) and place the router on the shipping pallet. Position the router on the pallet so that the front of the router is facing the silkscreened “front” mark on the pallet. The pallet also has crop marks to guide you in positioning the chassis.
8. Use the 13/32-in. or 10-mm open-end or socket wrench to install the four sets of brackets and bolts that secure the chassis to the wooden pallet.
9. Slide the plastic cover over the router chassis. The plastic cover is part of the router’s original packing materials.
10. Place the packing foam on top of and around the router.
11. Place the power cords in the box.
12. Remove the rack mount kit from the rack and place it and the connecting screws in the accessory box.
13. If you are returning accessories or FRUs with the router, pack them as instructed in "How to Pack a PTX10008 or Component for Shipping" on page 413.
14. Verify that all accessories are present. See "Compare the PTX10008 Order to the Packing List" on page 239.
15. Slide the cardboard box over the chassis, making sure that the arrows on the box point up and the pallet fasteners to secure the cardboard box to the wooden pallet are near the bottom.

16. Attach the cardboard box to the wooden pallet by screwing two screws into each of the four pallet fasteners. See Figure 13.

Figure 206: Attach the PTX10008 to the Pallet



17. Write the RMA number on the exterior of the box to ensure proper tracking.

How to Pack PTX10008 Components for Shipping

Before you begin packing a router component, ensure that you have the following parts and tools available:

- Antistatic bag, one for each component
- Electrostatic discharge (ESD) grounding strap

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

To pack and ship PTX10008 components:

1. Place individual FRUs in antistatic bags.

2. Use the original packing materials if they are available. If the original packing materials are not available, ensure the component is adequately packed to prevent damage during transit. The packing material you use must be able to support the weight of the component.
3. Ensure that the components are adequately protected with packing materials and packed so that the pieces are prevented from moving around inside the carton.
4. Close the top of the cardboard shipping box and seal it with packing tape.
5. Write the RMA number on the exterior of the box to ensure proper tracking.

RELATED DOCUMENTATION

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How to Pack a PTX10008 or Component for Shipping | 413

CHAPTER 8

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 | 425
- Fire Suppression Equipment | 425

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.

PTX10008 Chassis Lifting Guidelines

The weight of a chassis varies by the configuration. A chassis spare is the lightest at 273 lb (123.8 kg) and the weight goes up to 421 lb (191 kg) on the PTX10008-PREM3. Installing the PTX10008 router in a rack or cabinet requires either a mechanical lift or three people to lift the router and another person to secure it to the rack. To prevent injury, keep your back straight and lift with your legs, not your back.

CAUTION: If you are installing the PTX10008 without a mechanical lift, remove all power supplies, control boards, SIBs, cover panels, and fan trays before attempting to install the router. Unless you are using a mechanical lift, at least three people are required to perform the rack installation.

- Before installing a PTX10008, read the guidelines in "PTX10008 Site Preparation Checklist" on page 177 to verify that the intended site meets the specified power, environmental, and clearance requirements.
- Before lifting or moving the PTX10008, disconnect all external cables.
- When raising the PTX10008 into the rack, have two people lift and align the router with the rack while another person secures the router to the rack. 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

Mount the PTX10008 by Using the JNP10004-RMK-4POST Rack Mount Kit | 245

Mount the PTX10008 by Using the EX-MOD-RMK-4POST Rack Mount Kit | 253

Restricted Access Warning

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

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

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

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

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

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

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

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

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

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

Ramp Warning



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

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

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

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

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

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

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

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

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

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

Rack-Mounting and Cabinet-Mounting Warnings

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



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

- Install the device in a rack that is secured to the building structure.
- Mount the device at the bottom of the rack if it is the only unit in the rack.
- When mounting the device on a partially filled rack, load the rack from the bottom to the top, with the heaviest component at the bottom of the rack.
- If the rack is provided with stabilizing equipment, install the stabilizers before mounting or servicing the device in the rack.

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

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

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

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

Avertissement Pour éviter toute blessure corporelle pendant les opérations de montage ou de réparation de cette unité en casier, il convient de prendre des précautions

spéciales afin de maintenir la stabilité du système. Les directives ci-dessous sont destinées à assurer la protection du personnel:

- Le rack sur lequel est monté le Juniper Networks switch doit être fixé à la structure du bâtiment.
- Si cette unité constitue la seule unité montée en casier, elle doit être placée dans le bas.
- Si cette unité est montée dans un casier partiellement rempli, charger le casier de bas en haut en plaçant l'élément le plus lourd dans le bas.
- Si le casier est équipé de dispositifs stabilisateurs, installer les stabilisateurs avant de monter ou de réparer l'unité en casier.

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

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

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

- Il Juniper Networks switch deve essere installato in un telaio, il quale deve essere fissato alla struttura dell'edificio.
- Questa unità deve venire montata sul fondo del supporto, se si tratta dell'unica unità da montare nel supporto.

- Quando questa unità viene montata in un supporto parzialmente pieno, caricare il supporto dal basso all'alto, con il componente più pesante sistemato sul fondo del supporto.
- Se il supporto è dotato di dispositivi stabilizzanti, installare tali dispositivi prima di montare o di procedere alla manutenzione dell'unità nel supporto.

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

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

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

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

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

- El Juniper Networks switch debe instalarse en un bastidor fijado a la estructura del edificio.
- Colocar el equipo en la parte inferior del bastidor, cuando sea la única unidad en el mismo.
- Cuando este equipo se vaya a instalar en un bastidor parcialmente ocupado, comenzar la instalación desde la parte inferior hacia la superior colocando el equipo más pesado en la parte inferior.
- Si el bastidor dispone de dispositivos estabilizadores, instalar éstos antes de montar o proceder al mantenimiento del equipo instalado en el bastidor.

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

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

Grounded Equipment Warning



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

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

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

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

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

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

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

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

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

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

Radiation from Open Port Apertures Warning



LASER WARNING: Because invisible radiation might be emitted from the aperture of the port when no fiber cable is connected, avoid exposure to radiation and do not stare into open apertures.

Waarschuwing Aangezien onzichtbare straling vanuit de opening van de poort kan komen als er geen fiberkabel aangesloten is, dient blootstelling aan straling en het kijken in open openingen vermeden te worden.

Varoitus Koska portin aukosta voi emittoitua näkymätöntä säteilyä, kun kuitukaapelia ei ole kytkettynä, vältä säteilylle altistumista äläkä katso avoimiin aukkoihin.

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

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

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

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

Aviso Dada a possibilidade de emissão de radiação invisível através do orifício da via de acesso, quando esta não tiver nenhum cabo de fibra conectado, deverá evitar an EXposição à radiação e não deverá olhar fixamente para orifícios que se encontrarem a descoberto.

¡Atención! Debido a que la apertura del puerto puede emitir radiación invisible cuando no existe un cable de fibra conectado, evite mirar directamente a las aperturas para no exponerse a la radiación.

Varning! Osynlig strålning kan avges från en portöppning utan ansluten fiberkabel och du bör därför undvika att bli utsatt för strålning genom att inte stirra in i oskyddade öppningar.

Laser and LED Safety Guidelines and Warnings

IN THIS SECTION

- General Laser Safety Guidelines | **436**
- Class 1 Laser Product Warning | **436**
- Class 1 LED Product Warning | **437**
- Laser Beam Warning | **437**

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

Observe the following guidelines and warnings:

General Laser Safety Guidelines

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

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



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

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

Class 1 Laser Product Warning



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

Varoitus Luokan 1 lasertuote.

Avertissement Produit laser de classe I.

Warnung Laserprodukt der Klasse 1.

Avvertenza Prodotto laser di Classe 1.

Advarsel Laserprodukt av klasse 1.

Aviso Produto laser de classe 1.

¡Atención! Producto láser Clase I.

Varning! Laserprodukt av klass 1.

Class 1 LED Product Warning



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

Varoitus Luokan 1 valodiodituote.

Avertissement Alarme de produit LED Class I.

Warnung Class 1 LED-Produktwarnung.

Avvertenza Avvertenza prodotto LED di Classe 1.

Advarsel LED-produkt i klasse 1.

Aviso Produto de classe 1 com LED.

¡Atención! Aviso sobre producto LED de Clase 1.

Varning! Lysdiodprodukt av klass 1.

Laser Beam Warning



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

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

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

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

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

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

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

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

Varning! Rikta inte blicken in mot strålen och titta inte direkt på den genom optiska instrument.

Maintenance and Operational Safety Guidelines and Warnings

IN THIS SECTION

- Battery Handling Warning | **439**
- Jewelry Removal Warning | **440**
- Lightning Activity Warning | **441**
- Operating Temperature Warning | **442**
- Product Disposal Warning | **443**

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 207 on page 447) 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).

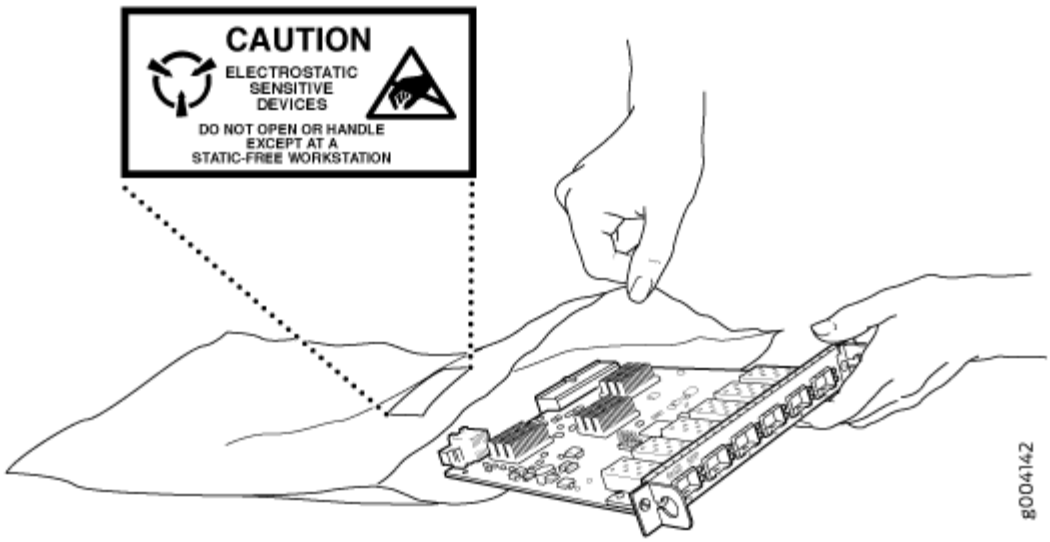
- When handling any component that is subject to ESD damage and that is removed from the device, make sure the equipment end of your ESD wrist strap is attached to the ESD point on the chassis.

  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 207 on page 447). If you are returning a component, place it in an antistatic bag before packing it.

Figure 207: 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 for the PTX10008 and PTX10016 Routers

This topic applies to hardware devices in the PTX10008 and PTX10016 routers.

- A DC-powered device is equipped with a DC terminal block that is rated for the power requirements of a maximally configured device.

  NOTE: To supply sufficient power, terminate the DC input wiring on a facility DC source that is capable of supplying a minimum of 60 A at –48 VDC for the PTX10008 routers and PTX10016 routers.

  Incorporate an easily accessible disconnect device into the facility wiring. Be sure to connect the ground wire or conduit to a solid office earth ground. A closed loop ring is recommended for terminating the ground conductor at the ground stud.

- 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 for installation only 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.
- For personal safety, connect the green and yellow wire to safety (earth) ground at both the device and the supply side of the DC wiring.
- 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 to be associated only 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.

PTX10008 and PTX10016 Agency Approvals and Compliance Statements

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- Compliance Statements for EMC Requirements for the PTX10008 and PTX10016 Routers | 460

Agency Approvals for the PTX10008 and PTX10016 Routers

IN THIS SECTION

- Compliance Statement for Argentina | 460

The PTX10008 and PTX10016 routers are tested against the following standards:

- Safety
  - UL 62368-1 Standard for Audio/video, information and communication technology equipment - Part 1: Safety requirements
  - CAN/CSA-C22.2 No. 60950-1 Information Technology Equipment – Safety
  - IEC 62368-1 Information Technology Equipment – Safety
  - IEC 60950-1 Information Technology Equipment – Safety CB Scheme report
  - IEC 60825-1 Laser safety
- EMC
  - FCC 47 CFR, Part 15 Class A (2012) USA radiated emissions – Class A
  - IC ICES-003 Issue 6, Jan 2016 Canada radiated emissions – Class A
  - EN 300 386 V1.6.1 Telecom network equipment – EMC requirements Class A

  - EN 300 386 V2.1.1 Telecom network equipment – EMC requirements Class A
  - EN 55032:2012 + EN55032:2012/AC:2013 Electromagnetic compatibility of multimedia equipment – Emission requirements Class A
  - CISPR 32:2012 Electromagnetic compatibility of multimedia equipment – Emission Requirements Class A
  - EN 55024:2010/AC:2011 European radiated emissions Class A
  - CISPR 24 Information technology equipment - Immunity testing
  - EN 55035:2017 – Electromagnetic compatibility of multimedia equipment – Immunity requirements
  - CISPR 35:2016 – Electromagnetic compatibility of multimedia equipment – Immunity requirements
  - IEC/EN 61000 Series – Electromagnetic compatibility
  - AS/NZS CISPR 32:2015 Electromagnetic compatibility of multimedia equipment – Emission requirements Class A
  - VCCI-CISPR 32:2016 Japanese radiated and conducted emissions Class A
  - BSMI CNS 13438 – Taiwan radiated emissions Class A
  - KN32 and KN35 – Korea radiated emission (at 10 Meter) Class A
  - KN 61000 Series – Korea electromagnetic compatibility
  - TEC/SD/DD/EMC-221/05/Oct-16 – Electromagnetic compatibility
  - VCCI-V-3/2013.04 and V-4/2012.04 – Japanese radiated emissions Class A
  - TCVN 7189 – Vietnam Electromagnetic compatibility for Multimedia
  - TCVN 7317:2003 – Vietnam Electromagnetic compatibility for Multimedia
- Network Equipment Building System (NEBS)
  - EN 300 019-2-1 – Environmental engineering
  - EN 300 019-2-2 – Equipment engineering
  - EN 300 019-2-3 – Environmental engineering
  - EN 300 753 – Equipment engineering
  - GR-63-CORE – Requirements, physical protection

- GR-1089-CORE, Issue 7 – Acoustic noise

Compliance Statement for Argentina

EQUIPO DE USO IDÓNEO.

Compliance Statements for EMC Requirements for the PTX10008 and PTX10016 Routers

IN THIS SECTION

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- European Community | **461**
- Israel | **461**
- Japan | **461**
- Korea | **462**
- United States | **462**
- Nonregulatory Environmental Standards | **462**

This topic describes the EMC requirements for the PTX10008 and PTX10016 routers for:

Canada

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

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

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

Before installing this equipment, users should ensure that it is permissible to connect the equipment to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the inside wiring associated with a single line individual service may be extended by means of a certified connector assembly. The customer should be

aware that compliance with the above conditions may not prevent degradation of service in some situations.

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

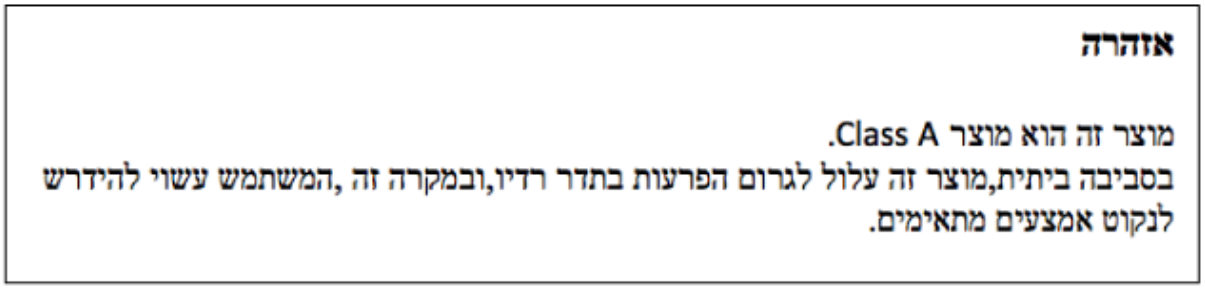
> ⚠ **CAUTION**: Users should not attempt to make electrical ground connections by themselves, but should contact the appropriate inspection authority or an electrician, as appropriate.

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

European Community

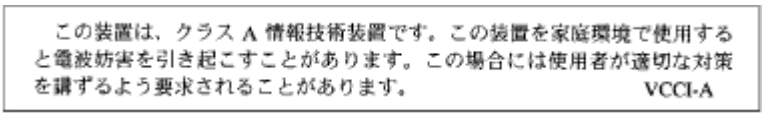
This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Israel



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

Japan

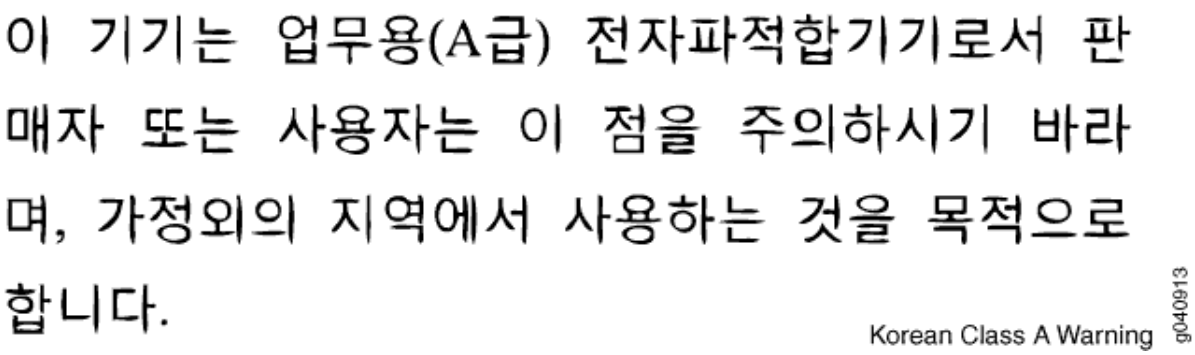


The preceding translates as follows:

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

VCCI-A

Korea



Korean Class A Warning

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.

United States

The PTX10008 and PTX10016 devices have been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Nonregulatory Environmental Standards

These PTX Series product SKUs are designed to be Network Equipment Building System (NEBS) compliant:

- PTX10008
- PTX10016

For specific line card compliance, see Table 112 on page 463.

Those device product SKUs are designed to meet the following NEBS compliance standards:

- SR-3580 NEBS Criteria Levels (Level 3 Compliance)
- GR-1089-CORE, Issue 7: EMC and Electrical Safety—Generic Criteria for Network Telecommunications Equipment
  - 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 (DC-I), as defined in GR-1089-CORE.
- GR-63-CORE: NEBS, Physical Protection
  - The equipment is suitable for installation as part of the Common Bonding Network (CBN).
  - The equipment is suitable for installation in a central office (CO).

Table 112: Line Card Compliance

Line Card	Compliance
PTX10K-LC1101	NEBS compliant
PTX10K-LC1102	NEBS compliant
PTX10K-LC1104	Data center GR-3160 compliant
PTX10K-LC1105	NEBS compliant
PTX10K-LC1201-36CD	NEBS compliant
PTX10K-LC1202-36MR	Data center GR-3160 compliant when installed in a PTX10008 router
QFX10000-60S-6Q	NEBS compliant